Three Quintus Hot Isostatic Presses Support Anhui Yingliu’s Climb to the Top in Casting Markets

Commissioning of world’s largest 2000-bar HIP rapidly followed by orders to more flexible production systems

A trio of Quintus HIPs is central to the Anhui Yingliu Group’s goal of establishing a world-class hot isostatic pressing center at its Huoshan Casting Co. Ltd. foundry in Anhui province, China. That plan is part of the company’s steadfast drive to secure a leadership position as a manufacturer of products meeting the mission-critical performance standards of demanding industries like aerospace and nuclear power.

Recent innovations from Quintus Technologies, including High Pressure Heat Treatment (HPHT), have enabled HIP productivity to soar by up to 100%. The ability to heat treat castings directly in the HIP system consolidates multiple process steps in a single press cycle, with no added cost or process time. These improvements simultaneously boost output and decrease running costs, a value proposition that quickly attracted the attention of Anhui Yingliu in its quest to combine broad materials competence with the most advanced and productive way of processing them.

The Yingliu Powerhouse

Anhui Yingliu develops, manufactures, and sells high-precision steel casted and machined components for a range of industrial applications, with an emphasis on uncompromising environments. As one of the largest such operations in China, it offers customers extensive manufacturing flexibility, with capabilities ranging from the large-scale production of complex castings to small-batch, highly customized orders for highly sophisticated applications.

Anhui Yingliu excels in foundry technology and is considered a strong contender in the international market for quality castings. With a focus on integrated manufacturing, Anhui strives to provide a one-stop solution for high-end components and assemblies. Its extensive customer base includes more than 60 globally recognized companies in over 30 countries and regions around the world. Approximately 36% of its sales are to China, 35% to North America, and 15% to European nations.
Anhui Yingliu Group Huoshan Casting Co. Ltd.

The world's largest 2,000-bar HIP

A perennial challenge in the casting process is the elimination of pores, which are caused by entrapped gas or solidification shrinkage. Hot Isostatic Pressing has become the standard practice to heal defects and remove internal porosity, thus attaining the 100% material density required for high-end castings. Globally, one of the most common HIP application is to consolidate and improve the material properties of titanium and super-alloys for the aerospace industry.

Seeking to scale up HIP capacity for the production of large aircraft engine casings, Anhui Yingliu went large when ordering its first Quintus system, selecting model QIH 1.6x2.5-2000-1400M URC for the Huoshan Casting facility. A sizeable work zone of 63 inches (1,600 mm) in diameter and 98 inches (2,500 mm) in height is ideal for the intended application, as well as for other high-performance parts. Fully commissioned in December 2015, the press operates at a pressure of 200 MPa (29,000 psi) and temperatures up to 2,552°F (1,400°C), making it the world’s largest in its pressure and temperature class.

After a few months of operation, with the efficiency and productivity benefits of the system clearly in evidence, Anhui placed an order for two more Quintus HIPs to further extend foundry capacity. The additional presses will produce investment castings for China’s thriving aircraft and nuclear power industries, among other customers.

The second press to be installed, in April 2017, is a compact production system, the QIH 48, with a work zone of 15x47 inches (375x1,200 mm), is capable of up to four cycles a day, depending on the application. Quintus will deliver the third unit, the QIH 173 L, a mid-size production system, with a work zone of 32x98 inches (800x2,500 mm), and it will be up and running in November 2017.

Unparalled Performance, Safety, and Service

Quintus HIP technology provides Anhui with a proven approach to complete material densification, increasing the fatigue resistance (by up to a factor of 10-100 depending on alloy), ductility, and impact toughness in critical, high-performance components. It also contributes to the bottom line by minimizing expenditures for time-consuming steps like repairs and non-destructive testing (NDT) while avoiding loss due to non-approved castings.

All three presses for the foundry are equipped with Quintus’s proprietary Uniform Rapid Cooling™ (URC™) feature, as an example the QIH 48 delivers carefully calibrated cooling rates, above 302°F (150°C) per minute. In a medium-sized HIP, URC can cool the full workload from 2300°F to 572°F (1260°C to 300°C) in less than 30 minutes, compared to the eight to 12 hours it takes for natural cooling. The URC design cools all areas of the workload uniformly, minimizing thermal distortion and non-uniform grain growth.

From a safety perspective, the vessel and yoke frame of all Quintus HIPs are fully pre-stressed and wire-wound with high tensile cold-rolled spring steel ribbon. The pre-stressing causes the pressure vessel wall to remain in residual compression, even at maximum operating pressure, eliminating tensile loads and preventing crack propagation and failure.

In addition, Quintus systems are well known for superior engineering that allows them to operate around the clock with a service life of tens of thousands of cycles, offering consistent high performance and availability. Anhui Yingliu has also signed a Service Level agreement to ensure robust operations. Local Quintus-trained and certified Field Service Engineers support the foundry’s press population with spares and service work based on Chinese market prices and currency.

With the stage set for the future growth of Hot Isostatic Pressing and advanced material processing, there is no doubt that Anhui Yingliu is well on its way to the top of the castings market, not only in China but throughout Asia.