

3D Printed Conformal Cooling Inserts for Mold Manufacturers



LPR GLOBAL

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3D Printed Conformal Cooling Inserts Outperform Cycle Time by 3 times.

Contract Manufacturing Services

We are an industry leader providing high precision 3D printing services in the aerospace, automotive, medical, industrial and tooling industry. Our state-of-the-art facility in South Korea is ISO13485, ISO 9001, ISO 14001 and AS9100 and TS 16949 certified. We specialize in functional 3D prototypes with metal, ceramics, engineered resins or plastic materials.

Our client, who uses conformal cooling inserts for their molds, has compared the performance of their conventional cooling channel and LPR's 3D printed cooling channels. The business case below is the comparison of the performance.

Application

- Conformal cooling inserts for molds used in the automotive industry

Conventional Cooling Channel Performance

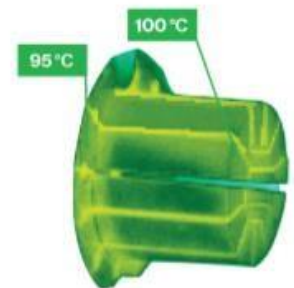
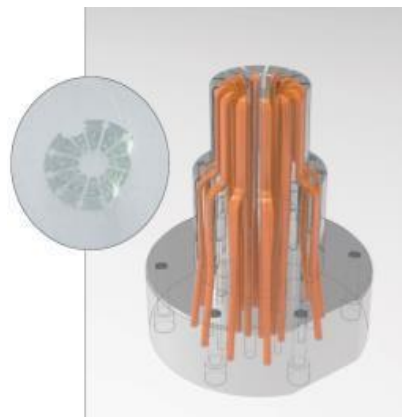
- Cycle Time: 90 seconds
- Defect Rate: 9%
- Hardness: HRC 52



Thermal image after 90 seconds

3D Printed Cooling Channel Performance

- Cycle Time: 28 seconds
- Defect Rate: 0.15%
- Hardness: HRC 54



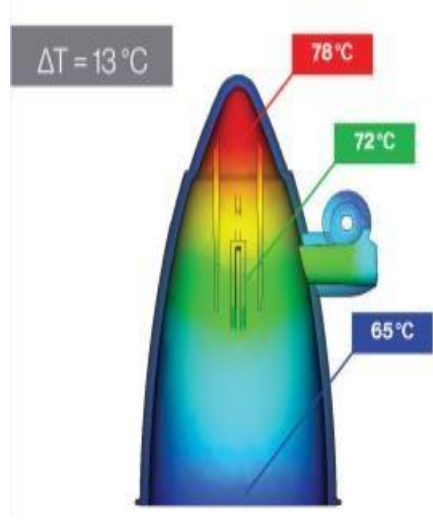
Thermal image after 28 seconds

3D Printed Conformal Cooling Inserts Reduce Defect Rates by 7 times.

Defect Rates: 3D printed cooling inserts vs conventional cooling inserts

Conventional Cooling Inserts for Molds

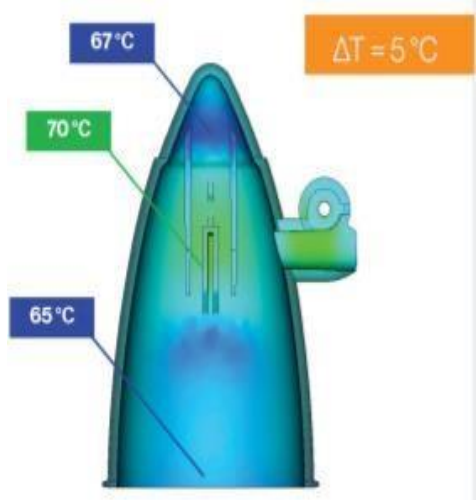
Cycle Time: 50 seconds
Defect Rate: 1.4%
Hardness: HRC 52



Thermal Image After 50 seconds

3D Printed Cooling Inserts for Molds

Cycle Time: 33 seconds
Defect Rate: 0.02%
Hardness: HRC 54



Thermal Image After 33 seconds

Facility Equipment

Manufacturing Equipment List

Equipment	Manuf.	Model	Work Area			Unit	Tolerance(mm)	RPM
			X (mm)	Y (mm)	Z (mm)			
Precision Machining								
CNC MC (3-axis)	FANUC	Robodrill α-D21LiA5	700	400	330	11	0.005	28,000
CNC MC (3-axis)	DMG Mori	DMC 650V	650	520	475	1	0.005	10,000
CNC MC (3-axis)	DMG Mori	DMC 850V	850	520	475	1	0.005	18,000
CNC MC (3-axis)	DMG Mori	MAX3000	400	270	280	1	0.005	15,000
CNC MC (5-axis)	DMG Mori	DMU 50	Φ630 × 500			1	0.005	18,000
CNC MC (5-axis)	DMG Mori	HSC 70 Linear Motor	Φ600 × 380			1	0.001	28,000
CNC Turn Mill	DMG Mori	NLX 2000/500	Φ366 × 590			1	0.005	6,000
CNC Turn Mill	Doosan	Lynx 220LMA	Φ250 × 510			1	0.005	6,000
3-Dimensional Measurement	Mitutoyo	CRYSTA-APEX S	700	1000	600	1	0.001	
3D Printing Systems								
3D Printer (Polymer)	EOS GmbH	EOS P 396	340	340	600	1		
3D Printer (Metal)	EOS GmbH	EOS M 290	250	250	325	2		
Hybrid (Laser Welding & Milling)	DMG Mori	LASERTEC 65 3D	Φ650 × 560			1	Laser Power: 2000W	

Project Experience with Material, Finishing and Machining



Materials	Finishing Process	Machining Capabilities
<ul style="list-style-type: none"> • Stainless Steel • Steel (NAK80/S45C) • Aluminum • Titanium • Magnesium • Ultem • PEEK • Polypropylene • Polycarbonate • HDPE • ABS • Acrylic 	<ul style="list-style-type: none"> • Bead Blasting • Polishing • Electro-Polishing • Black Oxide • Blacken • Clear & Hard Anodizing • Electro-plating • Powder Coating • Diamond Cutting • Chemical Etching • Vapor Polishing • Galvanizing 	<p>Minimum: ~+/- 0.02mm~0.03mm</p> <p>Minimum Thickness*</p> <ul style="list-style-type: none"> • AL: 0.3 mm • SS: 0.3 mm • Titanium: 0.5 mm • Mg: 0.5 mm • Acrylic: 1.0 mm • ABS: 1.0 mm • PC: 1.0 mm <p>Machining sizes (mm): 700 X 400 X 330 1100 X 600 X 520 (max)</p>

*Minimum thickness is only for reference. Depending on the project nature, the minimum thickness can change.



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