



A Review on Advancement in Investment Casting Process

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ABSTRACT

Investment Casting was the oldest fabrication method used in industry. To improve the quality of the product the advanced manufacturing techniques in Investment casting process has been used. Today Investment casting process used with advanced technology like rapid prototyping and rapid tooling technology with 3D modeling, finite element method and using latest simulation software to make better quality product, time saving and cost effective. It also make possible by using stereolithography, in which exact physical entity got from 3D computed based design in designer hand in short period of time. This advancement has been useful in metal industry and in patient specific implants. This paper provides a review of the development of advanced manufacturing techniques in Investment casting and the application fields.

Keywords: -

Rapid Prototyping; Rapid Tooling; stereo lithography ; Investment Casting process.

INTRODUCTION:-

The aim of this paper is to describe the different modern method used in investment casting to make the better product in industry. The conventional investment casting process is not up to the mark due to high cost, low surface finish and dimensional accuracy in critical area and take long time in casting.

Investment casting is known for its ability to produce components of excellent surface finish, dimensional accuracy and

complex shapes. Inadequate surface finish, hardness and excessive shrinkage of the wax pattern often result in poor quality of the finished casting [1].

Rapid Prototyping refers to a class of technologies that can automatically construct physical models from Computer-Aided Design (CAD) data or is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using 3D CAD data. The 3D printers allow designers to quickly create tangible prototypes of their designs rather than two dimensional pictures [2].

Rapid manufacturing is a new mode of operation that can greatly improve the competitive position of companies adopting it. The key enabling technologies of rapid manufacturing are rapid prototyping and rapid tooling. The remarkable increase in the number of commercially available Rapid Prototyping and Rapid Tooling solutions of the 1990s can be explained by advances in three-dimensional CAD modeling, computer aided manufacturing, computer numerical control and the development of new materials. These technologies were used initially in the fast growing, highly competitive, high technology, automotive and aerospace industries, which generated added momentum [3].

CT images combined with digital CAD and rapid prototyping model for the surgical planning of difficult corrective and this new application enables the surgeon to choose the proper configuration and location of internal fixation of plate on humerus bone in the field of orthopedics. Rapid Prototyping technologies



are definitely widely spread in different fields of medicine and show a great potential in medical applications. Various uses of Rapid Prototyping within surgical planning, simulation, training, production of models of hard tissue, prosthesis and implants, biomechanics, tissue engineering and many other cases open up a new chapter in medicine [4].

REVIEW OF ADVANCEMENT IN INVESTMENT CASTING PROCESS: -

The manufacturing of products in industry by using rapid tooling and rapid prototyping technology with CAE simulation software to save time and cost of producing wax models used for the investment casting process. The rapid wax injection tooling is an alternative for mass production and it could replace many expensive, time consuming and complex machining techniques for investment casting industry [5].

Using 3D rapid prototyping printers, 3D modeling software and casting technique allow for the cost effective, custom component and fabricate a host of supplemental component for application in SPECT, gamma-ray and x-ray imaging systems [6].

Rapid prototyping has some significant advantages which make them quite attractive, such as the direct translation of 3D CAD data into solid mold. The conventional investment casting and rapid prototyping enables a custom product to be made with acceptable surface finish and dimensional accuracy in the critical areas of the implant. It also provide the ability to quickly and easily add custom section, which may not require as tight tolerance, and thus avoid the need for complex wax modification [7].

Design and lattice structure configuration are used to avoid the crack of the

ceramic shell in the burnout procedure of the Stereo lithography (SL) pattern and to maintain certain pattern stiffness. It can not only to reduce design and development costs and time but also provides qualified SL pattern models which meet the requirement of investment casting [8].

Rapid Prototyping is makes inroads into industries throughout the world. Stereo lithography makes it possible to get an accurate physical part from Computer Aided Design (CAD) data into the hands of the designers in a relatively short period of time. Rapid prototyping becomes common in the medical industry, more and more application of this valuable technology will be discovered [9].

CONCLUSION: -

The advanced technology used in investment casting process is useful for complex design and given better dimensional accuracy at time of fabrication. It also has suitable for time and cost saving. By using rapid prototyping with latest technology software in investment casting, it improves designing and converted to easiest way. It is suitable for mass production in metal industry as well as in medical industry. The conventional investment casting with advancement is given the desire product design to industry.

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