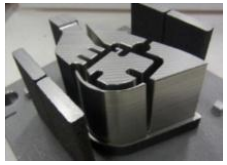
Merits of this method

(1) High aspect (deep ribs) processing is possible

- EDM process less
- Simple design of the mold



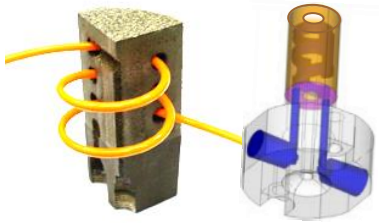
Examples of deep rib processing Without EDM process

(2) Ensure the accuracy & roughness by Milling

→ **Quick delivery** mold having a complicated shape

(3) Freely forming the 3D cooling channels

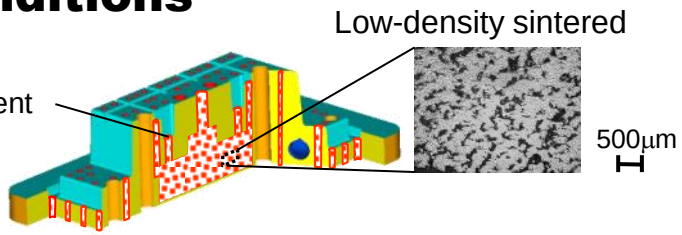
→ **High cycle** molding
High accuracy molding



3D cooling channels

(4) Density control by Laser sintering conditions

→ **Gas vent** function

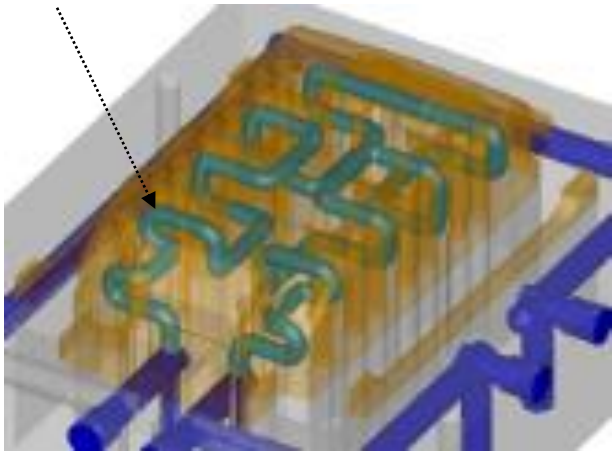


■ Integrated processing of mold of complex shape
■ 複雑形状の一体加工

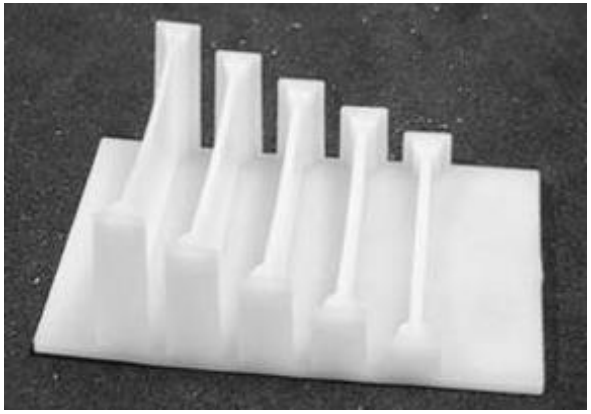
- **Application examples to injection mold**

High cycle and High accuracy molding by using the 3D cooling channels

High-performance mold of application examples



Conformal cooling



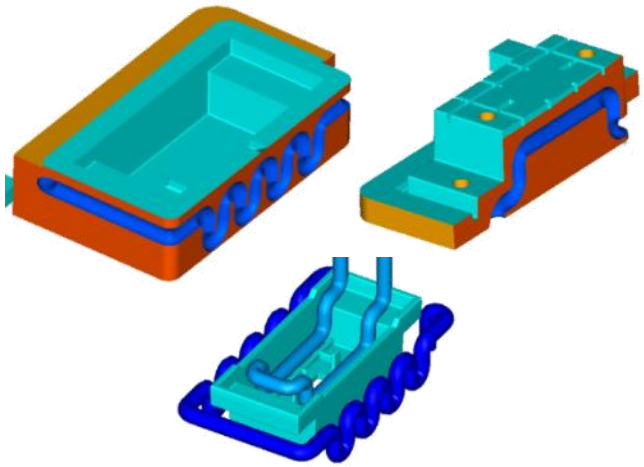
Conformal cooling

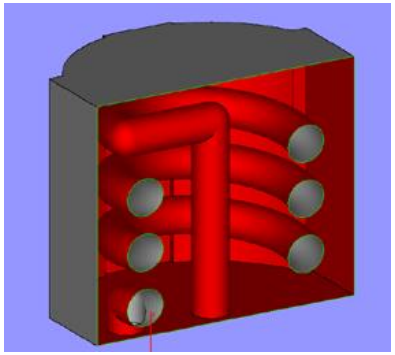
Gas vent

Freely form a 3D cooling channels

Freely form the internal structure

Free cooling channel design
impossible by the conventional method (drilling)

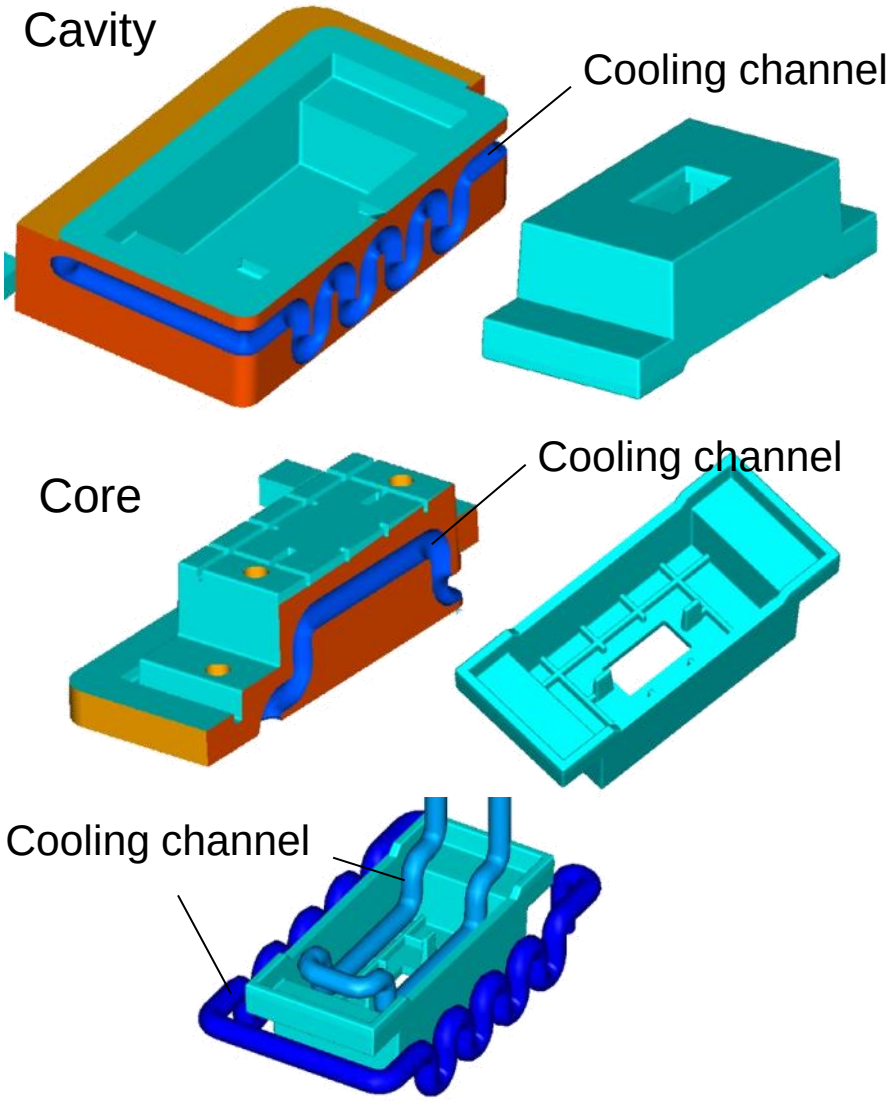




- **High cycle molding**
- **High accuracy molding**

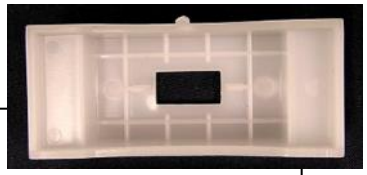
Shortening of the molding cycle 3D cooling channels

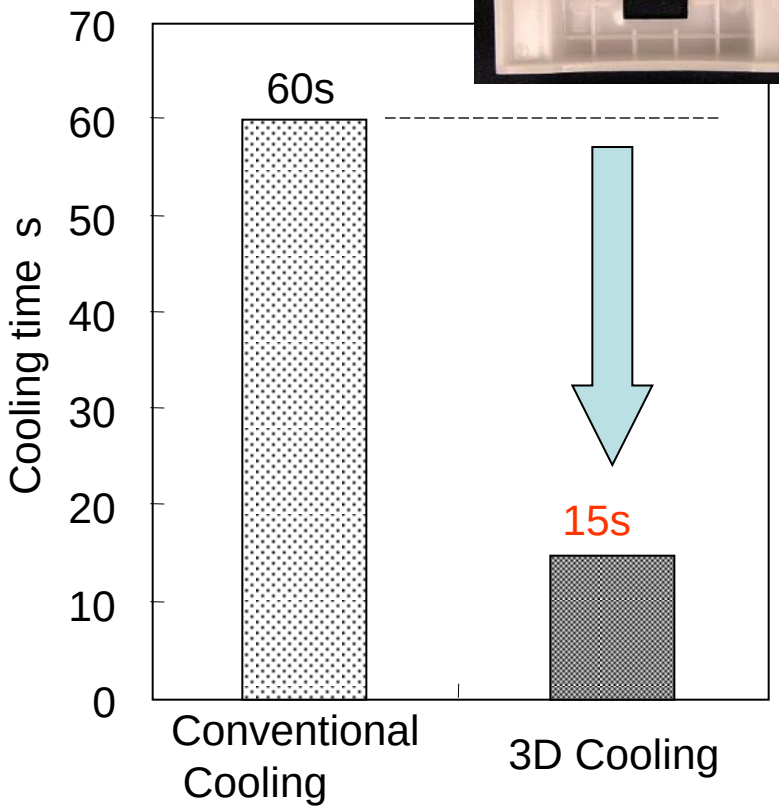
◆3D cooling channel structure



◆Cooling time

Material：PP





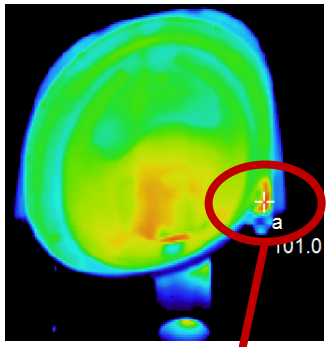
◆Effectiveness

1) Reduce the internal warp of box-shaped part
2) Shortening of the molding cycle

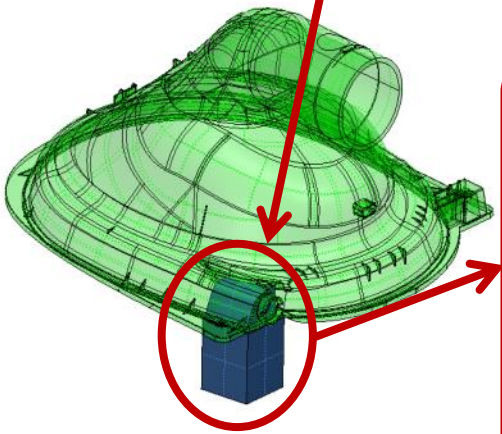
3D cooling for the part of heat spot

Plastic toilet parts

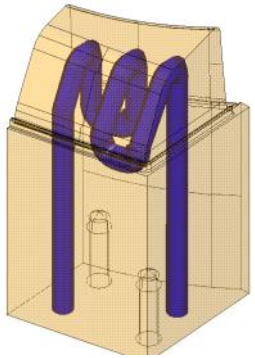
Prediction of heat spot by molding simulation

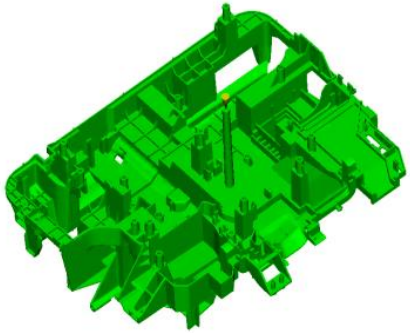


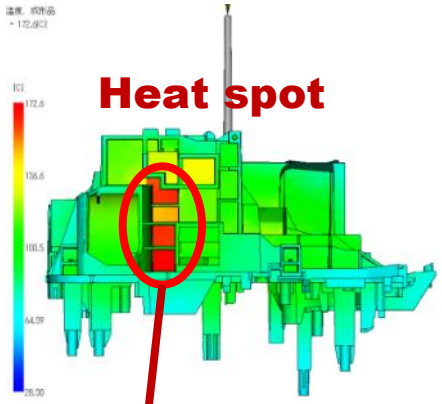
Heat spot

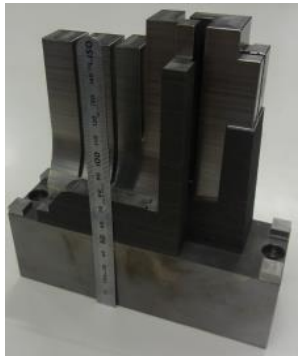


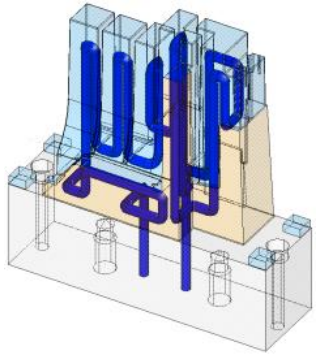
3D cooling
nesting piece







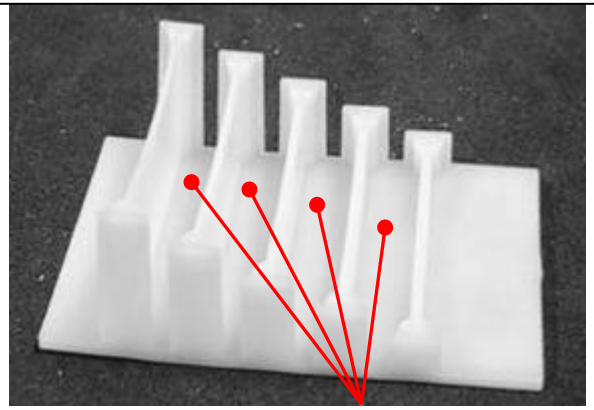




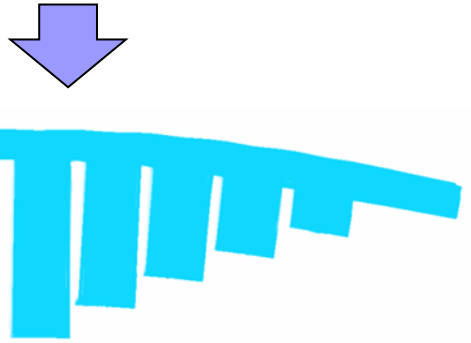
High accuracy molding using 3D cooling channels

- **Trying the high accuracy injection molding applying the 3D cooling channels.**

Shape of the molded part

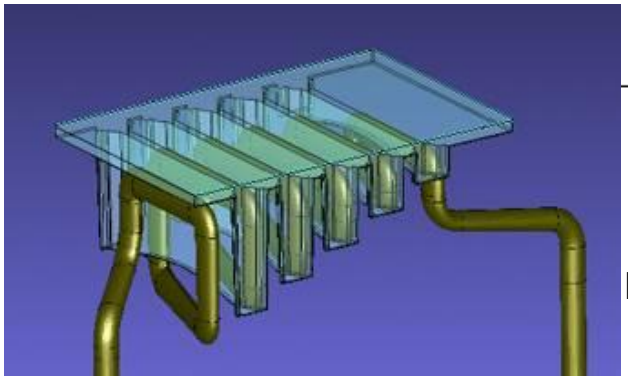


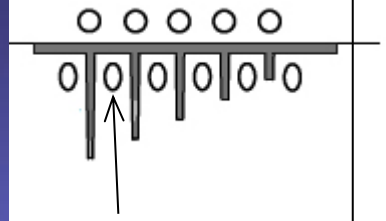
Easy to rise temperature but cooling channel can not arrange



Warp caused by the unbalanced cooling

Cooling channel to get heat balance

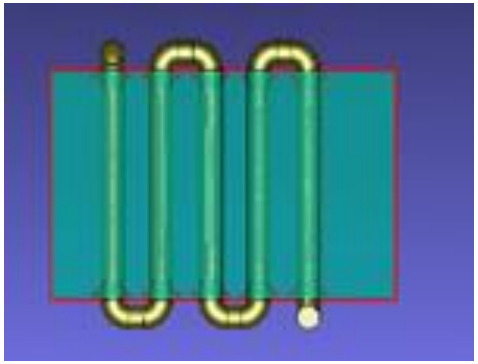




Ellipse (5×3mm)

Core side

Spiral channel is leaded between the ribs.



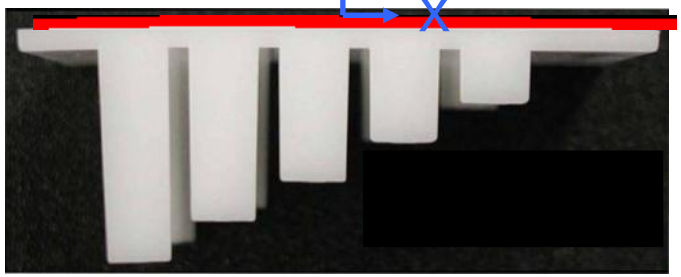
Cavity side

High accuracy molding using 3D cooling channels

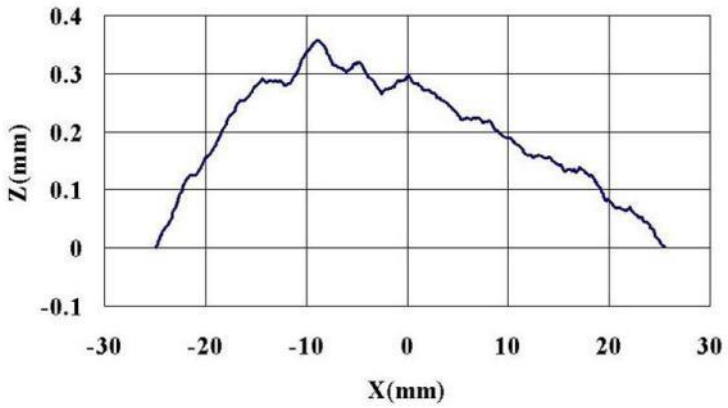
Significantly reduce the warpage by cooling the portion heat accumulated

Conventional cooling

Material	POM
Temp.	190℃

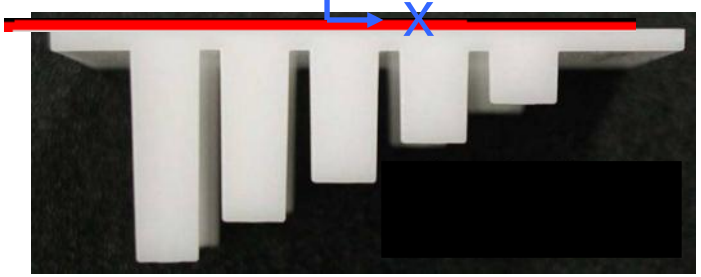


COR 40℃, 1.1 L/min
CAV 40℃, 2.5 L/min

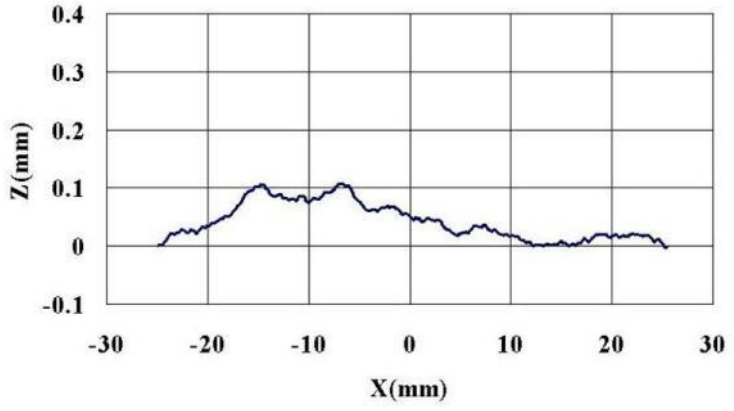


3D cooling

Material	POM
Temp.	190℃



COR 40℃, 1.1 L/min
CAV 40℃, 2.5 L/min



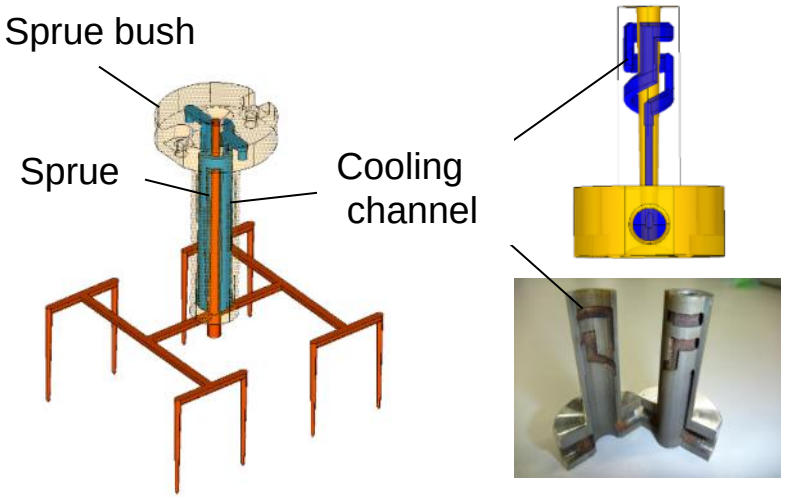
- **Application examples to injection mold**

Sprue bush with the 3D cooling channel

The high cycle molding by 3D cooling spure bush

What is 3D cooling sprue bush

・Since the sprue part is slow to solidify, molding cycle shortening is difficult



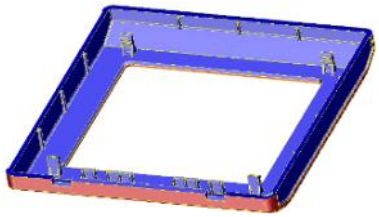
Objective

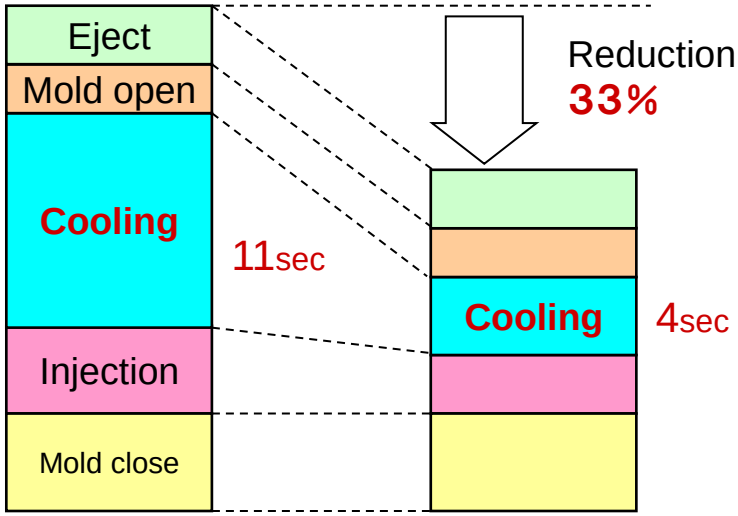
◆Productivity improvement

◆Ensure the maintenance time of mold

Effect and results

【 Subject mold】
※Molding cycle：26s

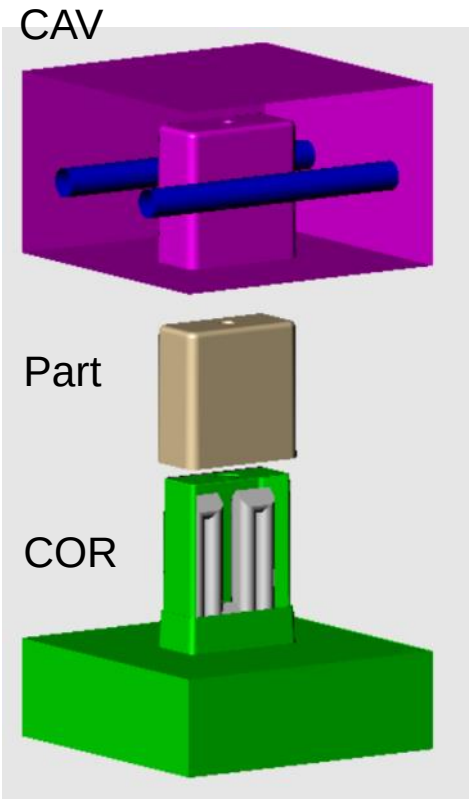




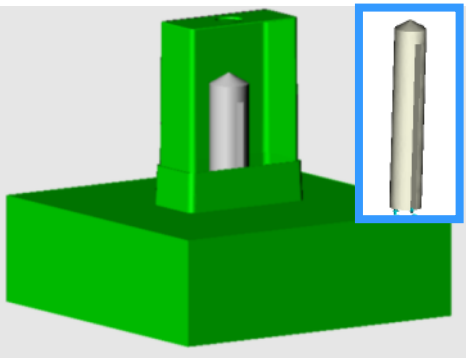
Optimal cooling channel design of the box-shaped molding die

◆**Free 3D cooling channel design**
◆**Designed with the simulation**

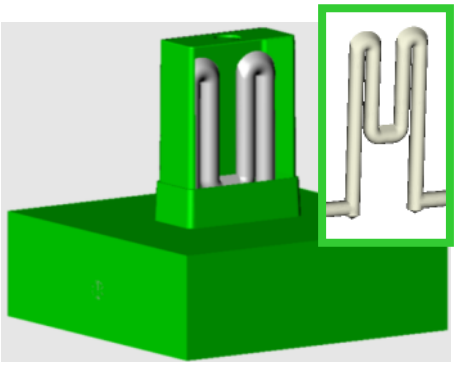
Mold construction



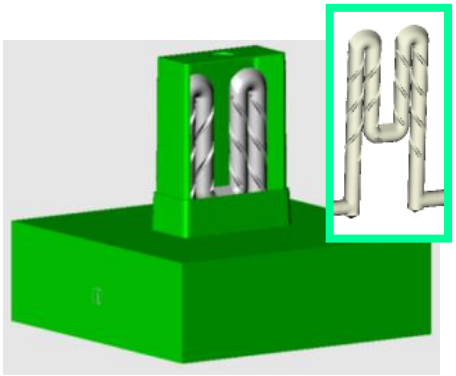
Case1 : Baffle (conventional)



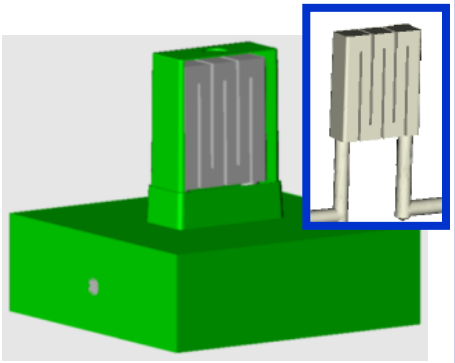
Case2：U-shaped



Case3：U-shaped + screw



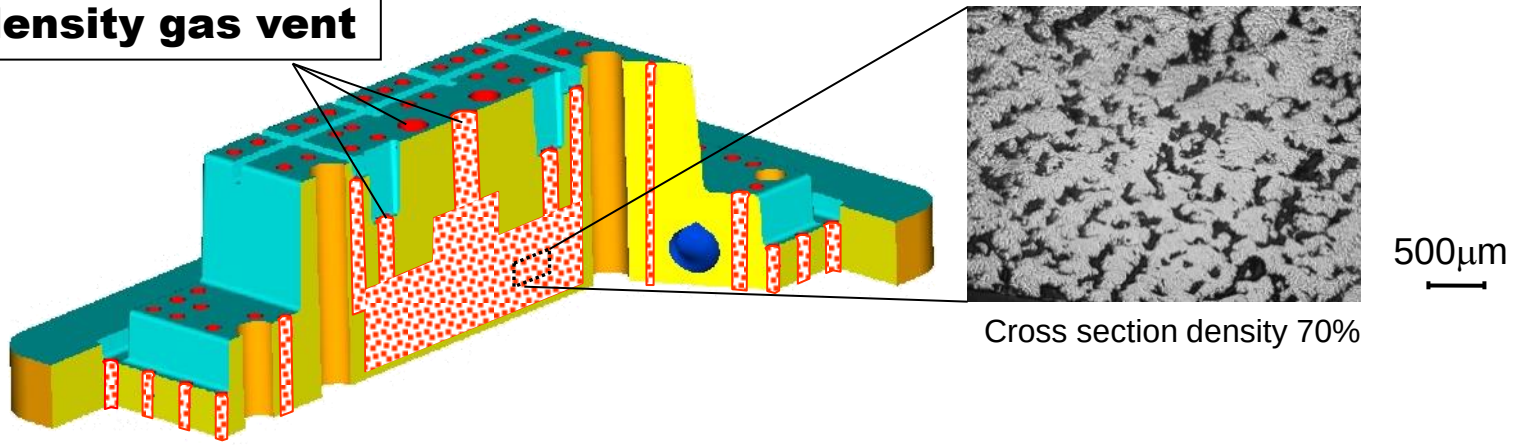
Case4：Rectangle



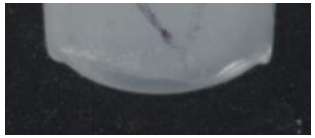
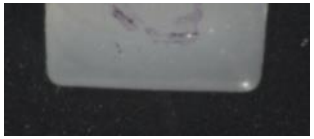
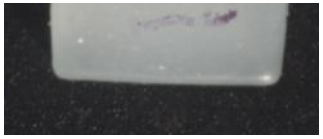
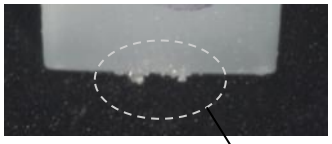
- **Application examples to injection mold**

Gas venting by density control

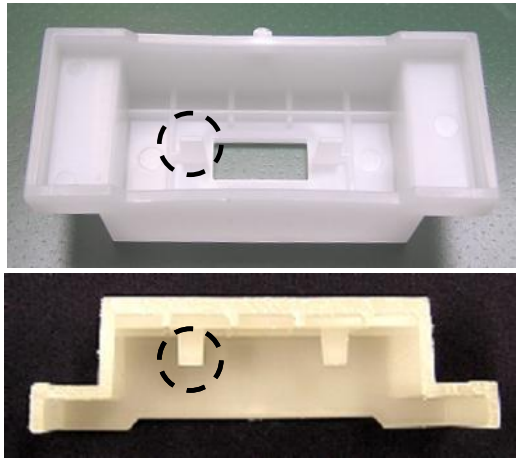
Gas vent function by density control



◆Comparison of resin filling

	Pressure keeping		
	0 MPa	15 MPa	30 MPa
No vent			
Low density gas vent			1mm

Projections due to the large vacancy



Material：PP