

**(RT)**

**(RP)**

ii

i

(RT)

(RP)

(Stereolithography)

(RTV)

(Epoxy Molding)

## ***Examination of RP and RT Technologies in Production of Turbine Blades IC Wax Patterns***

J. Zamani.; M. Forotan

### ***ABSTRACT***

The introduction of Rapid Prototyping and Rapid Tooling (RP&RT) Technologies in past two decades has caused great changes in manufacturing and production procedures. 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 should be concerned. Gas turbine blade as an investment cast part with geometrical and dimensional complexity and close manufacturing tolerances has been investigated in this research,. As a result 3D-CAD model that has been evolved from reverse engineering of a blade, was used in Stereolithography for manufacturing of the master models. Then, Epoxy and RTV rapid mould tooling used for wax production mould 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.

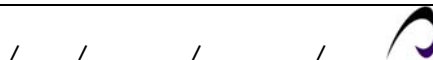
### ***KEYWORDS***

Rapid Prototyping, Stereo lithography, Rapid Tooling, Epoxy Molding, Vacuum Temperature Vulcanizing, Gas Turbine Blade.

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ii



(Hora'cek)

[ ](Lubos)

[ ](Yalagadda)

(Hock)

Polyurethane )

H

(RTV mould)

(mould

(RT)

(RP)

(RP)

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(Stereolithography)

(Master Model)

/ Ruston Ta 1750

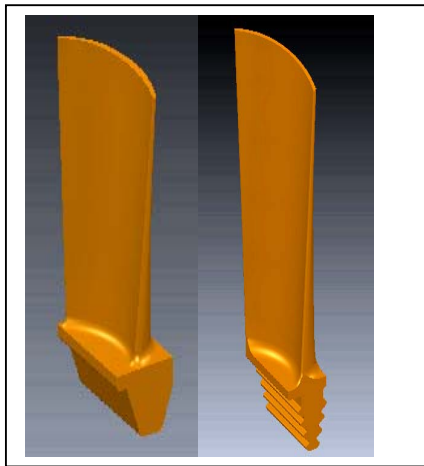
RTV

(Epoxy Molding)

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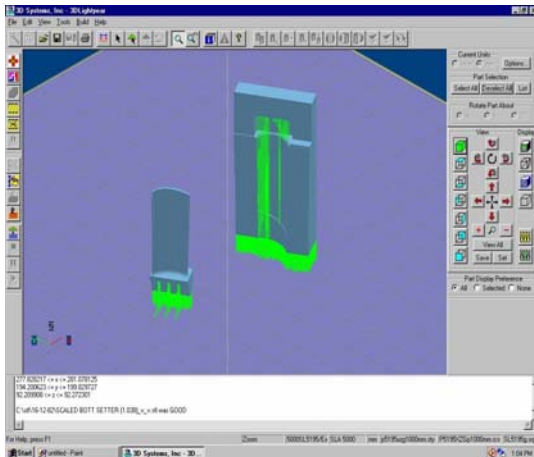
(RP)

(RT)

STL

STL

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SLA5000

(Power

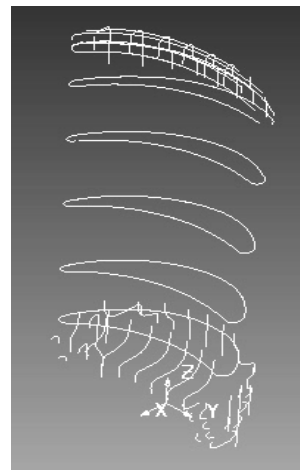
shape)

. ( ) (CMM)



CMM

(:)



(:)

(Pure Model)

/ /

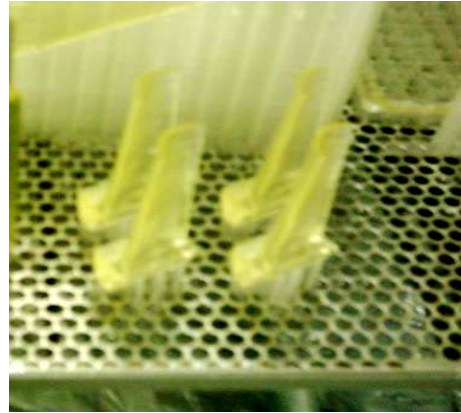
(RTV)

EP310

MCP HEK

UV

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SLA

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(RTV)

MCP HEK

VTV750

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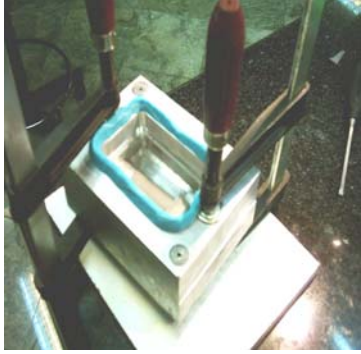
(bar)

RTV

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بعد از اضافه شدن مواد مذاب مومی،  
 کل قالب در شرایط خلاء قرار داده شد تا حباب‌های هوا تخلیه گردد.  
 شکل ۱۰، حالت نهایی قالب و قطعه آماده شده را نشان می‌دهد.

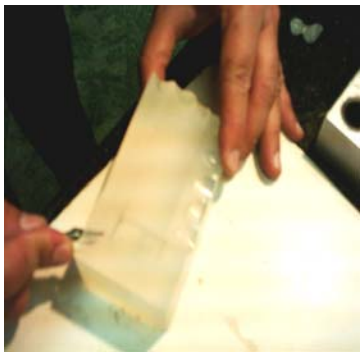
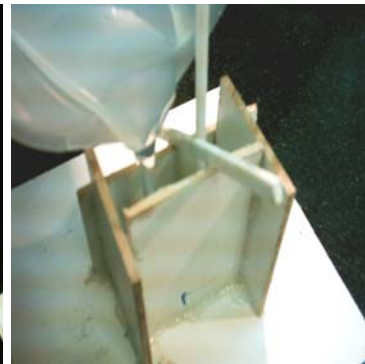
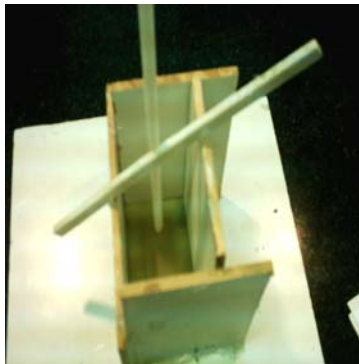
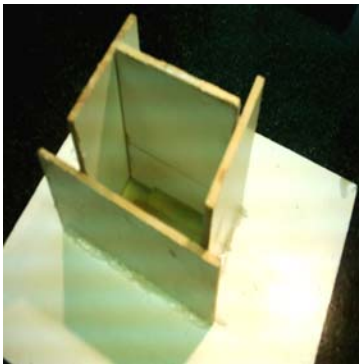




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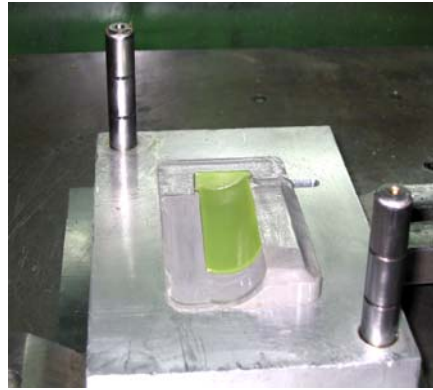
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RTV

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Taylor Hobson

ATOS 3D Scan III

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EDM

. [ ]

(Alignment)

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$R_a$	/	/

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**RTV**

RTV

(Alignment)

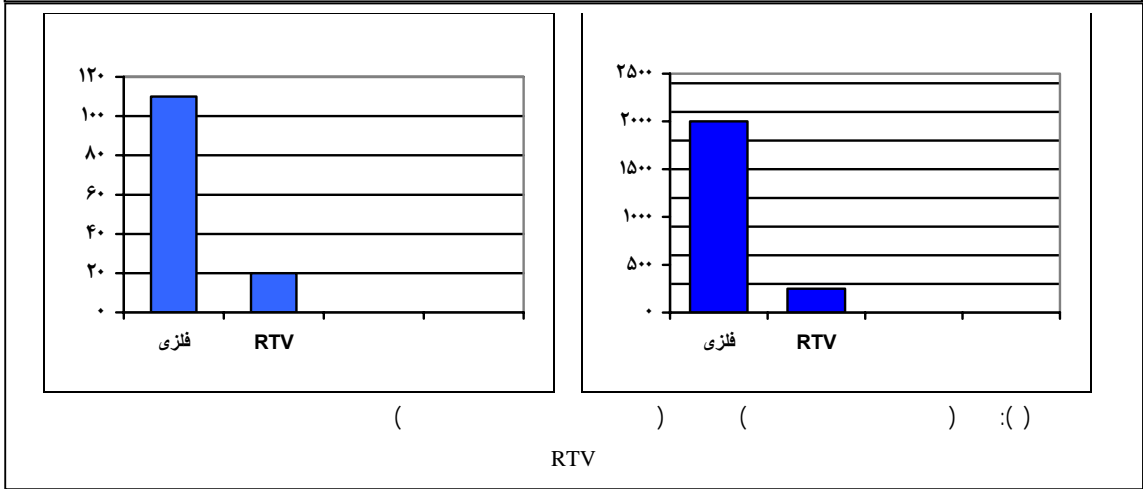
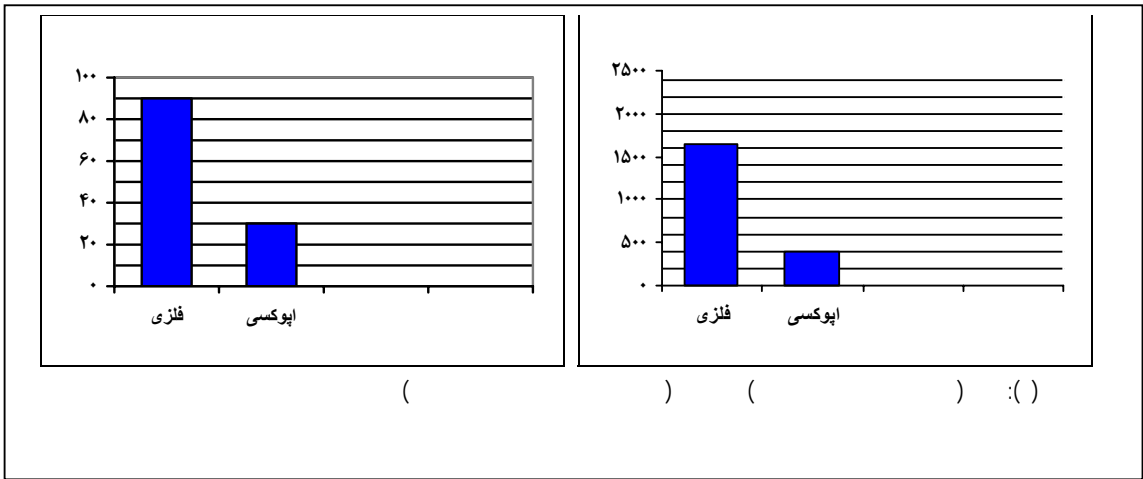
( )

RTV

مقایسه نیز همانند مواردی هستند که در قسمت قبل

(Stair Stepping)

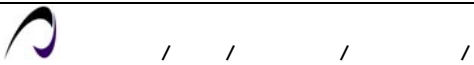
ذکر گردید



RT RP

RTV

RTV





- M. Horaček, S. Lubos, “*Parameter analysis of investment casting, using RP & RT*”, Proceedings of the Ninth World Conference on Investment Casting, San Francisco, CA, USA, 1996, pp. 1:1–1:20. [ ]
- P.K.D.V. Yarlagadda, T.S. Hock, Statistical “*Analysis on accuracy of wax patterns used in investment casting process*”, J. Mater. Process. Technol. 138, 75-81, 2003 [ ]
- Lee, C. W. Chua, C. K. Cheah; “*Rapid Investment Casting, Direct and Indirect Approaches*”, The Inter. J. of Advanced Manufacturing Technology, 23, 242-256, 2004 [ ]
- A. Rosochowski, A. Matuszak; “*Rapid tooling: the state of the art*”, Title in Italic (and the title components, if any), J. Mater. Process. Technol, No: 106, 191-198, 2000 [ ]
- Ma, I. Gibson, G. Balaji, Q. J. Hu; “*Development of Epoxy Matrix Composites for Rapid Tooling Applications*”, J. of Mater. Process Technol, No:75-82, 192-193, 2007 [ ]
- D.T Pham and S.S Dimov; “*The technologies and application of rapid prototyping and rapid tooling – 1<sup>st</sup> ed*”, Springer-Verlag, 2001, ISBN: 1-85233-360-X [ ]
- J. A. Mc Donald, C.J. Ryall; “*Rapid Prototyping Case Book*”, Professional Engineering Publishing, 2002, ISBN: 1-86058-076-9 [ ]