New aerospace casting milestone for UK’s sole titanium caster

Castings Technology International (Cti) has reached a new milestone by producing the first large-scale, centrifugally-manufactured, high-integrity component.

The UK-based specialist – a supplier of difficult-to-source, low volume castings to the high value manufacturing sector – used its considerable expertise to produce a demonstration intercasing by pouring 250kg of molten titanium into moulds rotating at 200 rpm.

The 600mm diameter, near net shape casting is similar to those used in engines powering large turbo-prop aircraft and short-haul commercial jets.

Cti’s success builds on its previous experience of making safety-critical, centrifugally-cast titanium components and is a major step towards its goal of making the largest centrifugally cast titanium aerospace components in Europe.

That would involve the company, based at the Advanced Manufacturing Park in South Yorkshire, melting 1.2 tonnes of highly reactive titanium to produce components used in engines for the largest twin-aisled commercial aircraft.
Cti General Manager Richard Cook and Technology Development Manager Will Jeffs will be showcasing the company’s capabilities for ‘supersize’ shell casting to a global audience at the 65th Annual Technical Conference and Expo in Kansas City, USA, hosted by the Investment Casting Institute.

Attendees at the yearly event benefit from presentations covering all aspects of the investment casting process and it is there where Will is to present his paper ‘Supersize My Shell’ on a system designed to be able to manufacture a shell envelope of 6ft 6ins in diameter and 8ft 2ins long with a maximum shell weight of 5,510lbs.

Cti’s expertise already includes making the largest ceramic shells in Europe using proprietary technology that enables it to create greener, cleaner near net shape castings with improved surface and micro structural properties.

Unlike other ceramics, the material Cti uses to make shells does not need heating to withstand the thermal shock when the molten titanium is poured in under the high g-forces produced by spinning the moulds. That radically reduces the thickness of the alpha case - a hard and brittle, oxygen-enriched surface layer that forms on titanium castings.

As a result, large castings made using Cti’s process are near net shape, require less finishing and avoid having to make over-sized castings which need significant chemical milling using highly corrosive materials that are difficult to dispose of safely.

Furthermore, unlike Cti’s materials, other ceramics have a density close to that of titanium, which makes defects difficult to detect using x-rays.

Cti General Manager, Richard Cook, said it is a major step forward for Cti’s expertise and for the capability of the European aerospace sector.

“Aero engine companies are understandably protective of their Intellectual Property, which is why we could only make an illustrative part.

“However, those who have seen it have been impressed by the complexity, the as-cast surface finish, internal quality and improved mechanical properties we have achieved, as well as the reduced ‘buy-to-fly’ ratio offered by our processes.

“We will now be scaling up the size of centrifugally-cast aerospace components we can make, so that we can take full advantage of the capacity of the 1200kg titanium caster at the University of Sheffield Advanced Manufacturing Research Centre on the Advanced Manufacturing Park site.”

Other recent achievements by Cti include expanded accreditation from the National Aerospace and Defense Contractors Accreditation Program (NADCAP). This allows it to supply conventional and centrispun titanium castings weighing up to 500kg for use by the civil and defence aerospace industries and now includes approval for welding of Titanium 6/4 (Grade C5) in addition to NDT Processes and Vacuum Heat Treatment.

It has also made the largest ceramic shell titanium casting ever created from a single pour in Europe - an industrial centrifugal pump housing, used for highly corrosive applications in the chemical and petrochemical sectors, poured from a 680kg melt with a 200kg finished part weight.

To find out how your company could benefit, contact:

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The near net shape casting is similar to those used in engines powering large turbo-prop aircraft and short-haul commercial jets.