

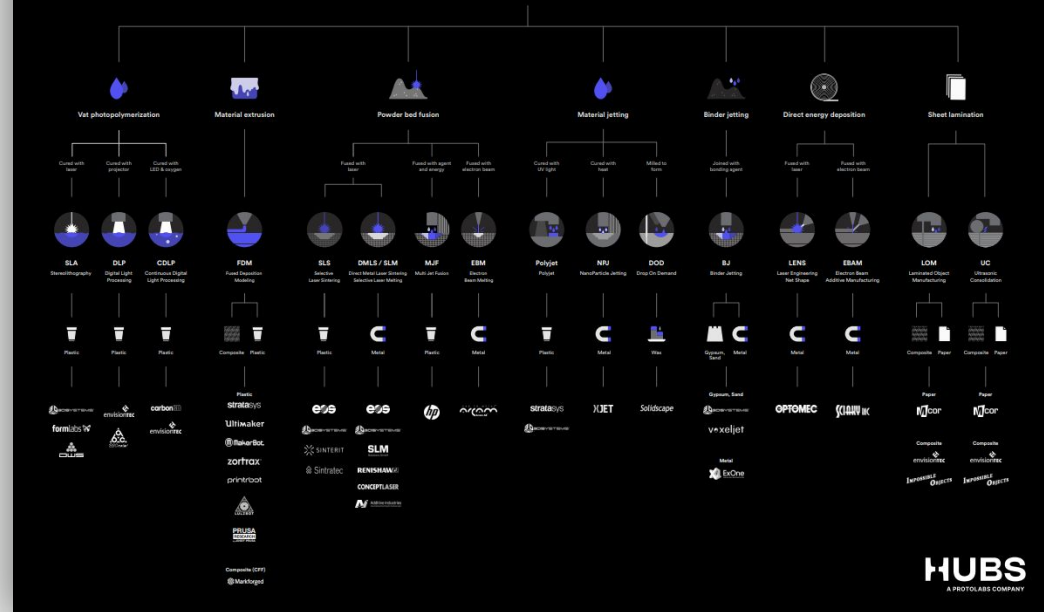
# **Manufactura aditiva: fused deposition modeling (FDM) selective laser sintering (SLS)**

Universidad Nacional de Colombia  
Facultad de ingeniería mecánica y mecatrónica

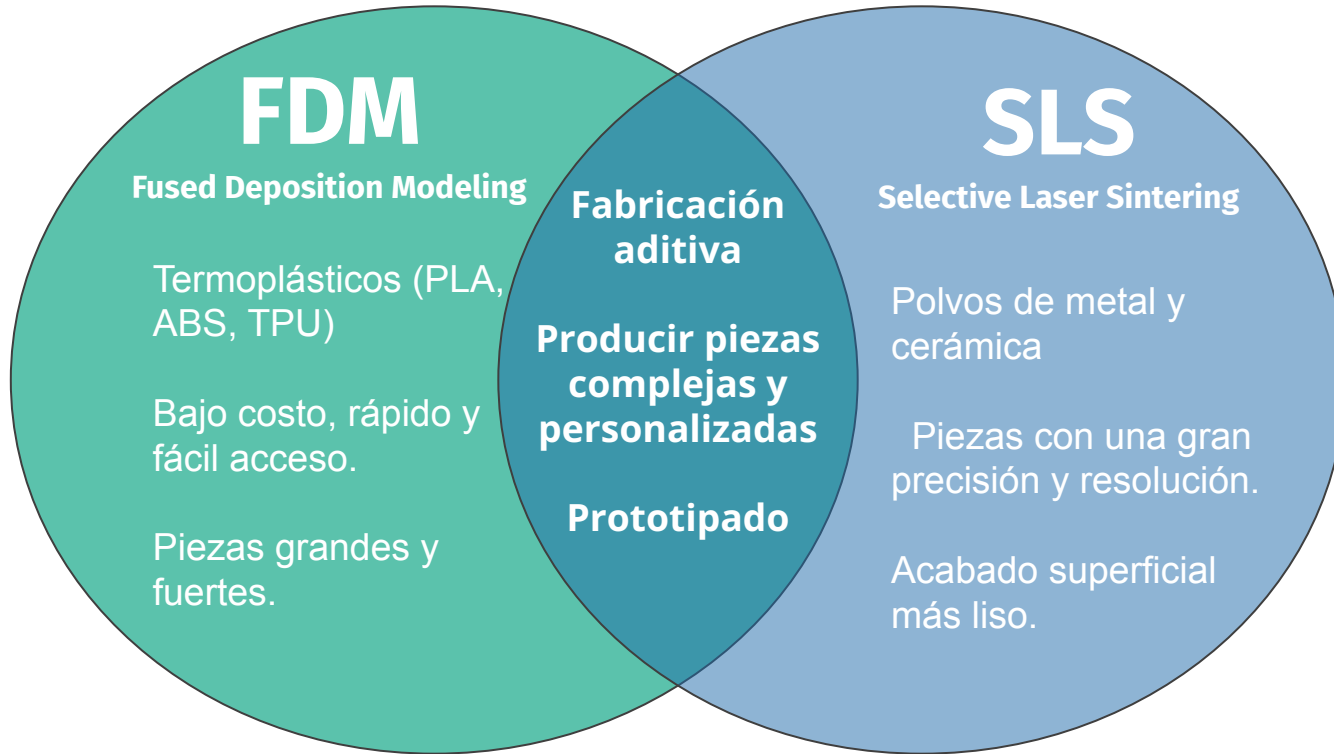
Andrés Holguín Restrepo

# Manufatura aditiva

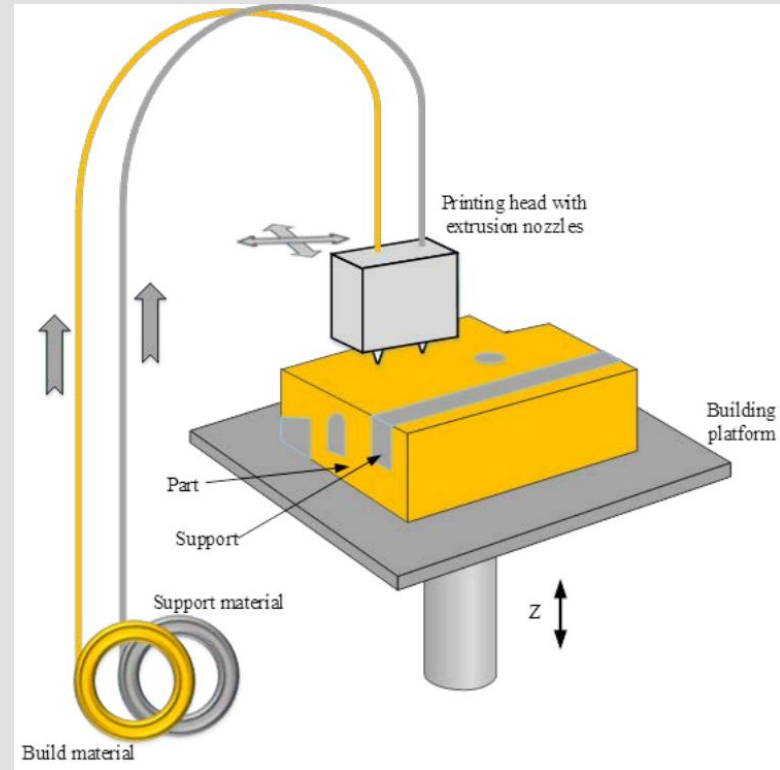
## ADDITIVE MANUFACTURING TECHNOLOGIES



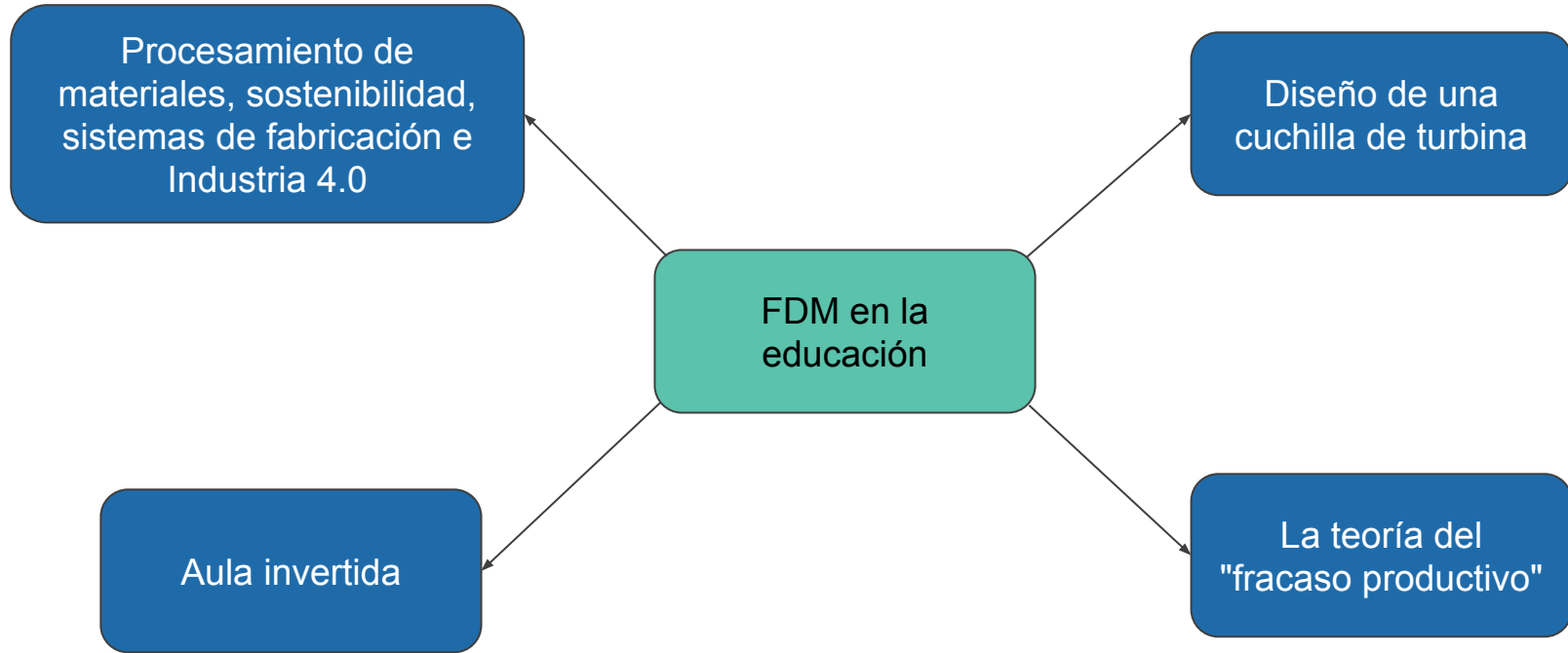
# Comparison of Cost, Material and Time Usage in FDM and SLS 3D Printing Methods



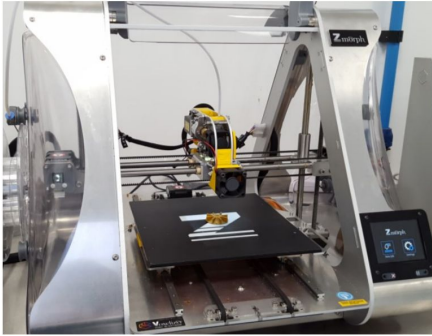
# Fused Deposition Modeling (DAC)



# Application of Additive Manufacturing in Design & Manufacturing Engineering Education

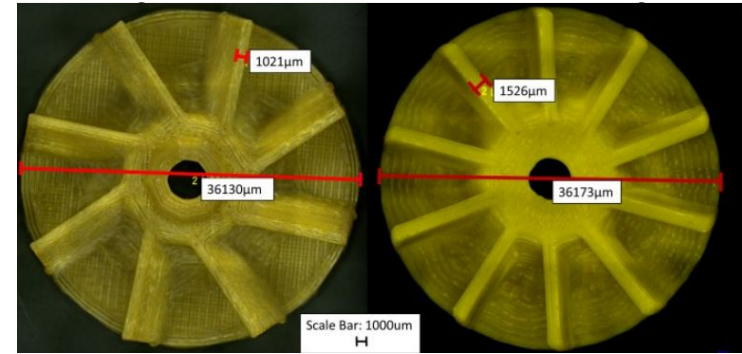
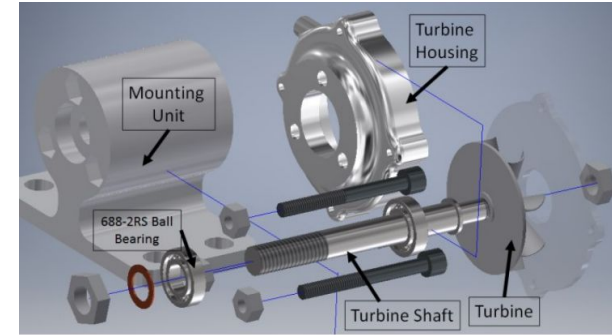


# Application of Additive Manufacturing in Design & Manufacturing Engineering Education

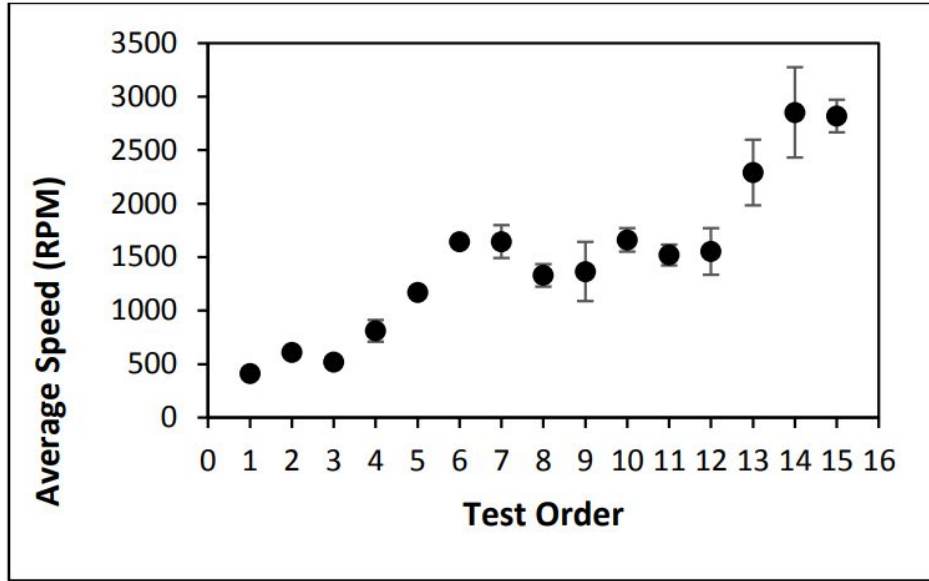


ZMorph Fab Multi-Tool 3D Printer  
2,000\$-3,000\$

Turbine Feature	Fixed Parameters
	Measurement
Turbine Base Thickness	1 mm
Turbine Dia	Ø35.5 mm
Turbine Height	7 mm
Inner Ring Dia	Ø14 mm d
Turbine Base Mounting Hole Dia	Ø6.90 mm
Turbine Top Mount Hole Dia	Ø4.40 mm



# Application of Additive Manufacturing in Design & Manufacturing Engineering Education



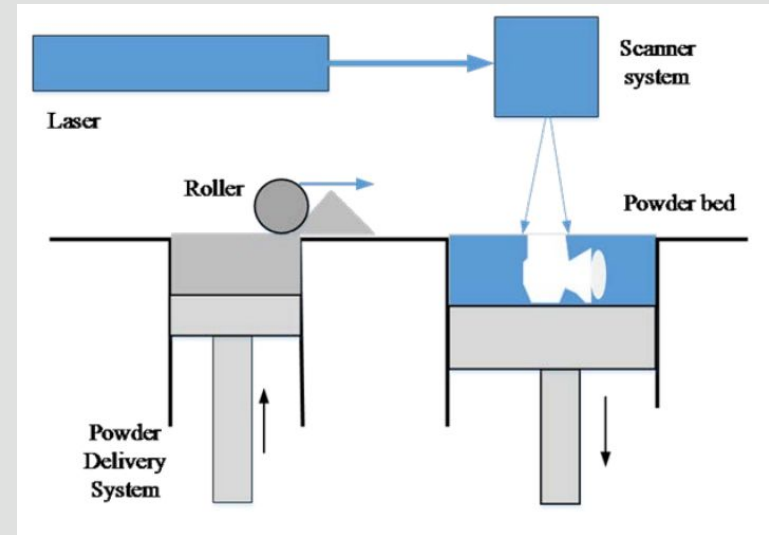
Prior to Course	Prior levels of knowledge before completing the activity				
	No Prior Knowledge	Knowledge of experience, but no experience	limited observation (1 experience)	Some prior experience / exposure	Substantial prior experience / exposure
Q1	0.00%	1.47%	11.76%	64.71%	22.06%
Q2	8.82%	22.06%	44.12%	19.12%	5.88%

Q1: Had you ever been exposed to any form of solid modelling software?

Q2: Had you ever been exposed to 3D printing?

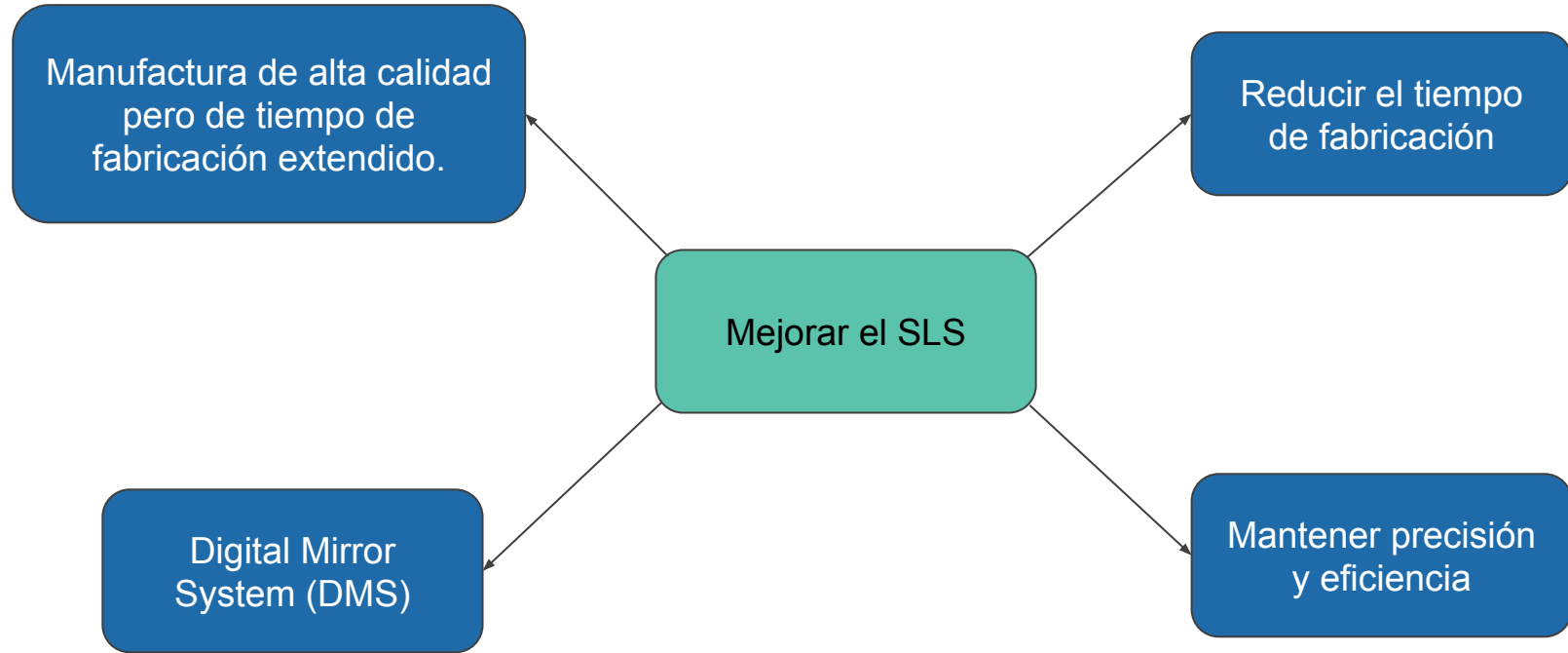
Result	Survey questions on a Likert scale out of 5 (higher value is a more positive response)				
	Interesting learning experience	Relevant learning experience	Valuable engineering design experience	Increased interest in 3D printing technologies	Satisfaction with printed part
Av.	4.3	4.4	4.1	4.2	3.8
Median	4.25	5	4	4.75	4
St. Dev	0.7	0.7	0.9	0.9	0.9
Var.	0.55	0.49	0.73	0.89	0.8

# Selective Laser Sintering (SLS)

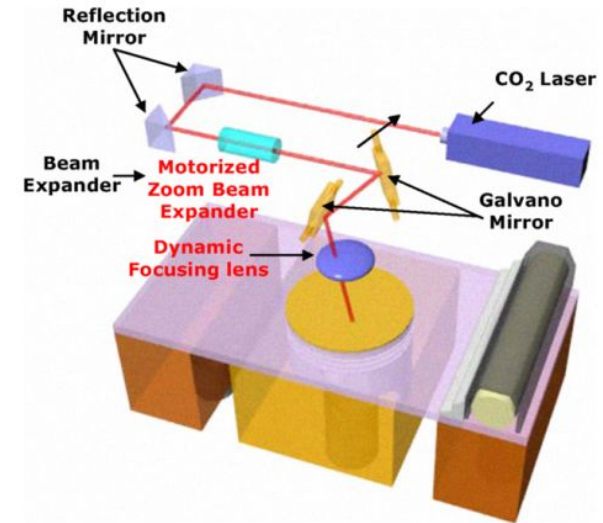
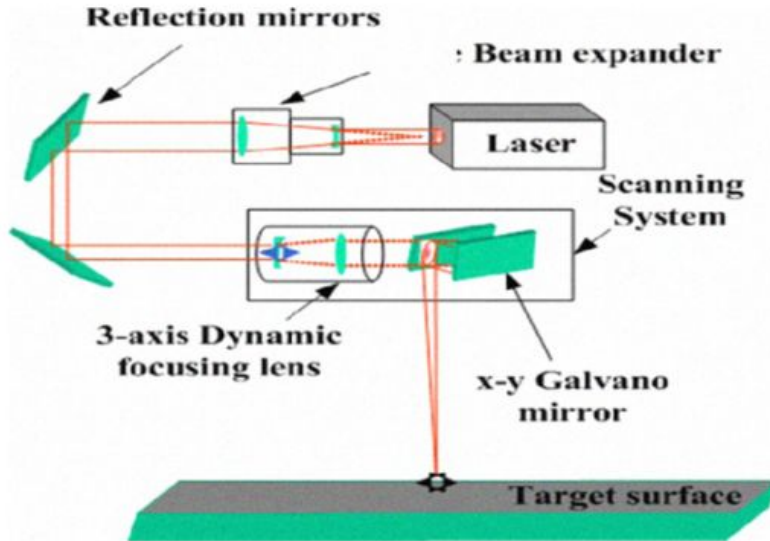




# An experimental study for rising manufacturing time and accuracy on SLS process



# An experimental study for rising manufacturing time and accuracy on SLS process

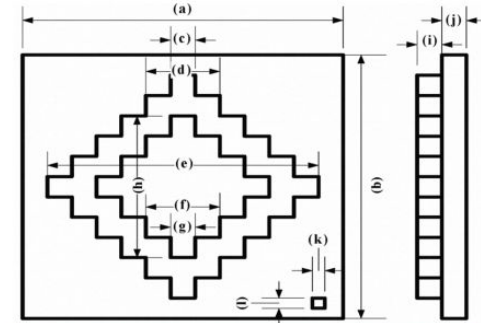
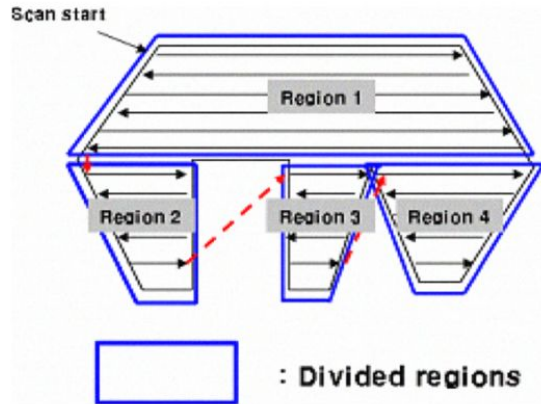


# An experimental study for rising manufacturing time and accuracy on SLS process

TABLE I

SPECIFICATION OF VARIABLE BEAM EXPANDER

Item	Expansion Range	Input Aperture	Output Aperture	Expansion change Time
Spec.	2~8	10mm	30mm	~10 seconds



# An experimental study for rising manufacturing time and accuracy on SLS process

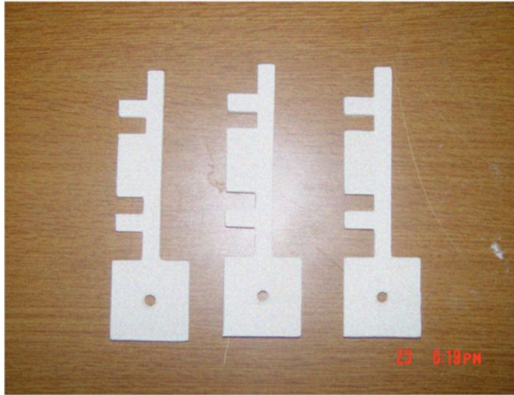
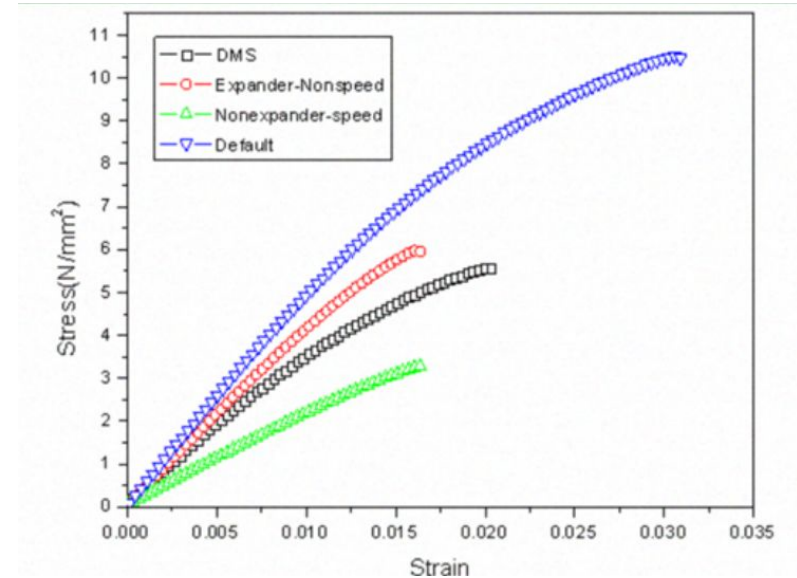


TABLE II

DMS APPLICATION PROCESS DATA

	1	2	3
Spacing(mm) / (spot size)	0.3/(0.5)	0.3/(0.3) 0.3/(0.6) 0.6/(0.8)	0.3/(0.3) 0.3/(0.6) 0.6/(0.8)
Speed(m/s)	5	5	6, 5, 4
Total Processing Time(ms)	390198	211881	189063



**Muchas  
gracias**

# Referencias

- [1] Kudelski, R., Cieslik, J., Kulpa, M., Dudek, P., Zagorski, K., & Rumin, R. (2017). Comparison of Cost, Material and Time Usage in FDM and SLS 3D Printing Methods. In 2017 22nd International Conference on Methods and Models in Automation and Robotics (MMAR) (pp. 742-746). IEEE.
- [2] Keaveney, S. G., & Dowling, D. P. (2016). Application of Additive Manufacturing in Design & Manufacturing Engineering Education. School of Mechanical and Materials Engineering, UCD Engineering and Materials Science Centre, Dublin 4, Ireland.
- [3] Bae, S. W., Kim, J. S., Kim, D. S., & Yoo, S. Y. (2009, November 17-20). An experimental study for rising manufacturing time and accuracy on SLS process. In 2009 IEEE International Symposium on Assembly and Manufacturing (pp. 444-449). Suwon, Korea.