

Application of Investment Casting: A Review paper

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Abstract

Investment casting process is a type casting process of producing clear net shape, high-dimensional accuracy and intricate design. Consistent research effort has been made by various researchers from all over the world with an objective to explore the world of investment casting. This article highlights the advancements made and proposed at each step of investment casting and its applications in practical world . Investment casting is being used from years to manufacture parts such as weapons, jewellery item, idols and statues of god and goddess; this article reviews the present and future applications of the investment casting. The aim of this review article is to present state of art review of applications of investment casting since 3200 BC.

This article is organized as follows: in section 'Introduction', introduction to investment casting and process is given ; in section 'Application in Aerospace Industries', background is given on the application of investment casting in aerospace and related industries; section 'Biomedical applications of investment casting' presents the medicine or biomedical applications of investment casting; section 'Conclusion' closes the article by offering conclusions.

Keywords: investment casting, biomedical application and aerospace industry application.

Introduction

Investment casting is a manufacturing process that can be traced back over 5,000 years to ancient Egypt and China. It is utilized to cast a wide variety of items, including high-quality, high-performance industrial parts. At PPCP, we utilize investment casting to produce a diverse range of parts up to 250 pounds. A wide variety of alloys can be used, from steel and aluminum to highly specialized materials. PPCP's castings serve many industries and applications.



Figure 1 : The Head of Medusa sculpture that now stand in the Loggia dei Lanzi in Florence, Italy.



Figure 2 : Some casted examples of investment casting.

Process of Investment Casting:-

In the investment casting process, a wax pattern is coated with a ceramic material, which, when hardened, adopts the internal geometry of the desired casting. In most cases, multiple parts are cast together for efficiency by attaching individual wax patterns to a central wax stick called a sprue. The wax is melted out of the pattern – which is why it is also known as the lost wax process – and molten metal is poured into the cavity. When the metal solidifies, the ceramic mold is broken off, leaving the near net shape of the desired part. Finishing, testing and packaging complete the process.

Application in Aerospace Industries

Jet propulsion for military and civilian aircrafts gave investment casting the foremost status in the casting industry. From heavy casting of 300Kg to small casting of 30 kg, this casting method is used for as wide for hi-tech industrial applications. This process is more expensive than sand casting in terms of the casting techniques, but the equipment are relatively cheaper. But still, investment casting is largely relied on for complicated designs that cannot be casted using any other method. Investment casting finds widespread application in spacecraft, jet engines, etc. Though this industry is heavily depended on the aircraft industry, it is is find our new field of application to broaden its horizon.

Investment casting is the most precision metal processing process, it can offer near or net near shape components for aerospace.

Comparing with other processes, investment casting is one of the cost-effective manufacturing method. So this kind of metal working way can offer high quality aerospace castings with low cost. Also, there is no limit on the quantity of products, even if a trial order, it is also feasible.

Aerospace industry require high precision, high durability parts, investment casting is the right process for such parts..

Thus to ensure the saftey and longer the serving life.

Typical aerospace investment castings are:

- Hydraulic fluid system components
- Interior components
- Landing and braking components
- Exterior and interior sensors, motion control and actuation systems
- Flight critical and safety components
- Bearing cages
- Cargo Systems

Biomedical applications of investment casting

Investment Castings are used in medical related applications where the complex metal components are used. With our modern investment casting technique, CFS

foundry can cast all metal alloys such as stainless steel, aluminum, ect in precise dimensions. We can supply medical investment castings for:

- Operating tables and other operating room equipment
- MRI machines
- X-ray equipment
- Stretchers, wheelchairs and similar products
- Injury stabilizing devices
- Implantable components

Investment casting offers a wide of material selection for medical application in several grades of steel and aluminum. Such investment casting technology use the lost wax method is able to to produce these parts with great accuracy. From mold making for each geometric details to excellent semi-automotive casting process controlled by computer, investment castings made for medical application will achieve great consistency with high quality. After casting, burrs will be removed for smooth surface. If required, post treatments like heat treatment, machining, surface coatings, will be applied for special demands.

In a word, investment casting is a efficient method for medical metal component. It can offer consistent parts in large production runs. This process can continue to cast these parts on a regular basis to hold inventory between minimum and maximum levels, ensuring the parts are available to the customer on a regular basis timely.

Conclusion

- From above study of investment casting and its application it is being cleared that investment casting is the most useful type of casting when it comes to precision and accuracy.
- It is being concluded that there is a bright scope for the investment casting as the future of many industries like aerospace and defense are going to be heavenly dependent on investment casting.
- There are many products to be manufactured through the investment casting like future missile parts, guns and artillery parts future medical equipments and synthetic body parts, etc.
- Investment casting industry is becoming a huge industry that will be very good for the sake of employment and the economic growth of the country.

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