

عنوان مقاله:

An experimental examination of rapid prototyping and rapid tooling for optimizing the design parameters of turbine blades used in investment casting process

محل انتشار:

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خلاصه مقاله:

The introduction of Rapid Prototyping and Rapid Tooling (RP&RT) Technologies in recent two decades has caused great changes in manufacturing and production world. Investment casting as a process for production of complex metal parts from various alloys is one of the areas that application of RP and RT could be paid attention. Gas turbine blade as an investment cast part with geometrical and dimensional complexity and close manufacturing tolerances has been investigated in this project. As a result 3D-CAD model that has been evolved from reverse engineering of a blade used in Stereolithography and MJM rapid prototyping techniques for manufacturing of master models. Then, Epoxy and VTV rapid mold tooling used for wax production mold making. At last the results of application of these methods and application of metal die for wax model production has been assessed and compared based on parameters such as time, cost, surface roughness, and dimensional accuracy. Based on this study it is concluded that Rapid Prototyping and Rapid Tooling methods are good options for designing and manufacturing the initial samples of turbine blades in order to optimize the design parameters in large quantity of their productions. From the current study it is noticed that the epoxy mold produce more accurate patterns than the silicone rubber mold. Furthermore, the range of dimensional changes in various directions of the wax patterns, were obtained. Average Shrinkage in direction along the length and width of the root in silicone rubber mold are almost 0.6%, 3.5% respectively. Also in epoxy mold in direction along the length and width of the root is almost 1.1%, 0.6% respectively. These studies will help those who apply both rapid tooling and investment casting in turbine blades production to estimate the changes required in the initial CAD drawings to produce a final casting with minimal dimensional inaccuracy

کلمات کلیدی:

Rapid Prototyping, Multi-Jet Modeling, RT, Epoxy Molding, Gas Turbine Blade, Design Parameters Optimization

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