

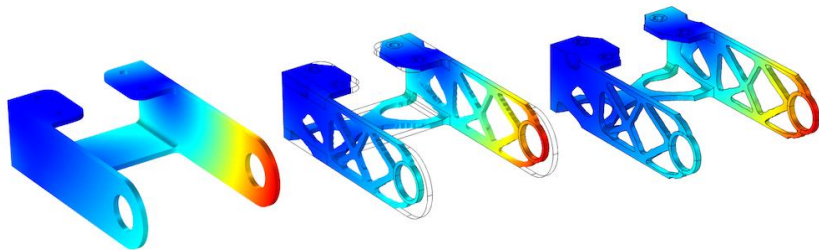


Progresívny dizajn a vlastnosti produktov Aditívnej výroby

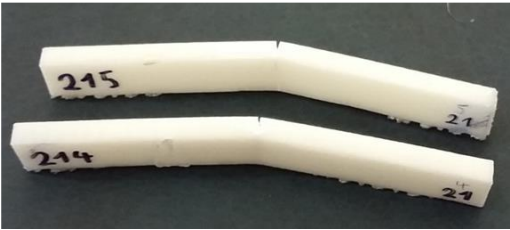
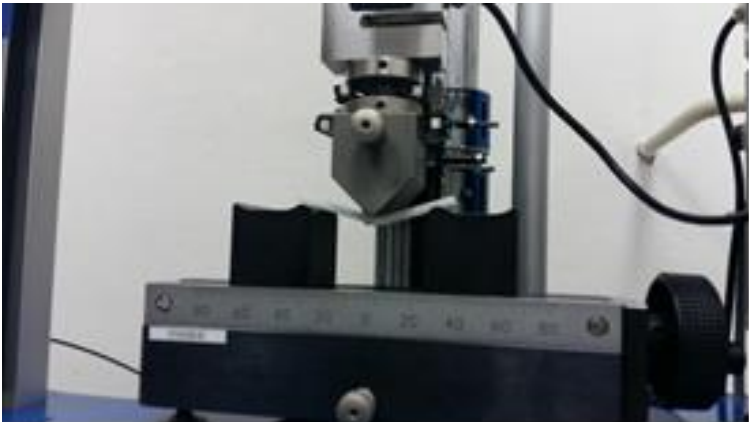
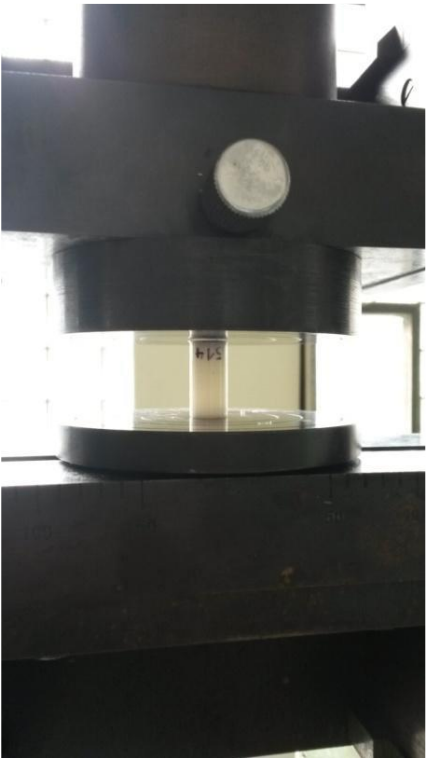
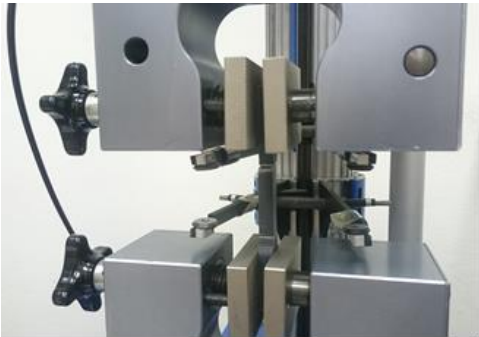
Strojnícka fakulta STU v Bratislave

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Material Testing



Material Testing

Special filaments

ABS industrial grade filament
Optimized for FDM



Table 2. Factors and levels for experiment

FACTOR	LEVEL 1	LEVEL 2
A	240°C	260°C
B	50mm/s	70mm/s

Table 3. Design of experiment (DOE)

EXP	1	2	3	4
A	1	1	2	2
B	1	2	1	2

Table 4. Measured values

EXP.	A	B	RM (MPa)
1	1	1	42,86
2	1	2	38,84
3	2	1	41,13
4	2	2	35,7

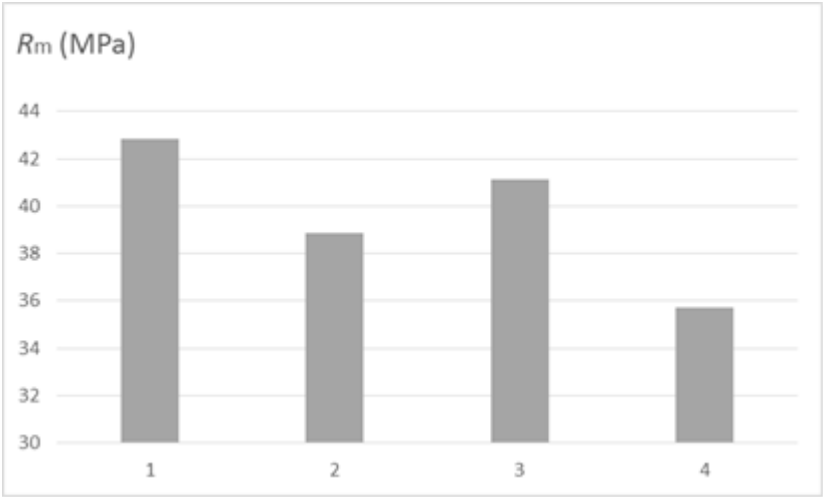
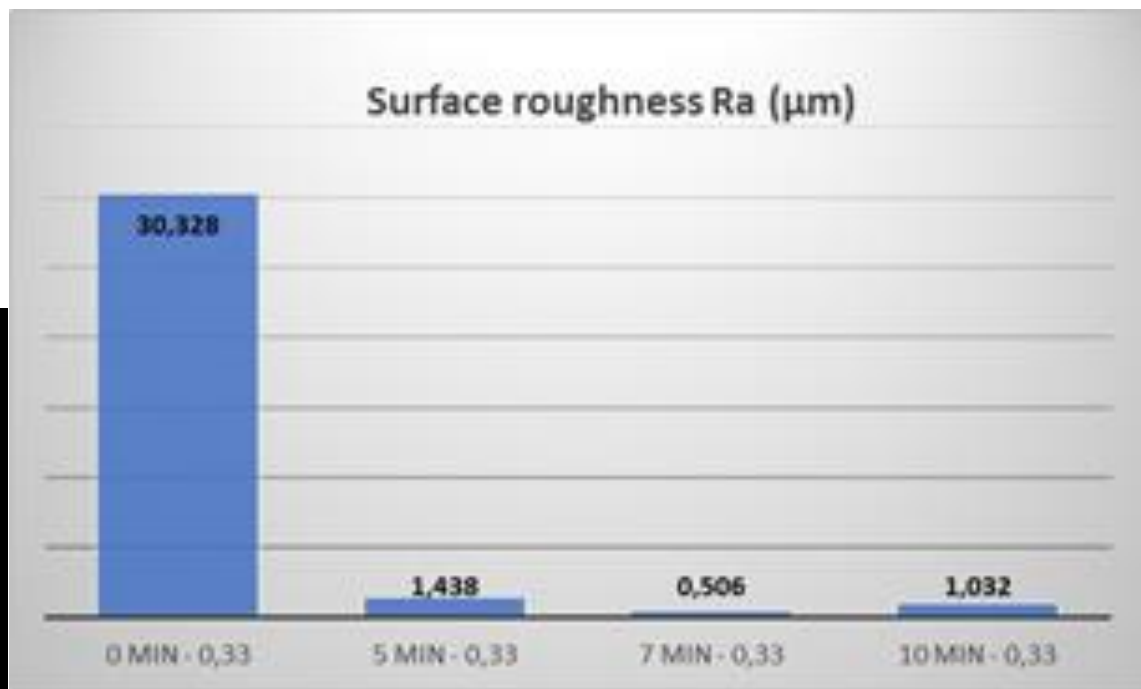


Table 5. Results of ANOVA analysis

Factors	F (1,20) (calc.)	p (signif.)	SS	F _{tab} 0,95
A	19,9	p<0,000243	35,7	1,80
B	74,5	p<0,000001	133,97	1,80
AxB	1,66	p<0,212862	2,98	1,80

Surface finishing

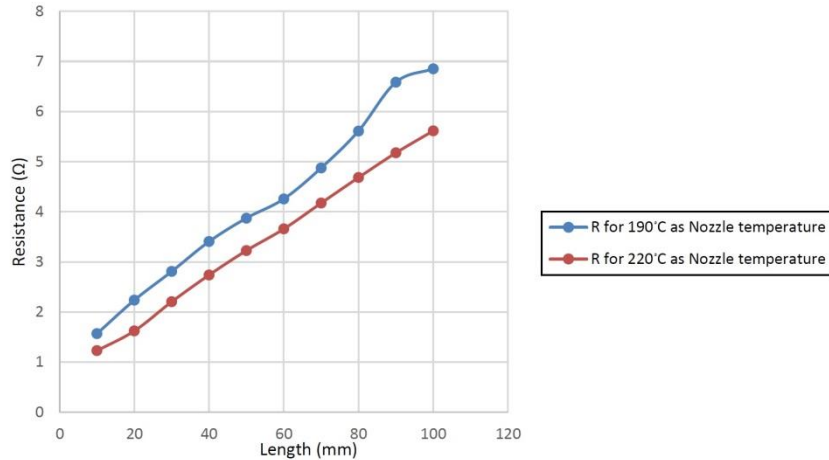


Special materials – Electro Conductive

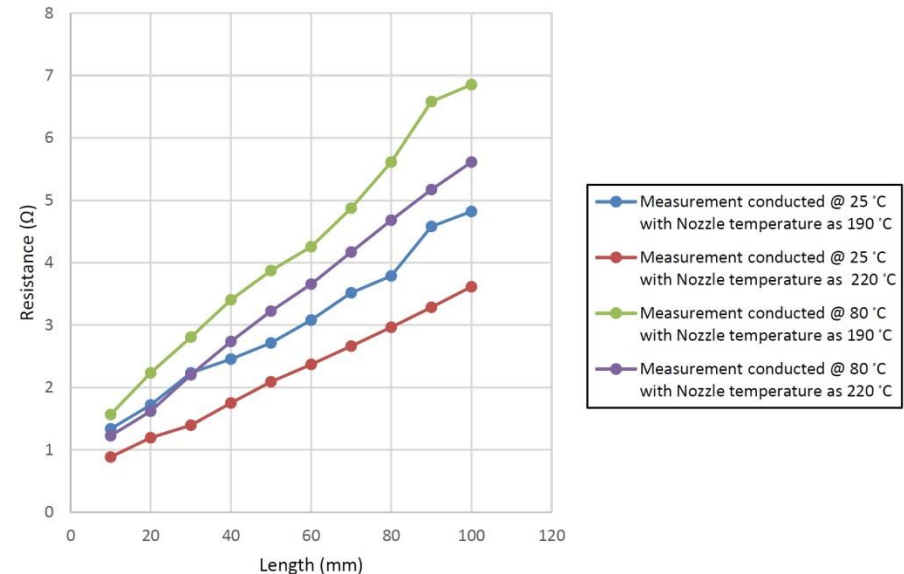
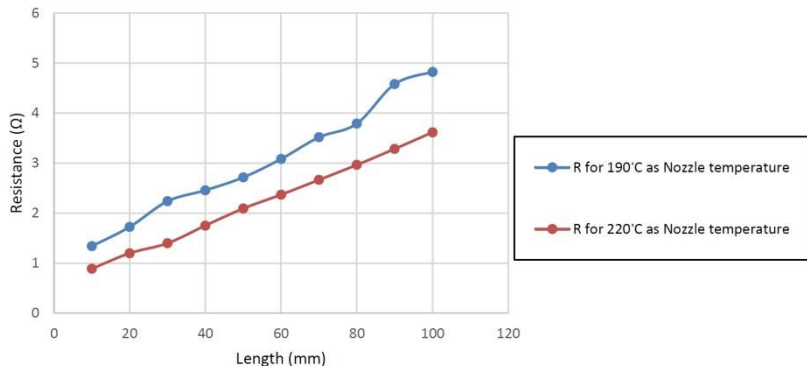
Factor	Level 1	Level 2		Level 10
A – Printing Temperature	190°C	220°C	–	–
B – Length of specimen	10mm	20mm		100mm



Resistance measured at elevated temperature



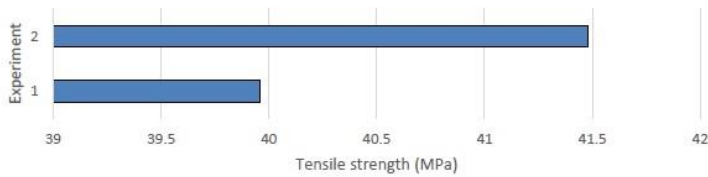
Resistance measured at ambient temperature



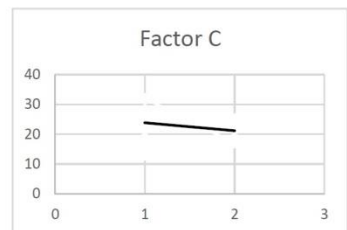
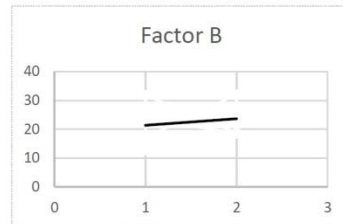
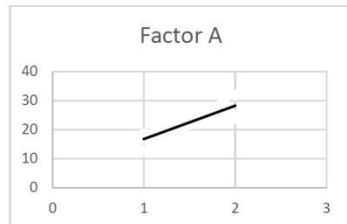
Special materials – Electro Conductive

Experiment No	Layer height	Tensile strength (MPa)				
		I	II	III	IV	6 _m
1	0.125mm	38.08	40.16	40.08	41.53	39.96
2	0.25mm	41.61	42.01	42.18	40.12	41.48

Table 10: Measured tensile stress for layer heights

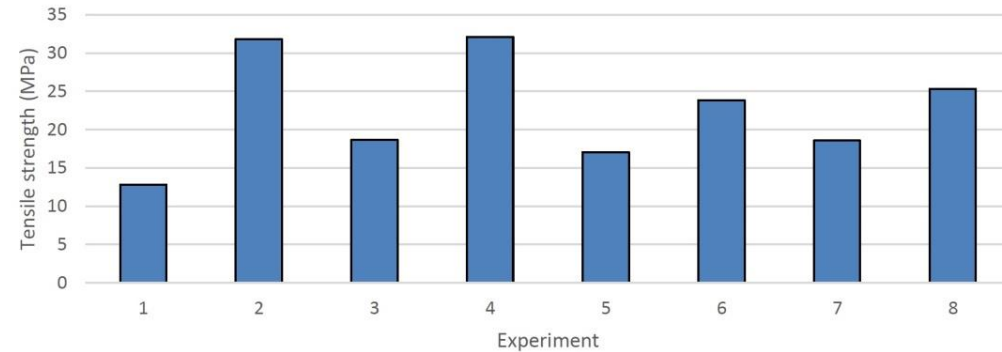


Measured values are represented graphically for easier recognition of measured values with respective experiments.

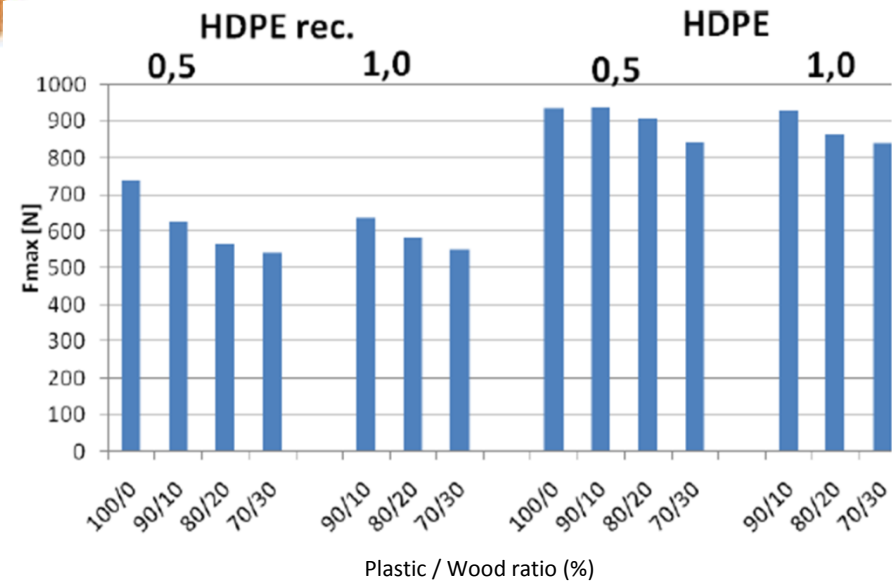


For this design of experiment,

- Factor A represents infill percentage
- Factor B represents layer height
- Factor C represents infill pattern



Composite Materials and Recycling



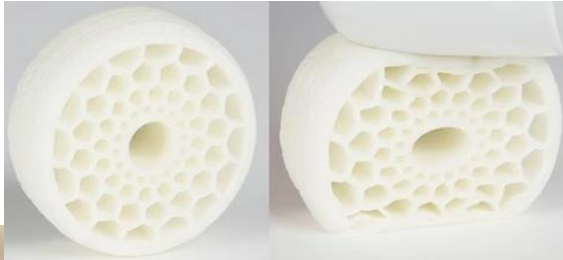
Special materials – Carbon



Special materials – Design Materials

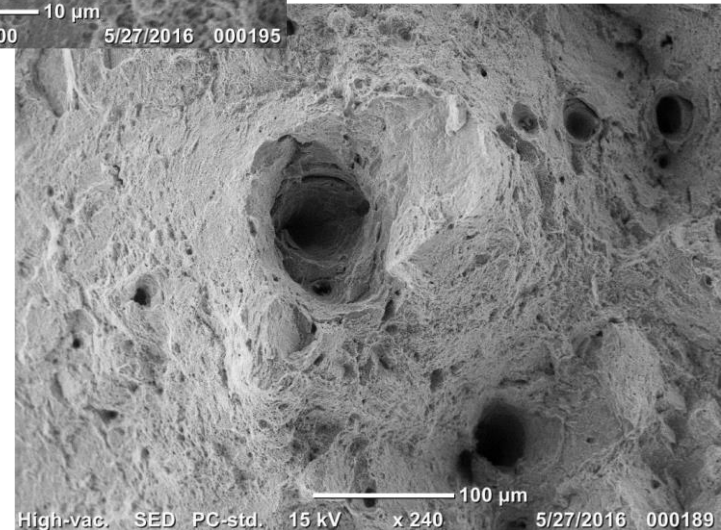
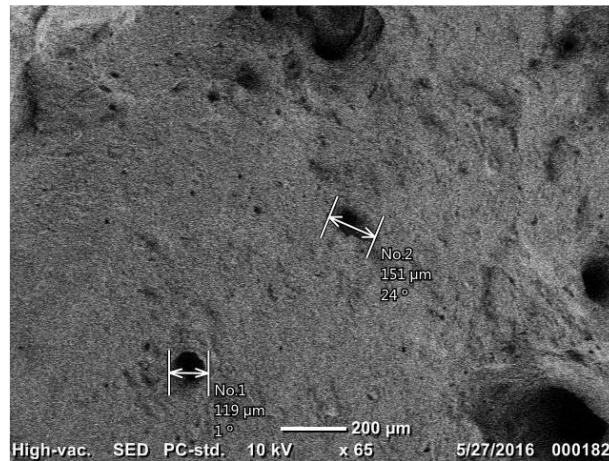
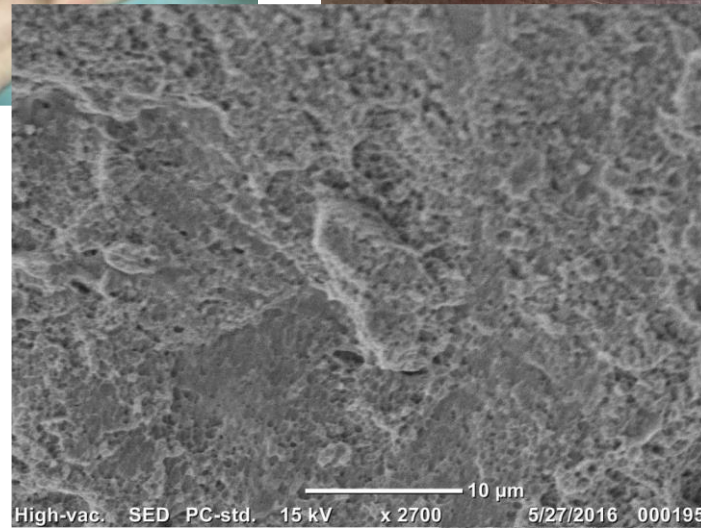
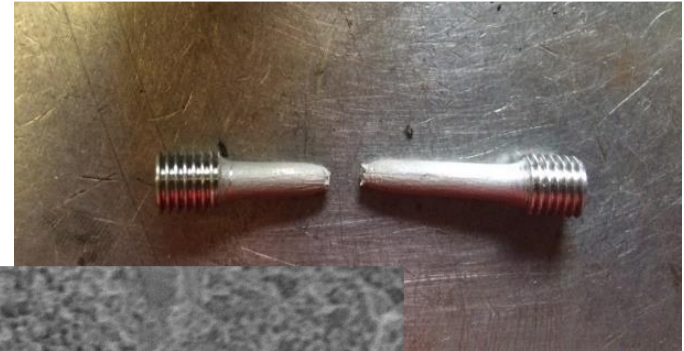
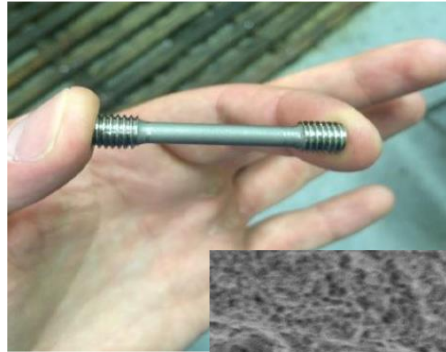


Other materials – Nylon, PP, Flexible, HIPS,

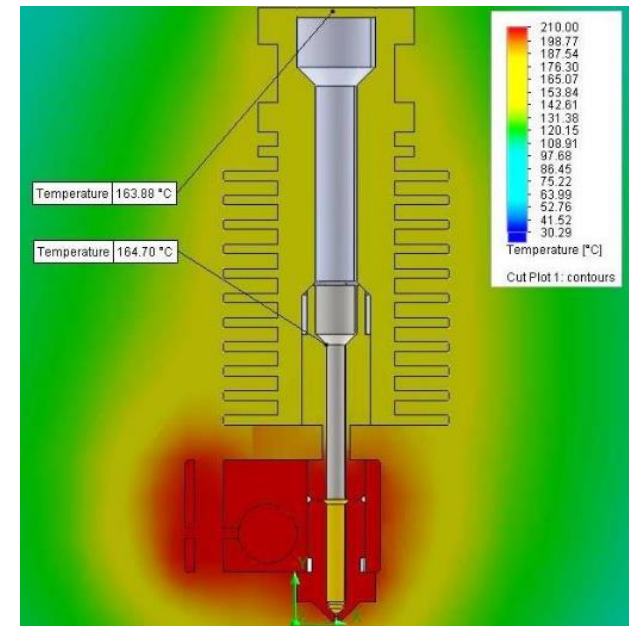
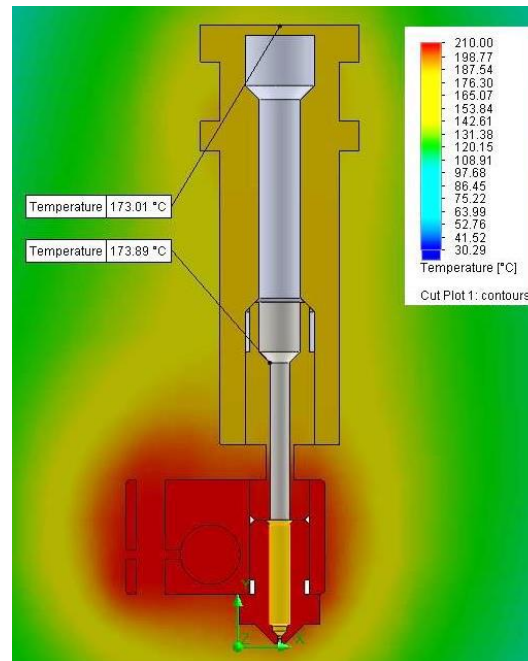
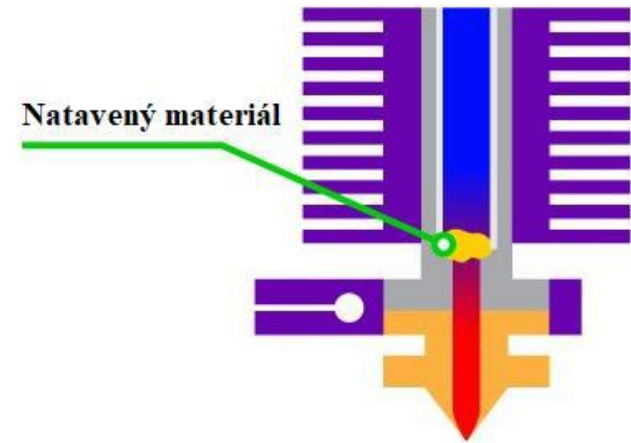
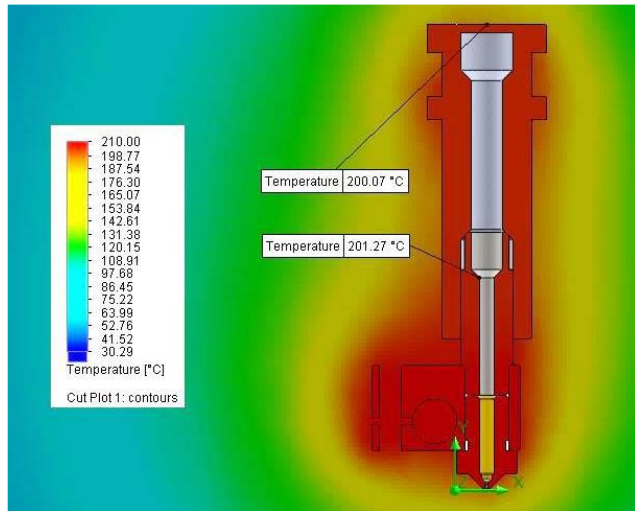


50% gravimetric powdered stone filling
 $\pm 37\%$ heavier than “normal” PLA

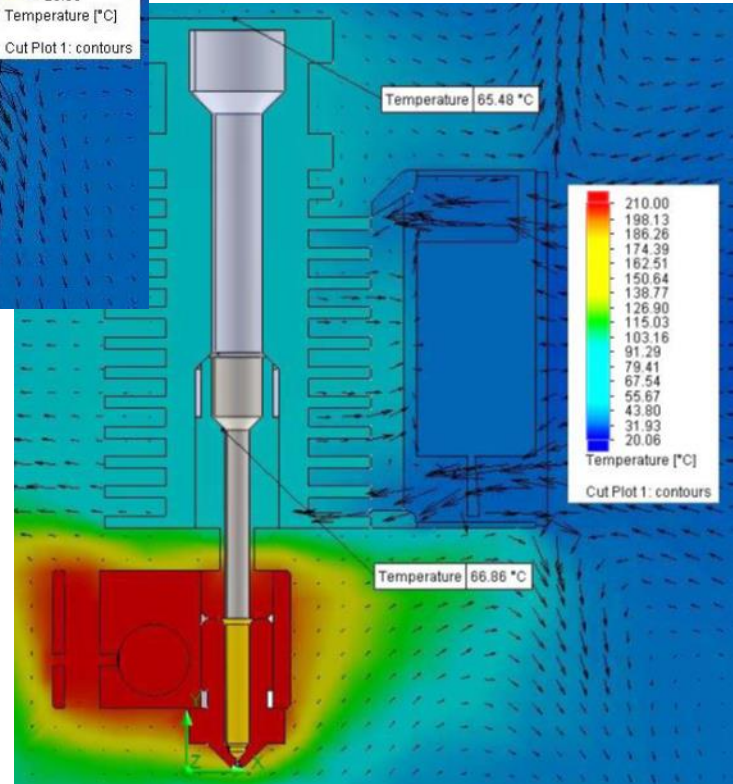
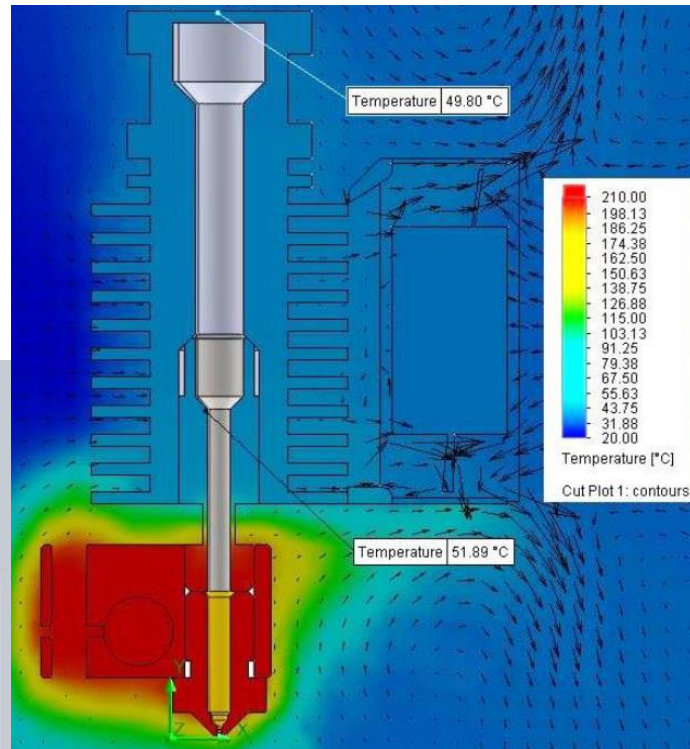
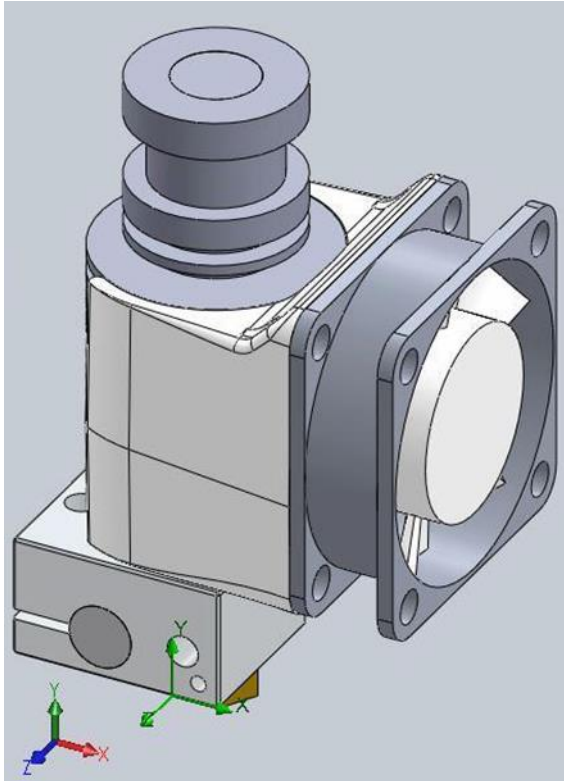
Laser Sintering / Laser Melting



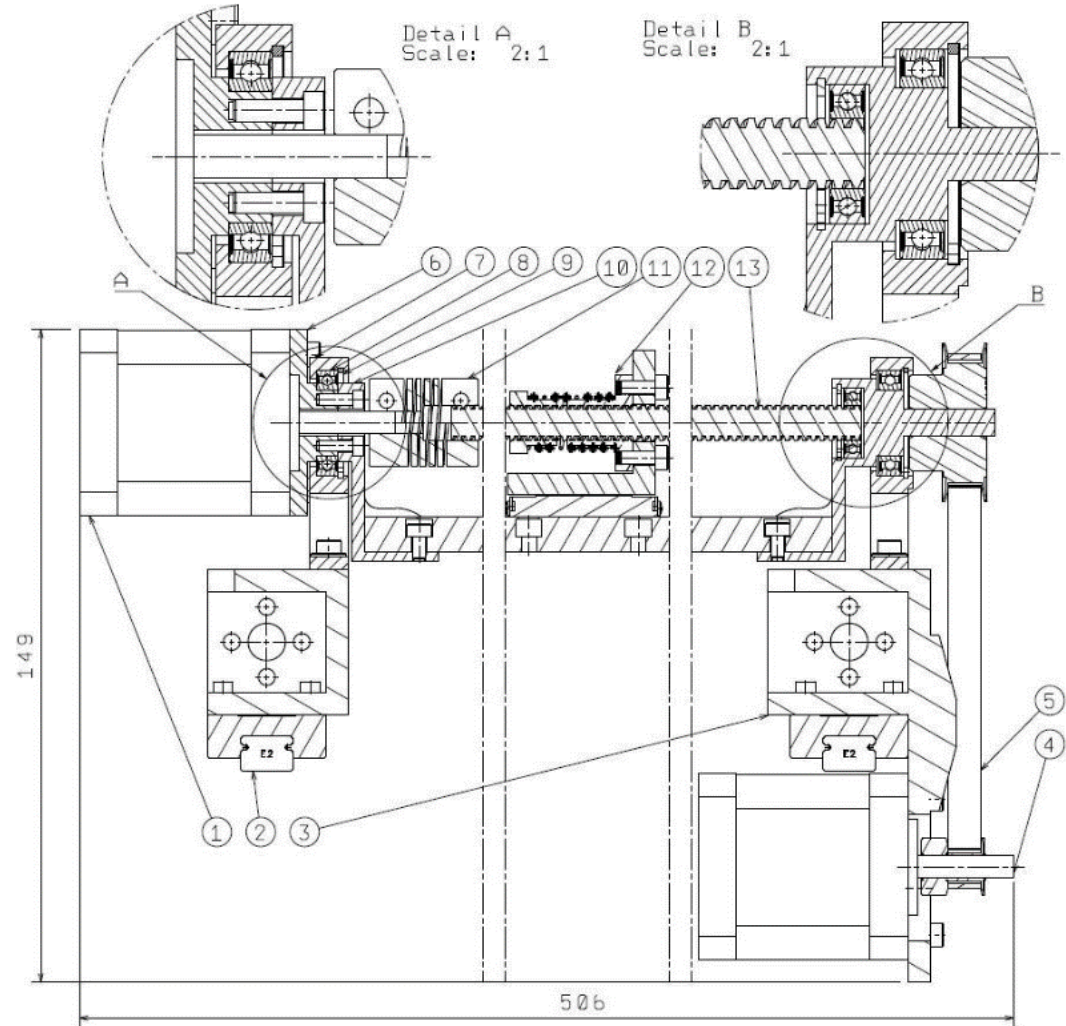
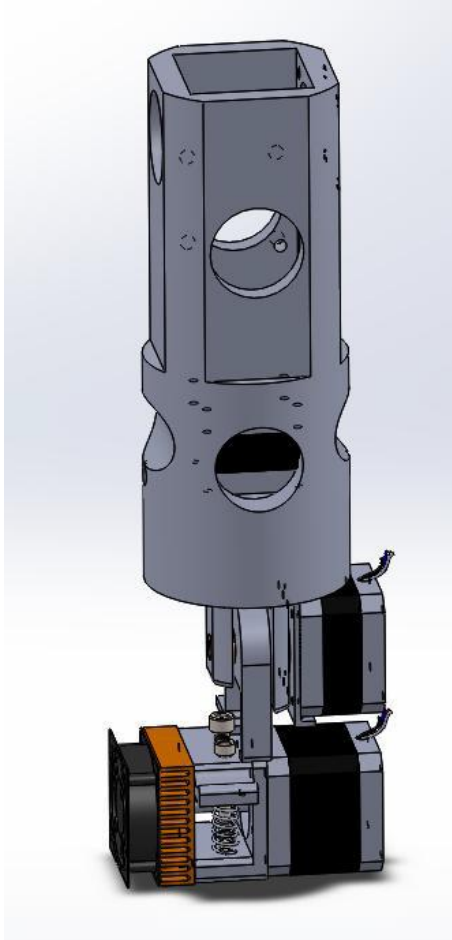
Design inovations and improvement



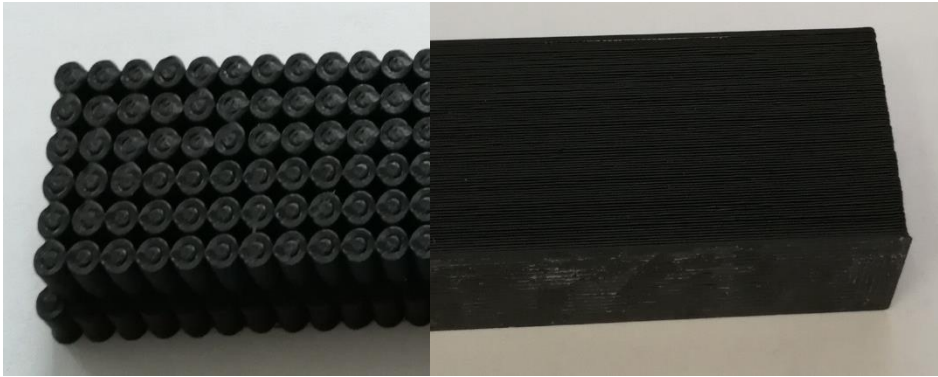
Design inovations and improvement



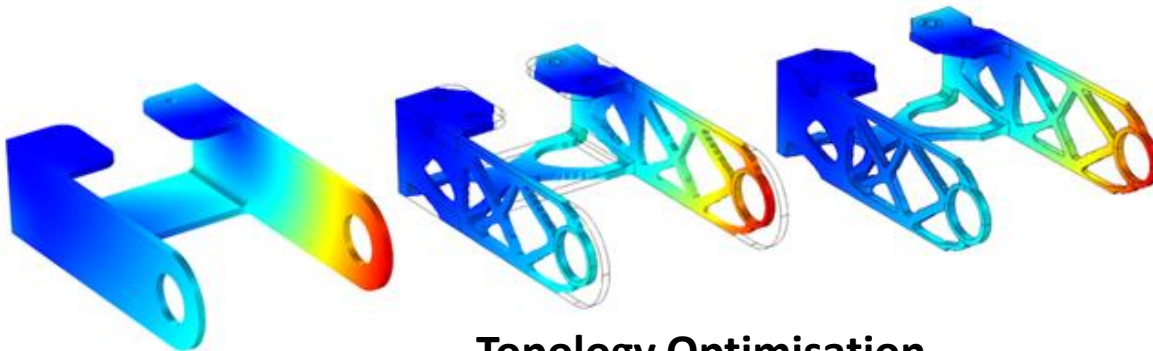
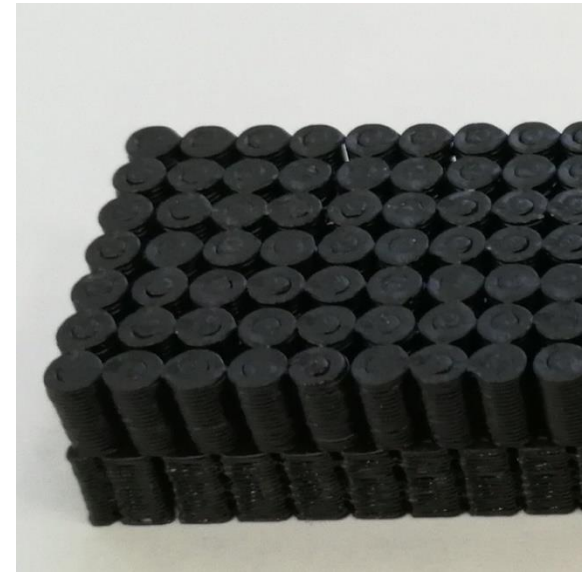
Design inovations and improvement



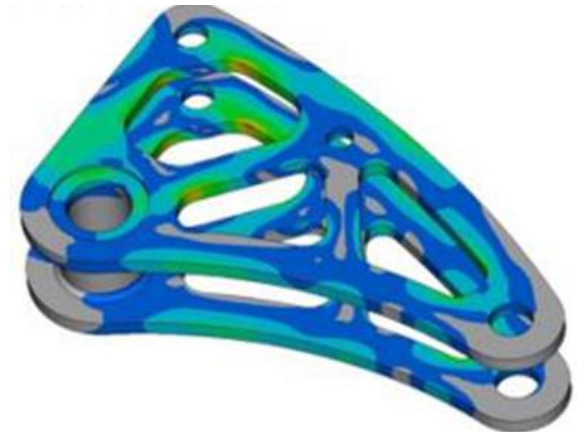
Additive Manufacturing technology and process improvement



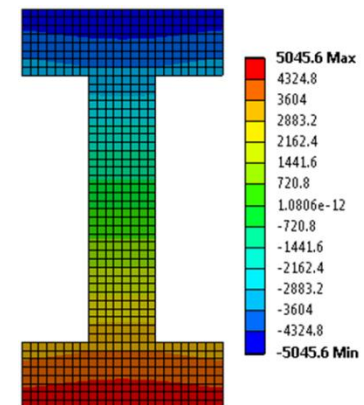
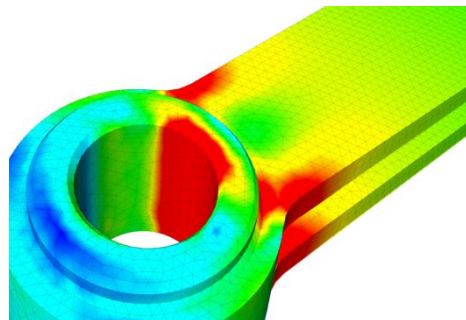
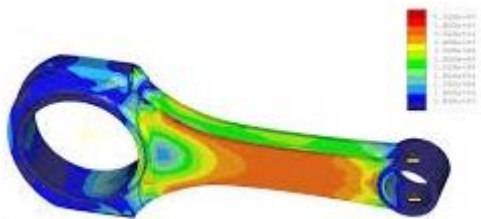
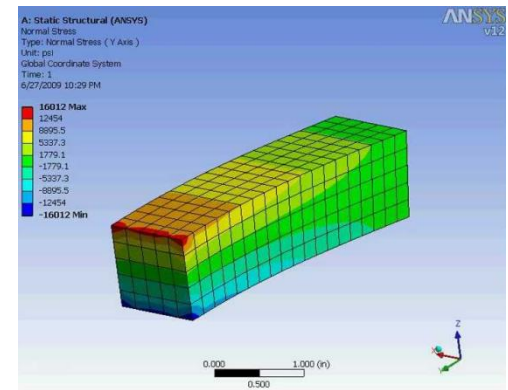
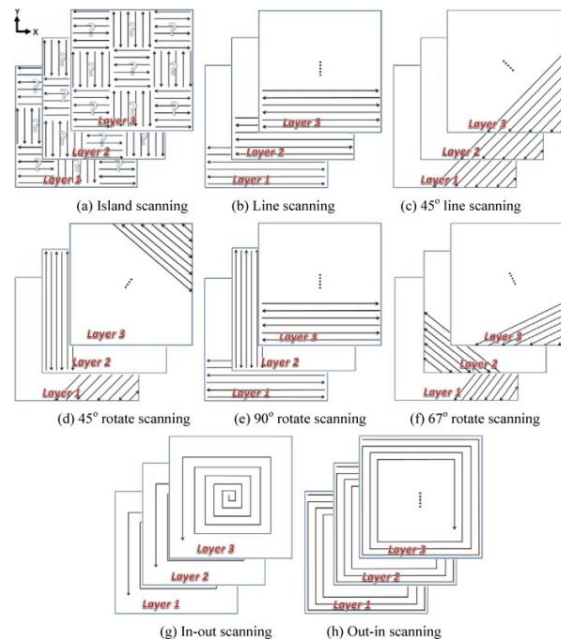
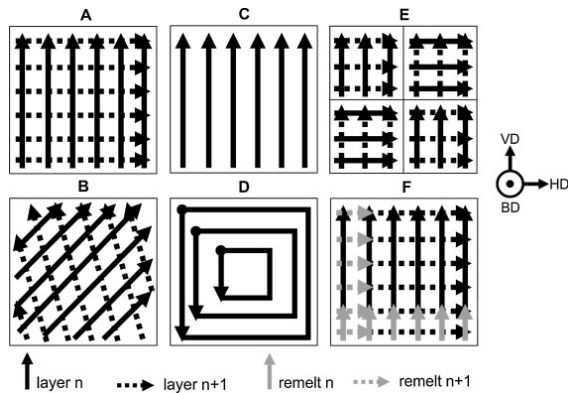
New Structures



Topology Optimisation



Additive Manufacturing technology and process improvement



INDUSTRY 4.0

ADVANCEMENT OF CORE PROCESSES

DATA COLLECTION
AND ANALYSIS



INDUSTRIAL
DESIGN



ENERGY
MANAGEMENT



QUALITY
MANAGEMENT



DATA COLLECTION
AND ANALYSIS



MANUFACTURING

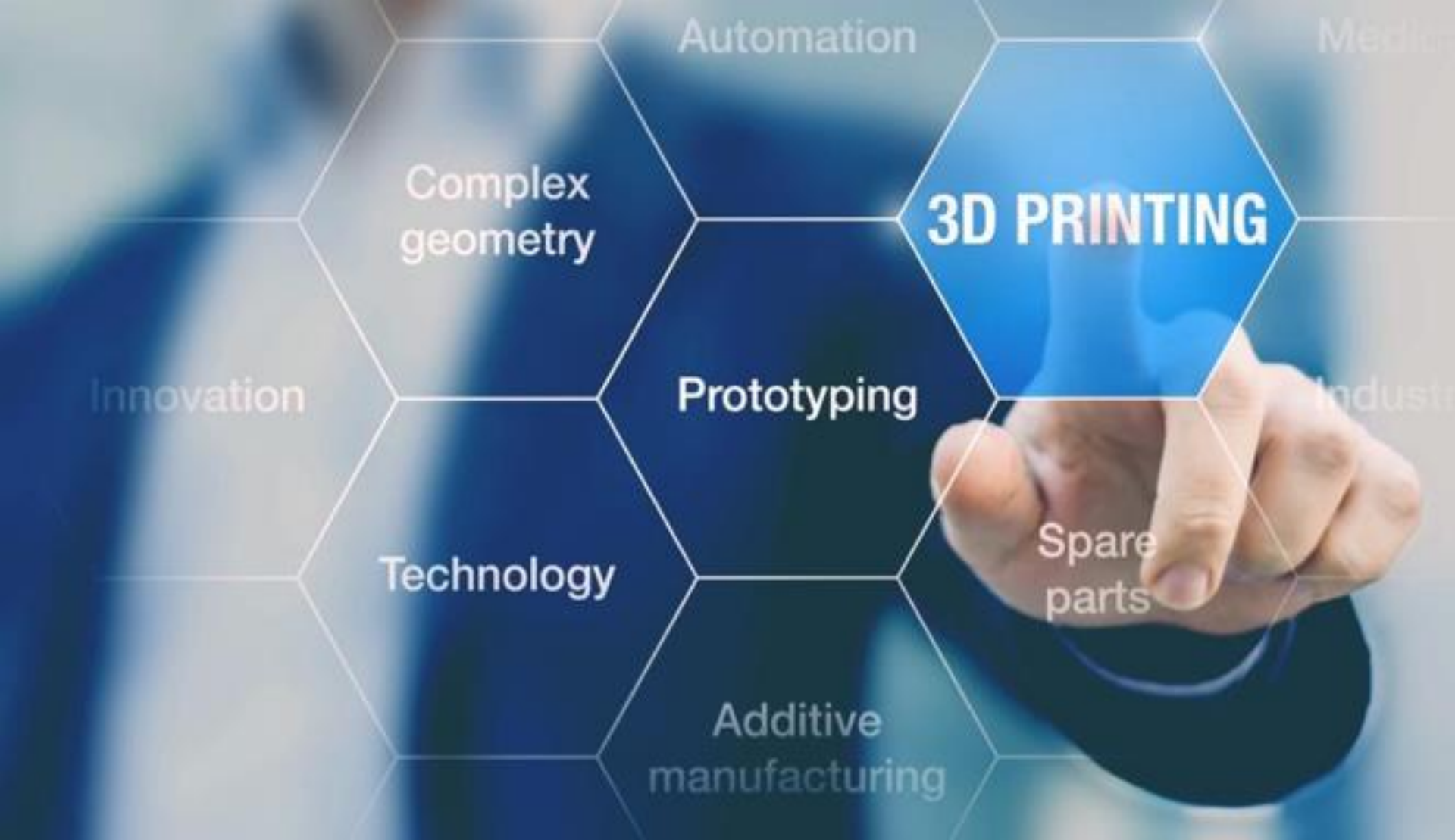


LOGISTICS



PRODUCT
MANAGEMENT





Doc. Ing. Juraj Beniak, PhD

Thanks for you attention

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