



**Let Us Create The Best Life With Flyinn!**



# CNC precision parts with 3D printing



Aluminum 3D printed with CNC processed parts for automotive industry



# CNC precision parts with 3D printing



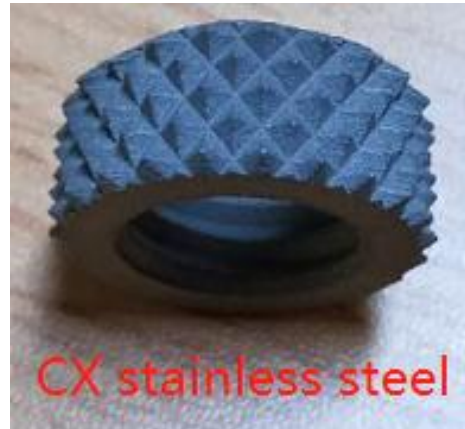
Aluminum 3D printed with CNC processed parts for automotive industry



# 3D Metal & Plastic Printing



## Printed parts for other industries.





# 3D Metal & Plastic Printing

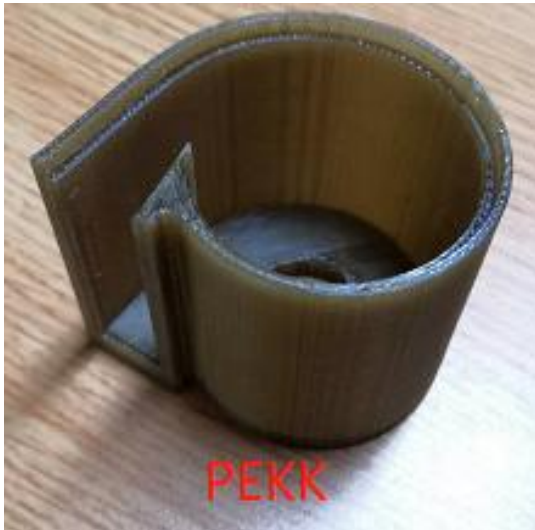
## Printed parts for other industries.





# 3D Metal & Plastic Printing

## Printed parts for other industries.



Vacuum casting in ABS material



PA



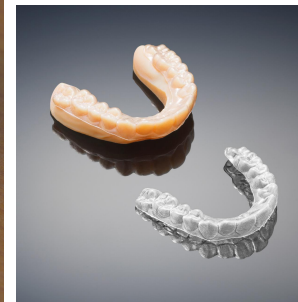
Stainless steel

Titanium Alloy

Somos

# 3D Metal & Plastic Printing

## Printed parts for other industries.



Multiple colors parts done by Polyjet printing



# CNC precision parts



Material: Aluminum



Material: Stainless steel



**We are professional team on 3D printing and manufacturing solution leading new key points in molds and other industries in China**

## **3D Metal & Plastic Printing**

1. Conformal cooling for mold components improving the plastic part warp problem, stable the dimensional and reduce the production cycle time
2. Vent insert printing with cooling line to solve the gas trap problem
3. Lead time: 5-12 days after kicking off, provide the conformal cooling design by free, 1-2 days
4. Conformal cooling can reduce cooling time approx. 60% and deformation approx. 30%
5. Vacuum Casting
6. Our 3D printing capacity: plastic, stainless steel, titanium alloy, aluminum alloy, bronze, ceramics, pure titanium on medical domain some like teeth & bone, etc.



## Design services

- Design feasibility studies
- Design consulting
- Conformal cooling
- Simulation service

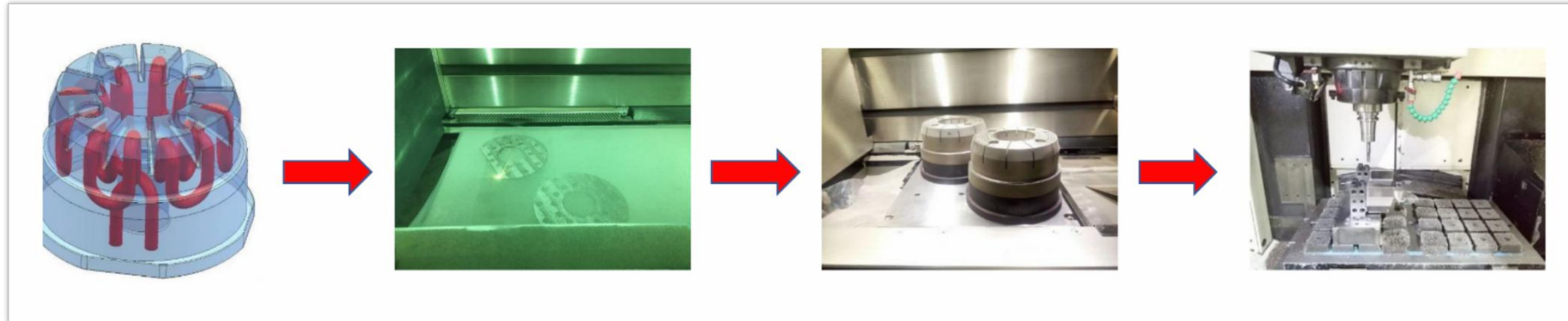
## Manufacturing services

- Heat treatment
- Provide machining processes such as CNC, EDM & WEDM after printing



## What is 3D printing?

Additive Manufacturing is another term for 3D printing. Unlike traditional manufacturing where material is removed to accomplish the end result, additive manufacturing does the opposite by adding layers of material to accomplish the end result. It does this by turning digital designs into three dimensional objects, as well as finished productions



## Factors influencing quality of parts in injection moulding

- 60% of defects on products come from wrong or not efficient mold temperature control
- 20% runner and gate choice
- 10% process stability
- 5% maintenance
- 5% part design



## Characteristics of AM Insert

- There two types of metal powder that are suitable for plastic injection tool: MS1(equivalent to 1.2709 steel) and CX(equivalent to Assab Corrax-stainless steel)
  - MS1 hardness: 52-54 HRC(after heat treatment)
  - CX hardness: 48-51 HRC(after heat treatment)
  - After printing, the insert hardness is about 30-34 HRC(before heat treatment)
  - After printing, insert surface roughness:
    - MS1= Ra 9um/Rz 50um
    - CX= Ra 5um/Rz 26um
- AM insert can be polish up to SPI A-3 to A-2 level
- AM insert can be laser weld
- AM insert can be coated
  - It is recommended to use a coating process temperature not more than 400 degree
  - Recommendation coating process: nickel and PVD

## Managing steel is very performing tool steel compared to standard ones

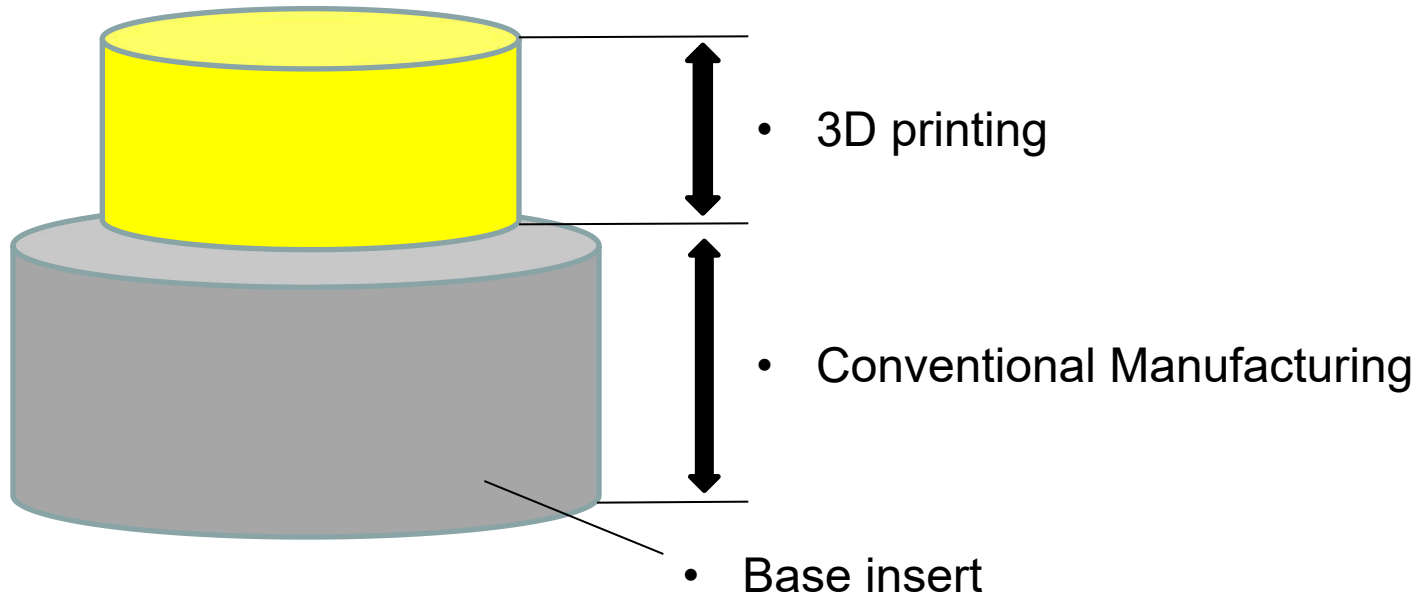
	Orvar supreme (1.2344)	Stavax (1.2083)	1.2343 (H13)	1.2709 (MS1)
Yield strength (Rp 0.2 %) [Mpa]	1250	1290	1400	1930
Tensile strength []	1400	1780	1600	2050
Elongation at break [%]	13	na	3-5	4-6
Modulus of elasticity [GPa]	210	210	215	200
Hardness [HRC]	52-54	48-52	52-54	52-54
Density [Kg/dm3]	7,8	7,74	7,8	8,0
Coefficient of thermal expansion [m/mK]	12,6x10 <sup>-6</sup>	11x10 <sup>-6</sup>	11,3x10 <sup>-6</sup>	10,3x10 <sup>-6</sup>
Thermal conductivity [W/m °C]	25	20	25	20
Corrosion resistance	yes	yes	No	yes



## Advantages of AM for the tool making

- Freedom of design work
- Hot spots or critical area of the insert is able to implement conformal cooling system
- Productivity increased due to cycle-time reduction and better molding yield rate
- Part quality improved due to better cooling system through conformal cooling
- Better dimension stability
- Less deformation on the product
- High number of various cooling designs are possible
- Reduction of cost per plastic product
- Validation of benefits and results through simulation
- Flowrate analysis
- Identified hot spot areas
- Insert life time improved due to better uniform cooling system- conformal cooling

## 3D Printing Methodology



Hybrid design concept



## Hybrid design concept

- Advantage – more economical
- Disadvantage – longer lead – time

## Direct design concept

- Advantage – shorter lead – time
- Disadvantage – cost more Money

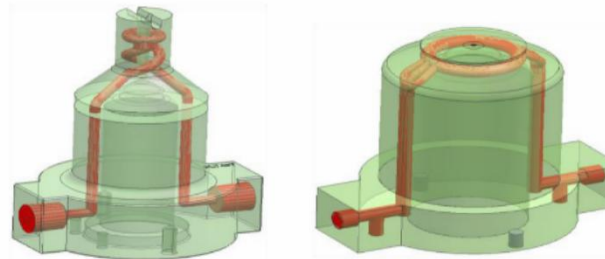


## Metal AM for tooling application

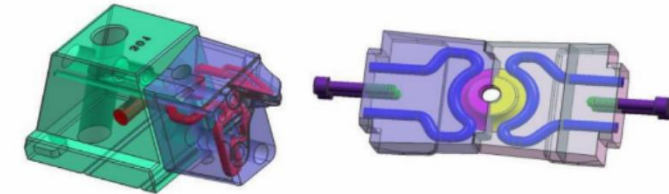
1. Sprue Bush – 2-plate mold



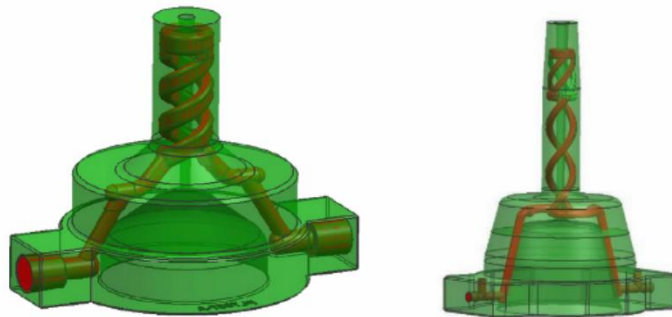
3. Hot-Tip Bushing



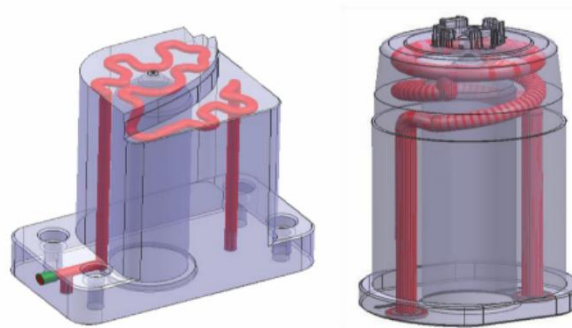
5. Slider Insert



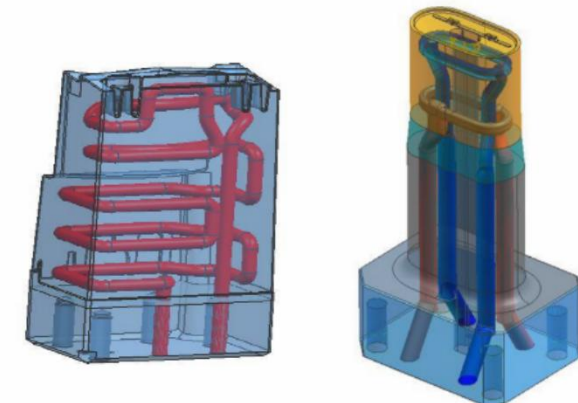
2. Sprue Bush – 3-plate mold



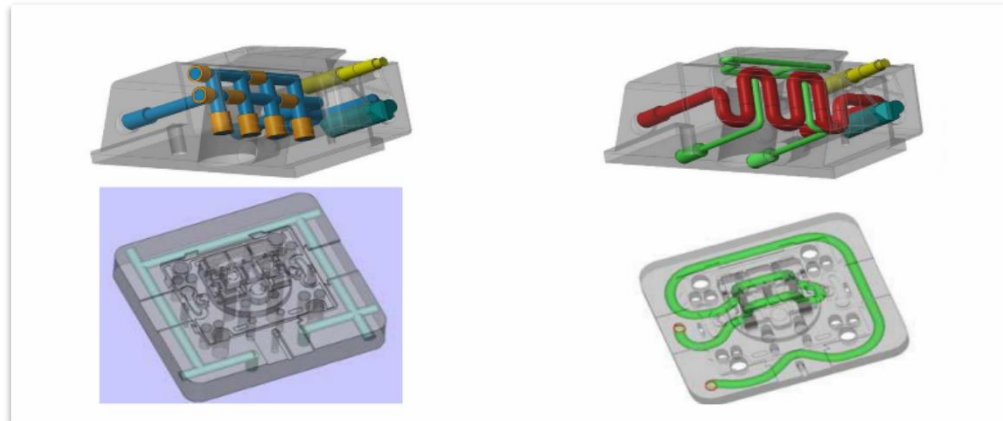
4. Sub-Insert with Hot-Tip



6. Sub-Insert

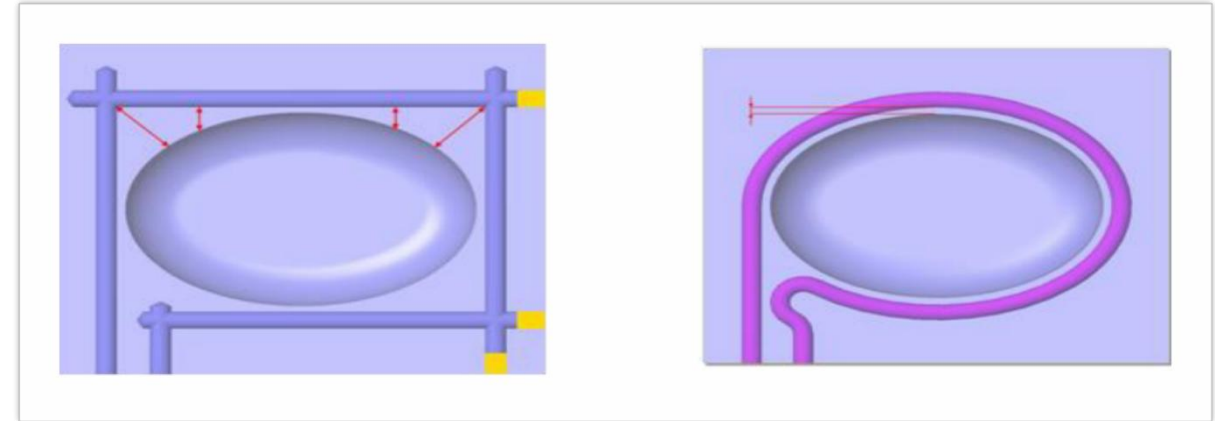


## Conventional cooling system VS conforming cooling system



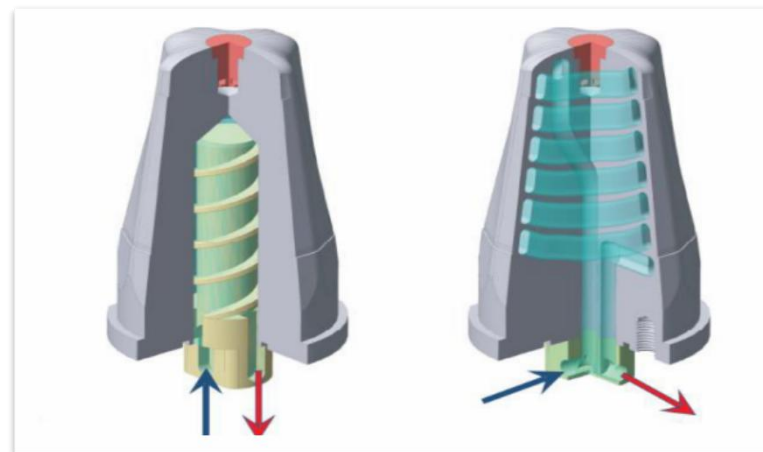
Conventional drilled cooling channels

Optimized conformal cooling



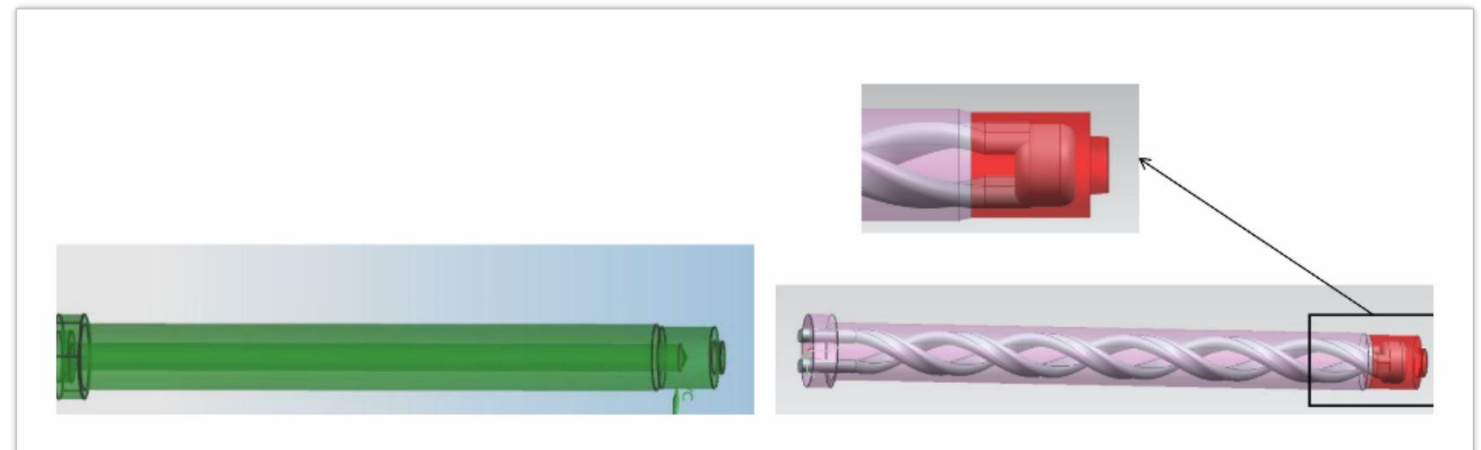
Conventional drilled cooling channels

Optimized conformal cooling



Conventional drilled cooling channels

Optimized conformal cooling

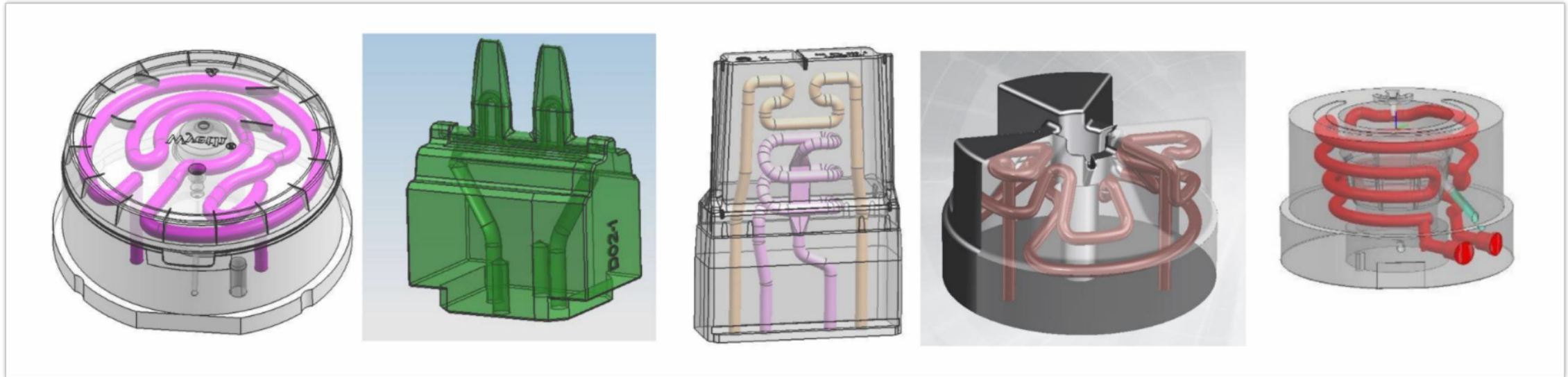


Conventional drilled cooling channels

Optimized conformal cooling

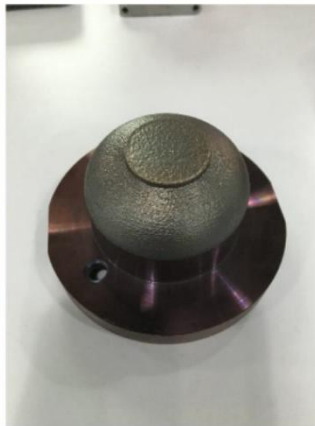


## Examples of conformal cooling design



# 3D Metal & Plastic Printing

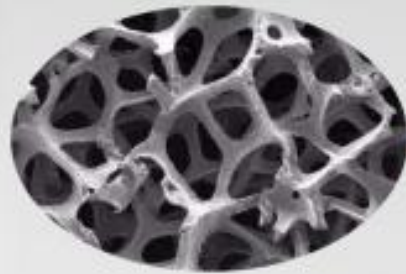
Printed mold components with conformal cooling inside.







Venting/blowing channel to avoid blocking.



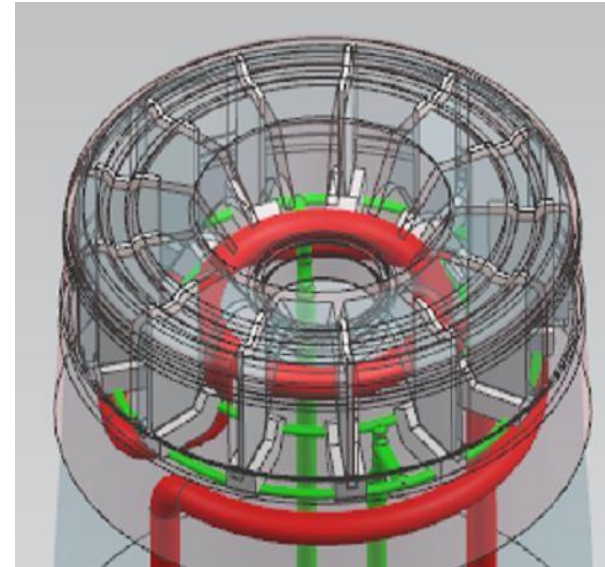
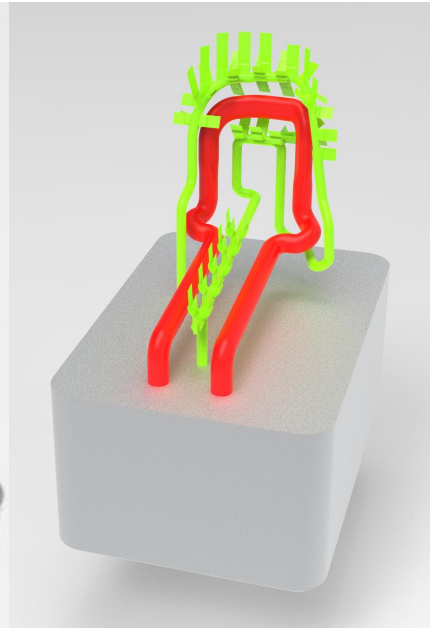
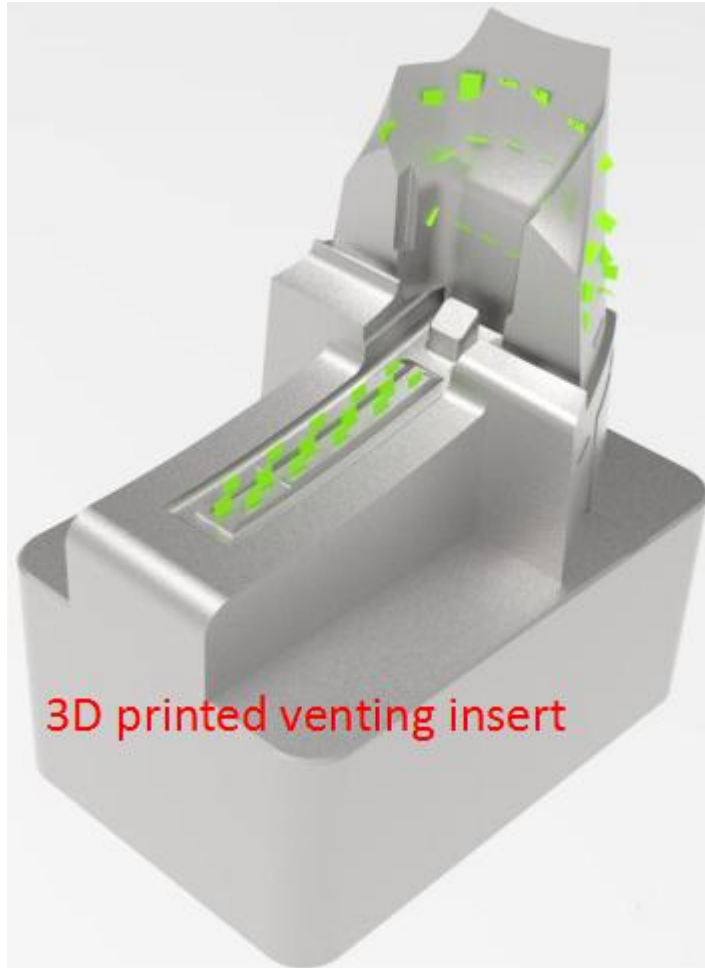
Uniform venting holes



Advantage: the venting holes are well controlled to be uniform, the surface can be made to be VDI30 and venting holes are able to be added to ejector pins.

Disadvantage: it is not suggested to apply for high glossy products.

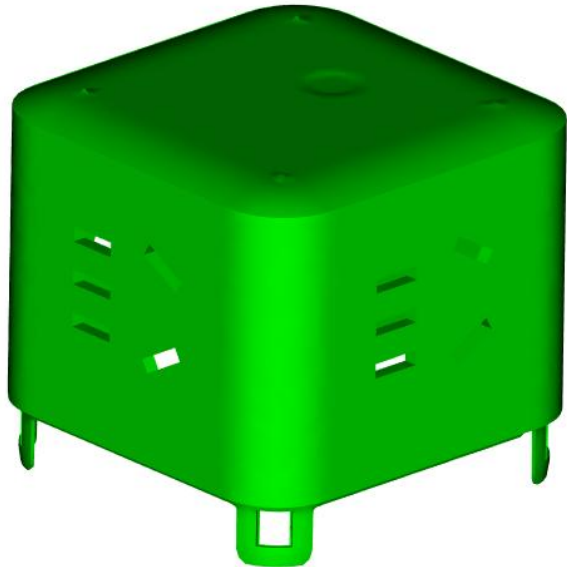
# 3D Metal & Plastic Printing



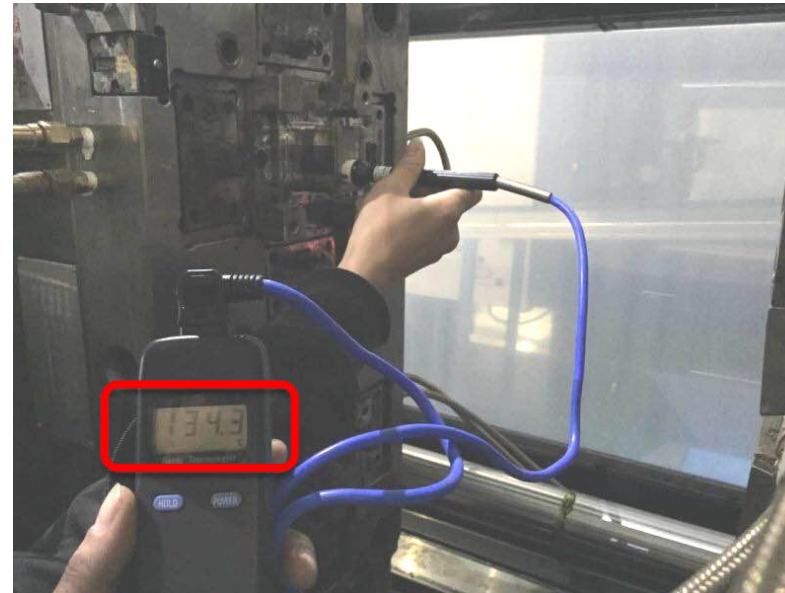


Practical case in using conformal cooling inserts in mold.

Before using conformal cooling inserts.



Product picture

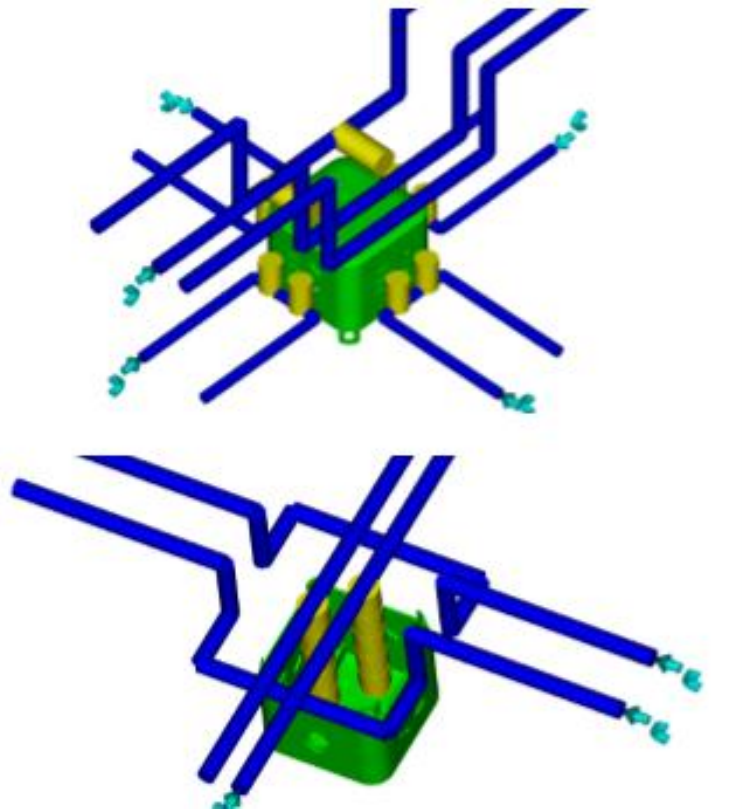


Current mold

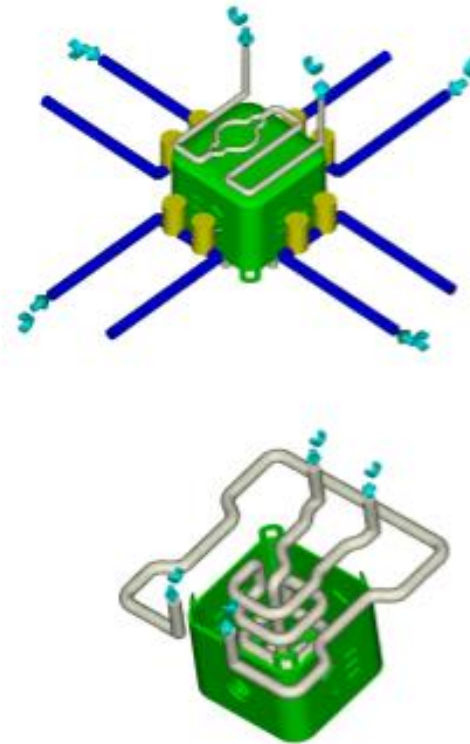
The material of this product is PC, mold temperature is too high which is around 134°C and cycle time is 36 sec which is too long, the mold temperature needs to be reduced to 80~90°C and the cycle time is also needed to be shortened to increase daily output for production, so we suggested customer to use conformal cooling inserts.

## Practical case in using conformal cooling inserts in mold.

### Cooling lines comparison



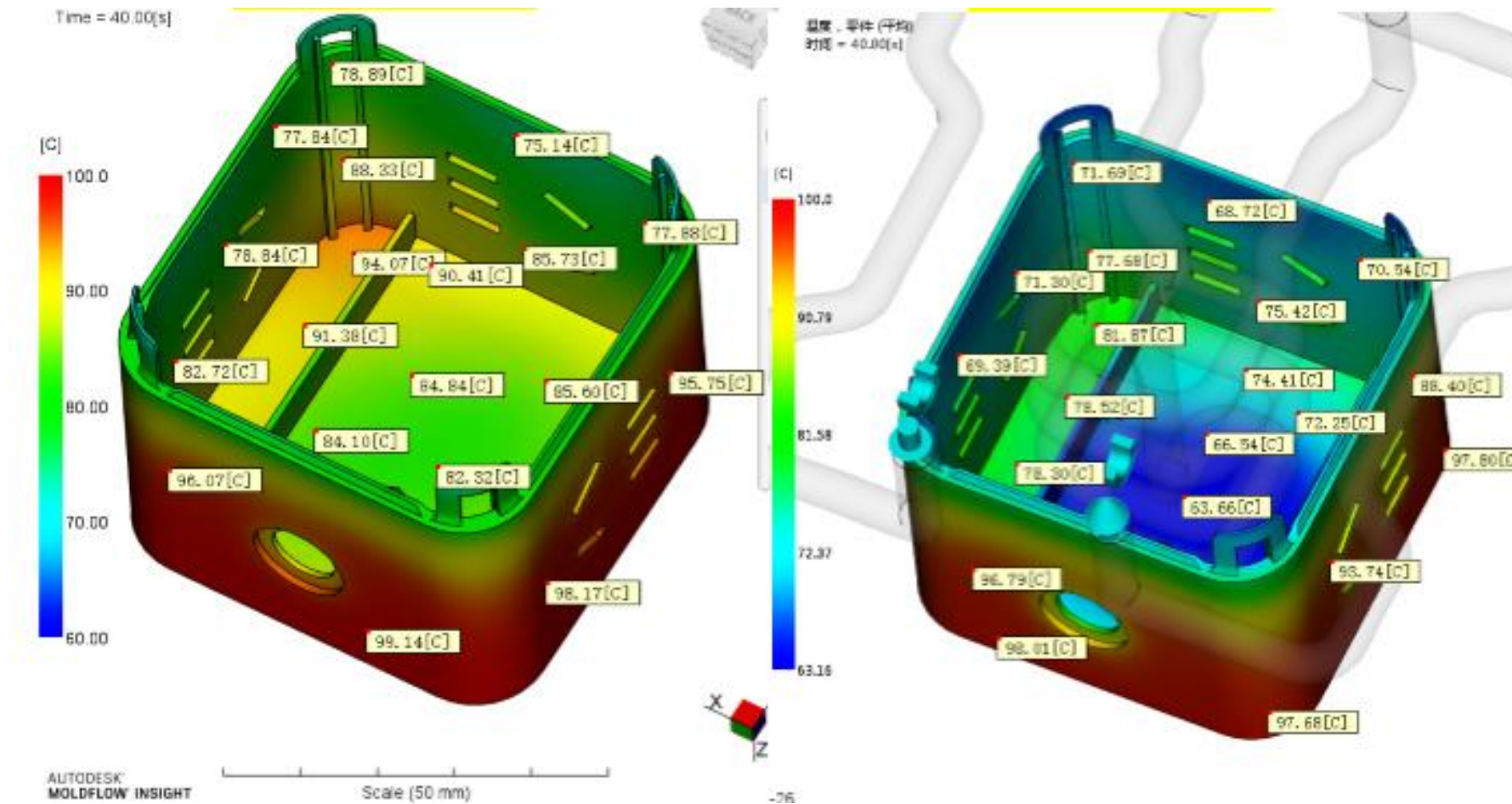
Current cooling in mold



Conformal cooling we designed for customer.

With validation we know that the current cooling line total length is 556mm, conformal cooling line total length is 950mm which is 71% increased, and the current cooling line total area is 23008mm<sup>3</sup>, conformal cooling line total area is 26876mm<sup>3</sup> which is 17% increased, thus the quality of product will be improved a lot for dimensional/cosmetic issues, and also the cycle time will also be shortened.

## Practical case in using conformal cooling inserts in mold.



Current cooling in mold

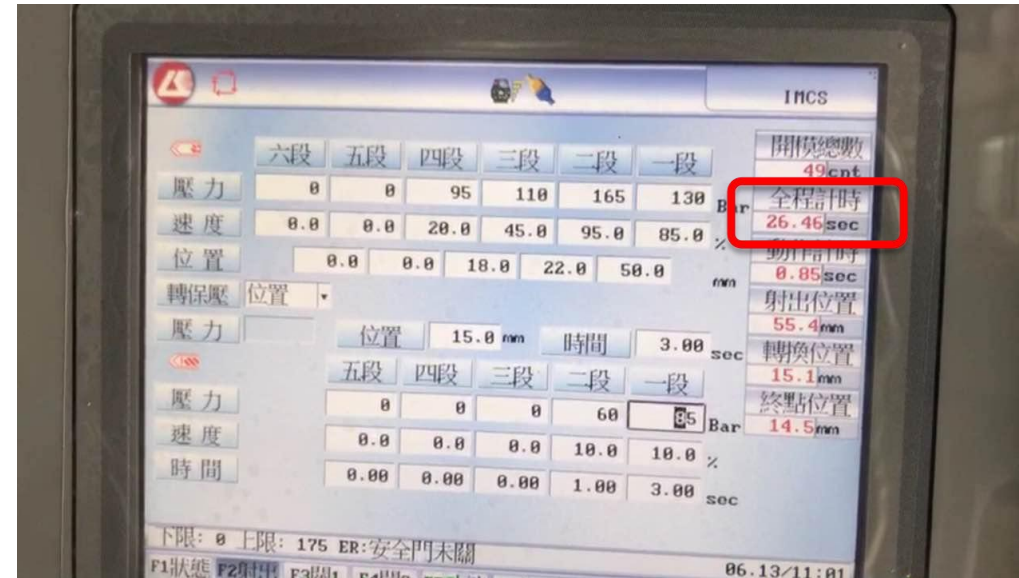
Conformal cooling

With the conformal cooling, the bottom temperature is 15~20°C lower and top temperature is 5°C lower.



Practical case in using conformal cooling inserts in mold.

After using conformal cooling inserts.

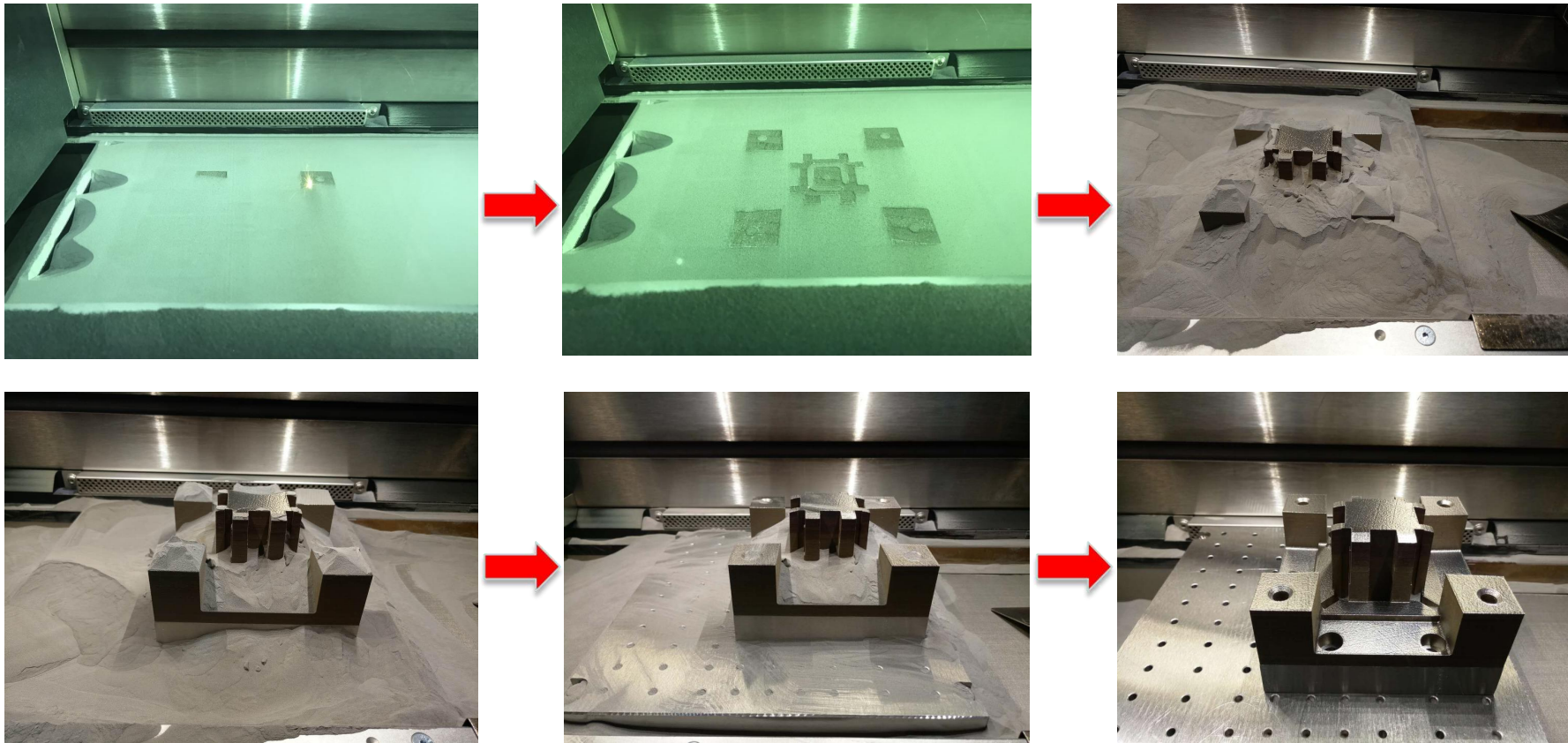


With the conformal cooling inserts, the mold temperature is 40~50°C lower than before and also the cycle time is reduced to be 26 sec from 36 sec.

# 3D Metal & Plastic Printing

Practical case in using conformal cooling inserts in mold.

The conformal cooling insert is being printing in machine



## Practical case in using conformal cooling inserts in mold.

### Benefits by using conformal cooling insert

1. Taking 250 injection machine as an example, the cost per second is 0.0035USD, thus the cost reduction for each product will be  $0.0035 \times 10 \text{sec} / 2 \text{cavities} = 0.017 \text{USD}$ .
2. The annual output for each mold is 2,000,000pcs parts, so the cost reduction for each mold will be  $0.017 \text{USD} \times 2,000,000 = 35,714 \text{USD}$  every year, there are 7 set molds using conformal cooling inserts and running production every day, which is 249,998USD saved per year.
3. Money saving is also indicated on injection machine, for example, an injection machine will be running production for 330 days per year,  $330 \times 17\% = 90$ , so there will be 90 days saved for each machine. Speaking about machine investment, if you are trying to buy 40 set injection machines, then you just need to buy 30 sets which is able to achieve the same output as 40 sets do with using conformal cooling inserts for your molds.



# 3D Metal & Plastic Printing



## Printable material/dimension and lead time etc...

Material name:	Finish options:	Colors:	Minimum dimensions:	Maximum dimensions:	Maximum weight:	Production time:
316L(Stainless)	Raw	Grey	1*1*1mm	380*380*350mm	20kg	8~10 days(for a part of 10*10*10cm)
Steel(1.2709)	Raw	Grey	1*1*1mm	380*380*350mm	20kg	8~10 days(for a part of 10*10*10cm)
CX(Stainless)	Raw	Grey	1*1*1mm	380*380*350mm	20kg	8~10 days(for a part of 10*10*10cm)
AlSi10Mg(Aluminium alloy)	Raw	Silver	1*1*1mm	420*420*450mm	20kg	8~10 days(for a part of 10*10*10cm)
qcr1(Bronze)	Raw	Coppery	1*1*1mm	380*380*350mm	20kg	8~10 days(for a part of 10*10*10cm)
Copper	Raw	Coppery	1*1*1mm	380*380*350mm	20kg	8~10 days(for a part of 10*10*10cm)
Ti64(Titanium alloy)	Raw	Silver	1*1*1mm	380*380*350mm	20kg	8~10 days(for a part of 10*10*10cm)
Polycarbonate(PC)	Raw	Clear/White	1*1*1mm	350*350*300mm	20kg	3~5 days(for a part of 10*10*10cm)
ABS	Raw	White	1*1*1mm	1400*1000*800mm	20kg	3~5 days(for a part of 10*10*10cm)
ABS	Raw	White/Black/Red/Orange/Yellow/Blue	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
ABS ESD7	Raw	Black	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
ABS M30i	Raw	Natural	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
Somos 128	Raw	White	1*1*1mm	600*600*400mm	20kg	3~5 days(for a part of 10*10*10cm)
Somos 8000	Raw	White	1*1*1mm	600*600*400mm	20kg	3~5 days(for a part of 10*10*10cm)
Somos 11122	Raw	Translucent	1*1*1mm	600*600*400mm	20kg	3~5 days(for a part of 10*10*10cm)
ULTEM 1010	Raw	Brown	1*1*1mm	914*610*914mm	20kg	3~5 days(for a part of 10*10*10cm)
ULTEM 9085	Raw	Brown/Black	1*1*1mm	914*610*914mm	20kg	3~5 days(for a part of 10*10*10cm)
ASA	Raw	White/Black/Red/Orange/Yellow/Green/Blue	1*1*1mm	355*254*355mm	20kg	3~5 days(for a part of 10*10*10cm)

# 3D Metal & Plastic Printing



## Printable material/dimension and lead time etc...

Material name:	Finish options:	Colors:	Minimum dimensions:	Maximum dimensions:	Maximum weight:	Production time:
PLA	Raw	White/Black/Red/Orange/Yellow/Green/Blue	1*1*1mm	300*300*280mm	20kg	3~5 days(for a part of 10*10*10cm)
Woodlike PLA	Raw	Woody	1*1*1mm	300*300*280mm	20kg	3~5 days(for a part of 10*10*10cm)
PETG	Raw	White	1*1*1mm	300*300*280mm	20kg	3~5 days(for a part of 10*10*10cm)
TPU(45~60A)	Raw	Yellow/White/Red	1*1*1mm	300*300*280mm	20kg	3~5 days(for a part of 10*10*10cm)
SLSNylon	Raw	White	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
HP MJF Nylon	Raw	Black	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
Transparent resin	Polished	Clear	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
Glass-filled	Raw	Natural	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
Rubber	Raw	White/Black/Color/Clear	1*1*1mm	300*300*280mm	20kg	3~5 days(for a part of 10*10*10cm)
PEKK	Raw	Brown	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
PEEK	Raw	Brown	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
Lasty-R	Raw	Natural	1*1*1mm	380*380*350mm	20kg	3~5 days(for a part of 10*10*10cm)
PC-ABS	Raw	Black	1*1*1mm	380*380*350mm	20kg	2~3 days(for a part of 10*10*10cm)
TPU 92A	Raw	Raw	1*1*1mm	355*254*355mm	20kg	2~3 days(for a part of 10*10*10cm)
Veropurewhite/Verowhiteplus	Raw	White	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)
VeroBlackPlus	Raw	Black	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)
VeroBlue/VeroGray	Raw	Blue/Gray	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)
VeroClear	Raw	Clear	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)
RGD720	Raw	Clear	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)
TangoBlackPlus	Raw	Black	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)
TangoGray	Raw	Gray	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)
Agilus30	Raw	Raw	1*1*1mm	500*400*200mm	20kg	2~3 days(for a part of 10*10*10cm)

# Equipments



High Speed CNC Machine



CNC



# Flyinn GB/T19001-2016/ISO9001:2015





**Thank You & Welcome To Contact US!**

Billy Lau  
China Cell Phone:  
+86 13421471917  
Email: [billy@flyinn-tech.com](mailto:billy@flyinn-tech.com)

James Zhang  
China Cell Phone:  
+86 13410643656  
Email: [james@flyinn-tech.com](mailto:james@flyinn-tech.com)

Company Address: FlyInn Tech ZhongShan Co.,Ltd. Unit 1857,  
18 floor, LiHe commercial centre, ZhongShan city, GuangDong,  
China.

Website: [www.flyinn-globaltech.com](http://www.flyinn-globaltech.com)