



Moldex3D
MOLDING INNOVATION

Moldex3D Cooling Channel Designer

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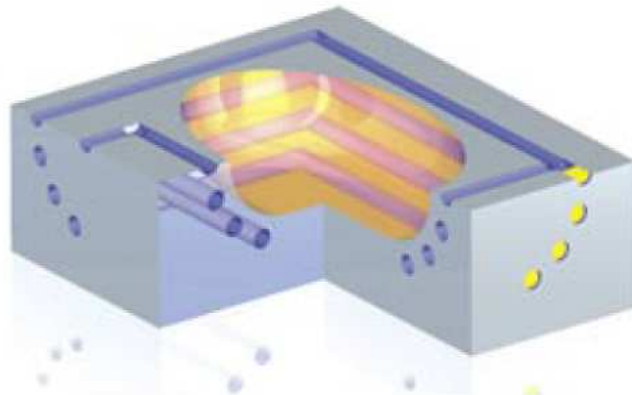
Moldex3D Italia srl
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Conformal cooling?

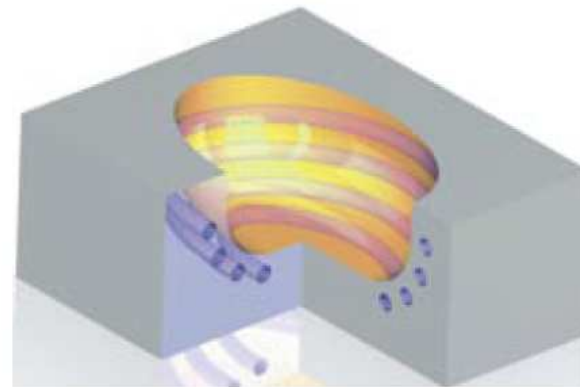
Overview of Conformal Cooling

- > What is conformal cooling?
 - **Cooling channel design based on product contour**

- > Why use conformal cooling?
 - **Increase cooling efficiency.**
 - With conformal cooling, cooling rate difference can be minimized through the whole part
 - **Reduce cycle time and cost**
 - **Obtain better product quality**



Conventional



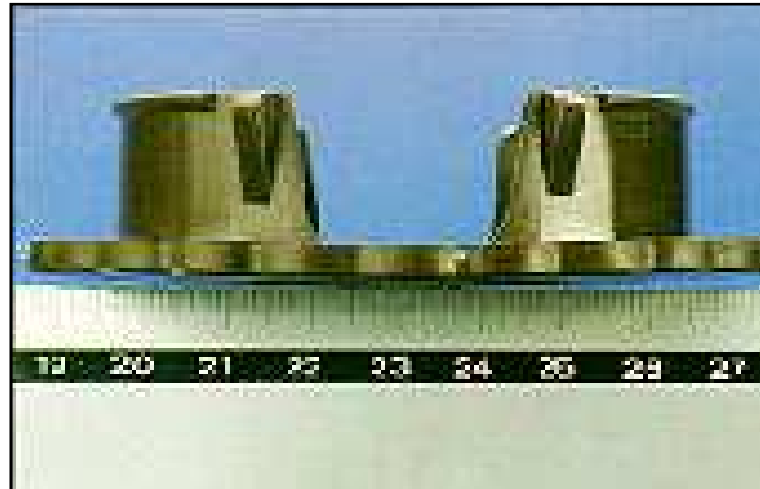
Conformal

Benefits of Conformal Cooling

- > Improve product quality such as **Warpage** and **Sink mark**
- > Reduce cycle time



Sink mark

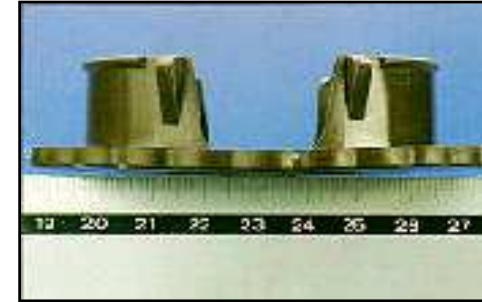


Warpage

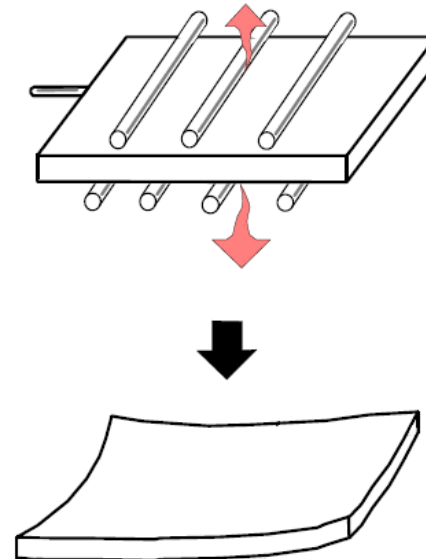
How Conformal Cooling Can Help?

> Warpage

- Caused by non-uniform volume shrinkage due to:
 - Packing pressure difference
 - **Mold temperature difference**
 - Fiber orientation



> Conformal cooling can minimize mold temperature difference and warpage



How Conformal Cooling Can Help?

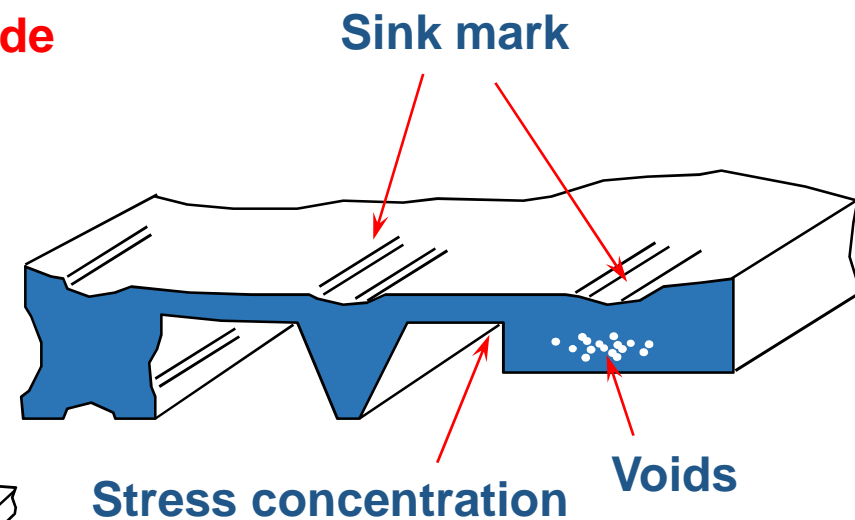
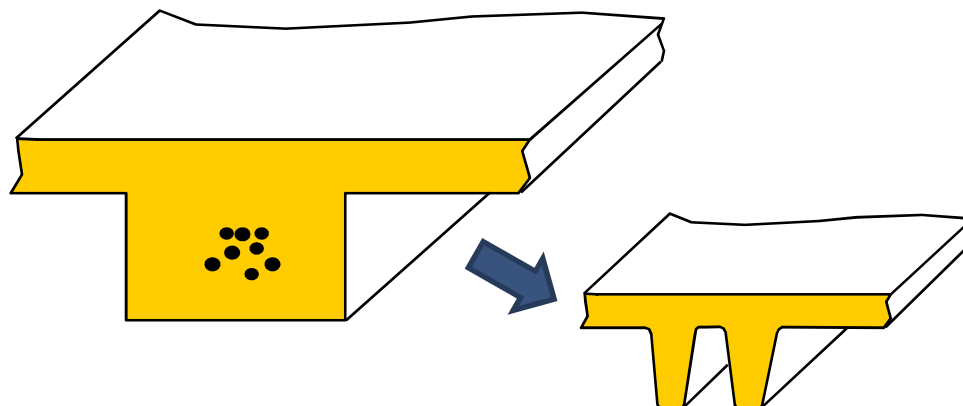
> Sink marks

- Caused by non-uniform volume shrinkage due to thickness variation
- Accompanied with problems such as stress concentration and void



> Possible solutions:

- Enhanced cooling on core side
- Redesign Part



CCD Module

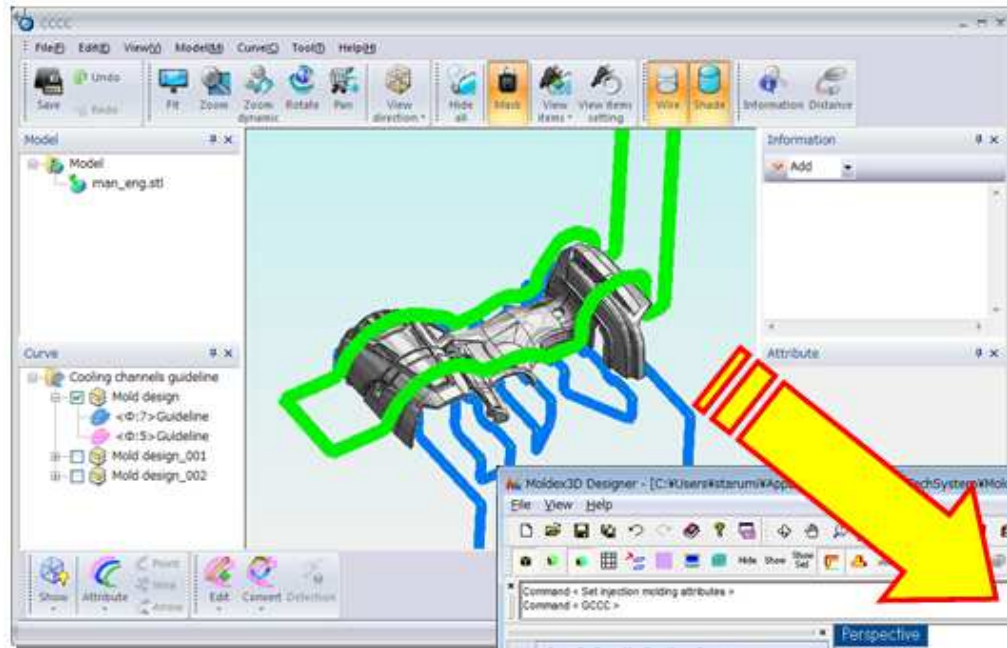
- > CCD module enables users to build Conformal Cooling Channels according to the contour of product in **a fast and intuitive way.**

CCD is launched from Moldex3D Designer for creating guidelines

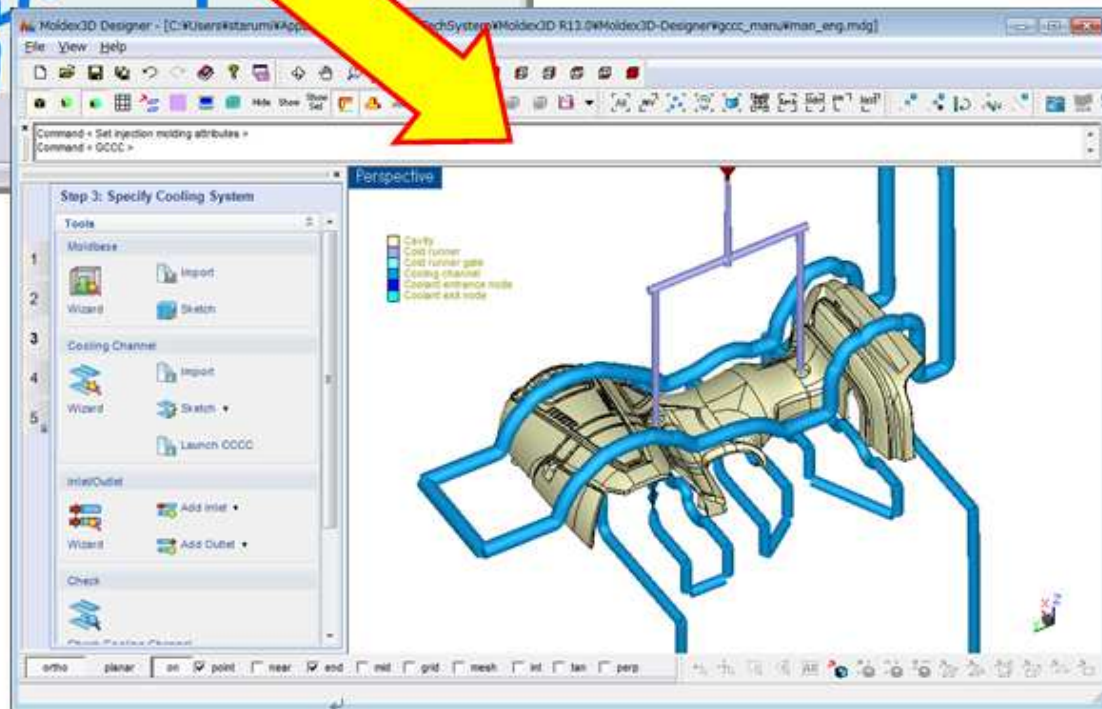
Guidelines, imported into Moldex3D Designer, makes the conformal cooling channels easily created in Designer

Design	Value
Design name	Cavity and Core
Generation direction	Cavity and Core
Normal distance	4
Channel diameter	4
Entrance position	4
Parameters	
Axis	Axis Z
Step distance	200
Start position	0
Guideline Type	
Lozenge curve	0
Curve type	Arc
Tolerance	0.005
Inset radius	Useless
Radius	
Accuracy parameter	
Resolution	0.05

CCD Module

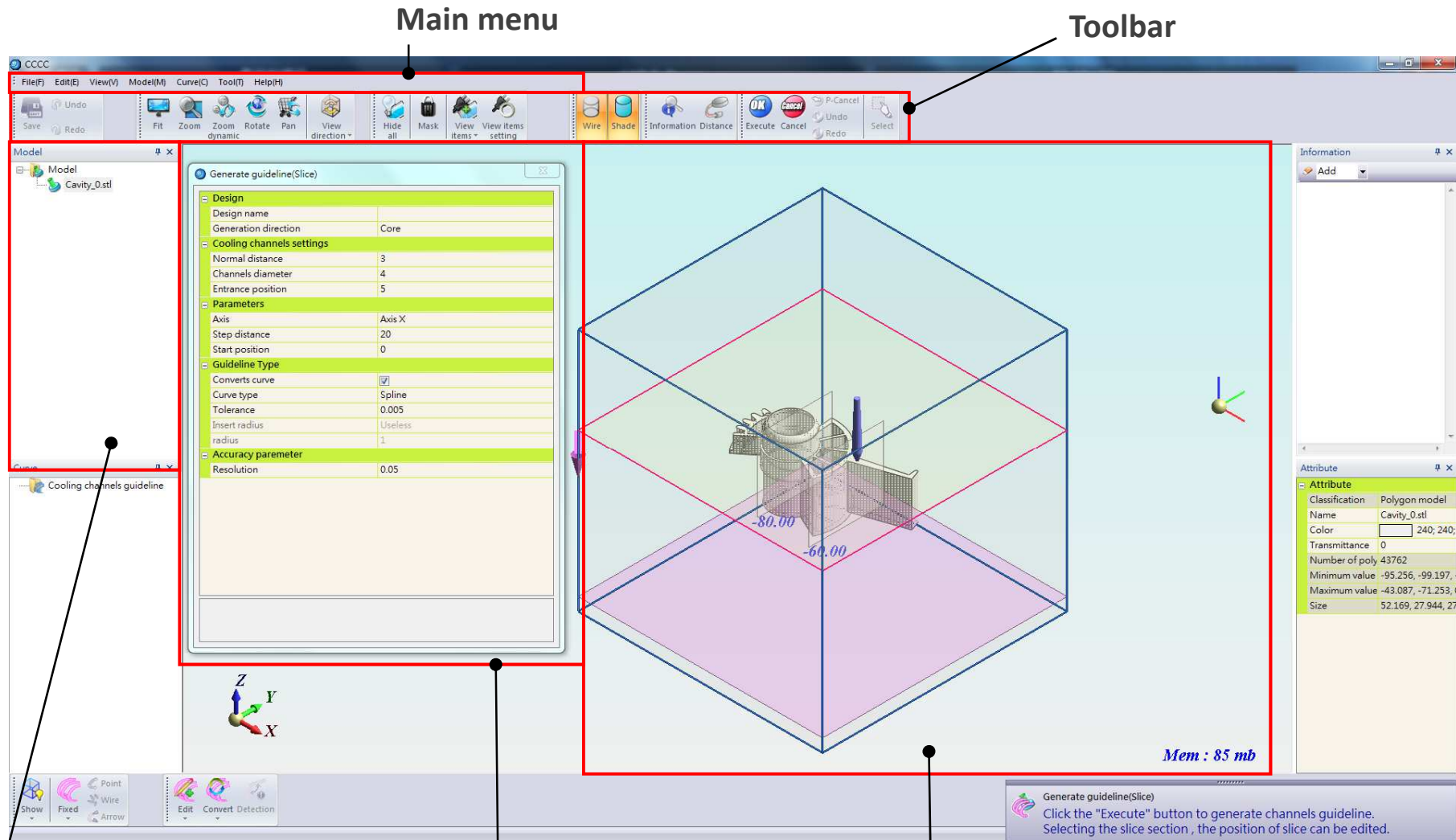


Cooling channels is exported to Moldex3D Designer.



Conformal Cooling Channels Creation in CCD interface

CCD Interface



Panel:
ex. Model panel ,Curve panel

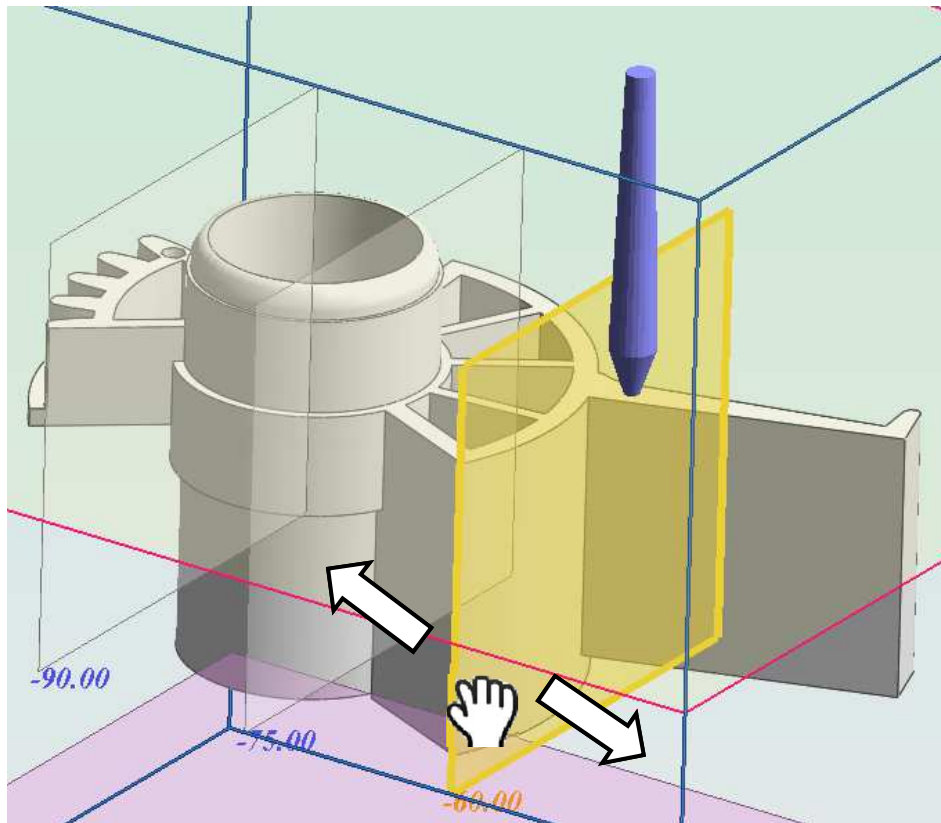
**Command parameter
dialog box**

3D-view

Generate guidelines for Conformal Cooling Channels creation (1)

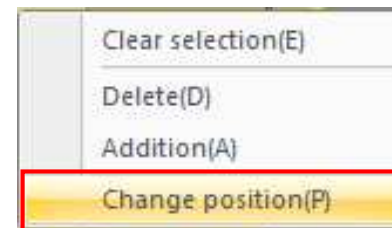
> 1. Edit Slices

- The guideline of Conformal Cooling Channels is generated on the slice plane
- Editing the slices, enables optimal cooling channels design
- Options: Drag / Delete / Addition / Change Position

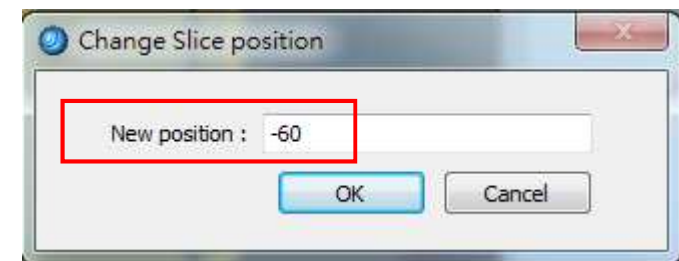


Manual: Drag the slice

Right-click on the selected slice:
4 options shows as follows



Enter the designated
position to shift the slices



Generate guidelines for Conformal Cooling Channels creation (2)

> 2. Command Parameter Dialog

- The guideline of Conformal Cooling Channels generated according to the parameters in this dialog

Generate guideline(Slice)

Design	
Design name	
Generation direction	Core

Cooling channels settings

Normal distance	3
Channels diameter	4
Entrance position	5

Parameters

Axis	Axis X
Step distance	20
Start position	0

Guideline Type

Converts curve	<input checked="" type="checkbox"/>
Curve type	Spline
Tolerance	0.005
Insert radius	Useless
radius	1

Accuracy parameter

Resolution	0.05
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Detail Description

- Sets design name of moldbase.
- Select direction to create cooling channels as "Core", "Cavity" or "Cavity and Core"
- Sets the distance from surface to cooling channels.
- Specify diameter of cooling channels.
- Specify the entrance position (inlet/outlet) from moldbase.
- Selects axis of slice plane as "Axis X", "Axis Y" or "Axis Z"
- Specify the step distance between slices.
- Specify start position of slices.

Generate guidelines for Conformal Cooling Channels creation (2 Cont)

> 2. Command Parameter Dialog (Cont)

Generate guideline(Slice)

Design	
Design name	
Generation direction	Core
Cooling channels settings	
Normal distance	3
Channels diameter	4
Entrance position	5
Parameters	
Axis	Axis X
Step distance	20
Start position	0
Guideline Type	
Converts curve	<input checked="" type="checkbox"/>
Curve type	Spline
Tolerance	0.005
Insert radius	Useless
radius	1
Accuracy parameter	
Resolution	0.05

Detail Description

Checked: able to convert guidelines into multi-curve such as arc or spline.

Selects conversion type of guideline as "Arc" or "Spline".

Specify the tolerance for curve conversion.

On arc conversion enables to insert radius to guideline.

Selects insert type.

"Useless" : Does not insert radius.

"Channels radius" : Enables to insert the radius of channels.

"Input radius" : Enables to insert the radius of specified value.

Specify the radius ("Input radius").

Specify the pitch of the inner model for guideline.

Recommended value - 0.03

Generate guidelines for Conformal Cooling Channels creation (3)

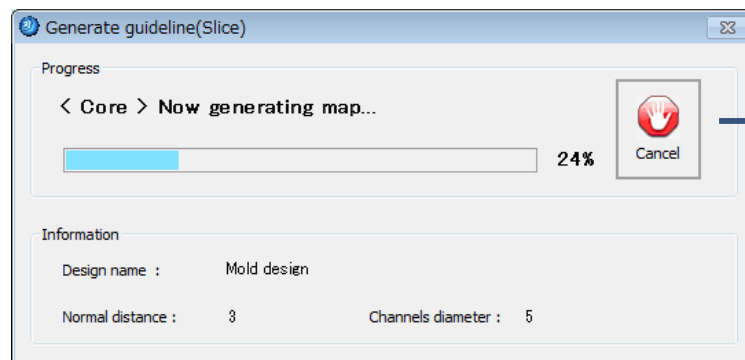
> 3. Execute Function

- After setting the parameters and editing the slices, click the “Execute” button in the “command” toolbar or click the mouse center button to run “generate the guideline”. Upon execution, a progress dialog box will be displayed

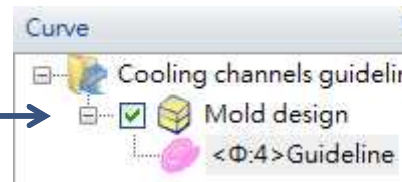
Execute button



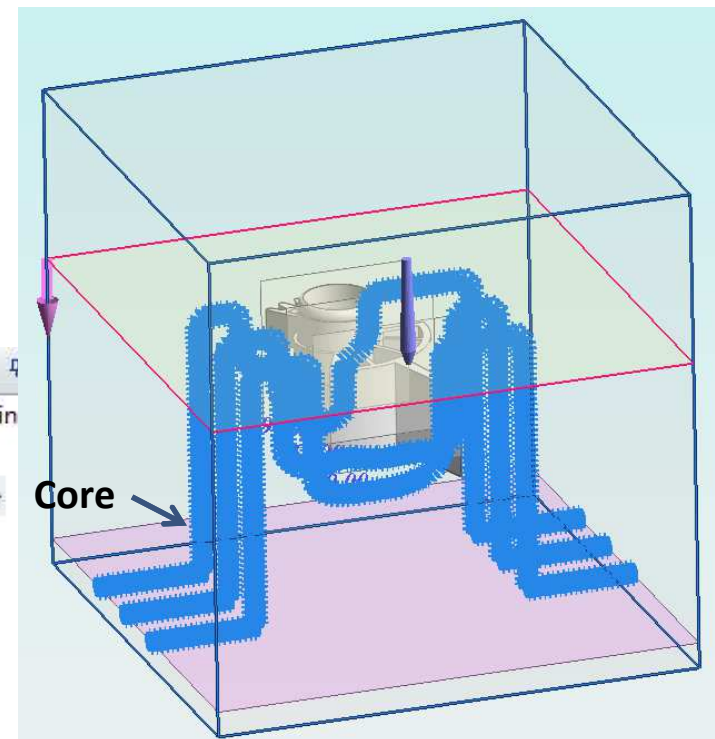
↓ Progress Dialog box



Curve Panel

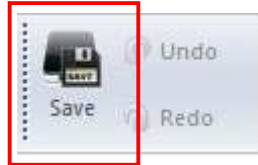


3D View

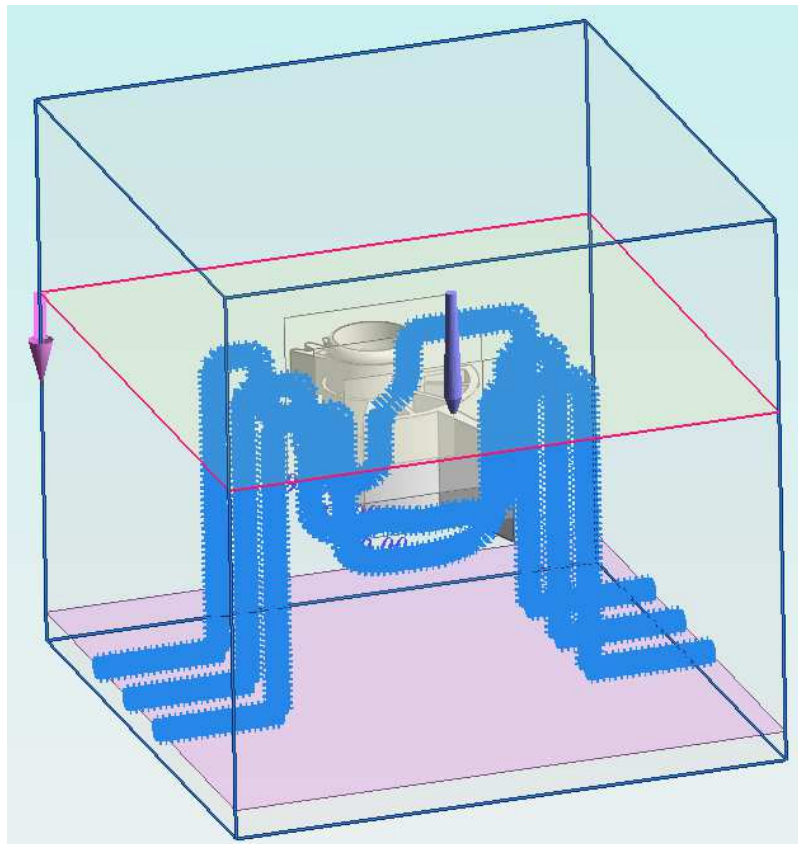


Generate guidelines for Conformal Cooling Channels creation (4)

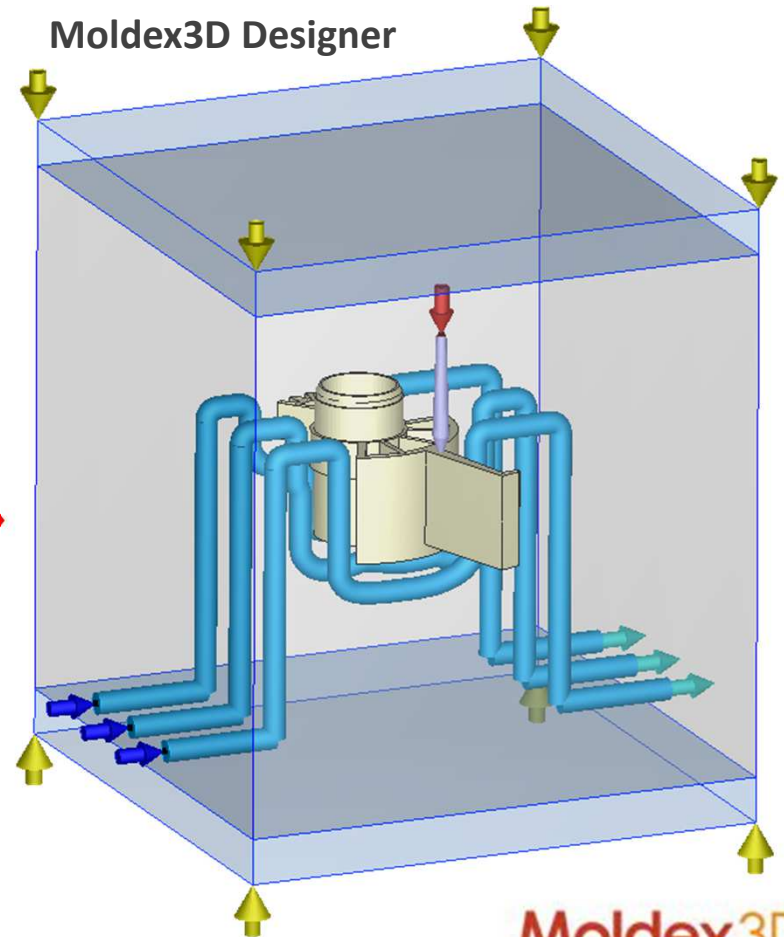
- > 4. Export cooling channels to Moldex3D Designer by clicking  on the Toolbar



CCD Module



Moldex3D Designer

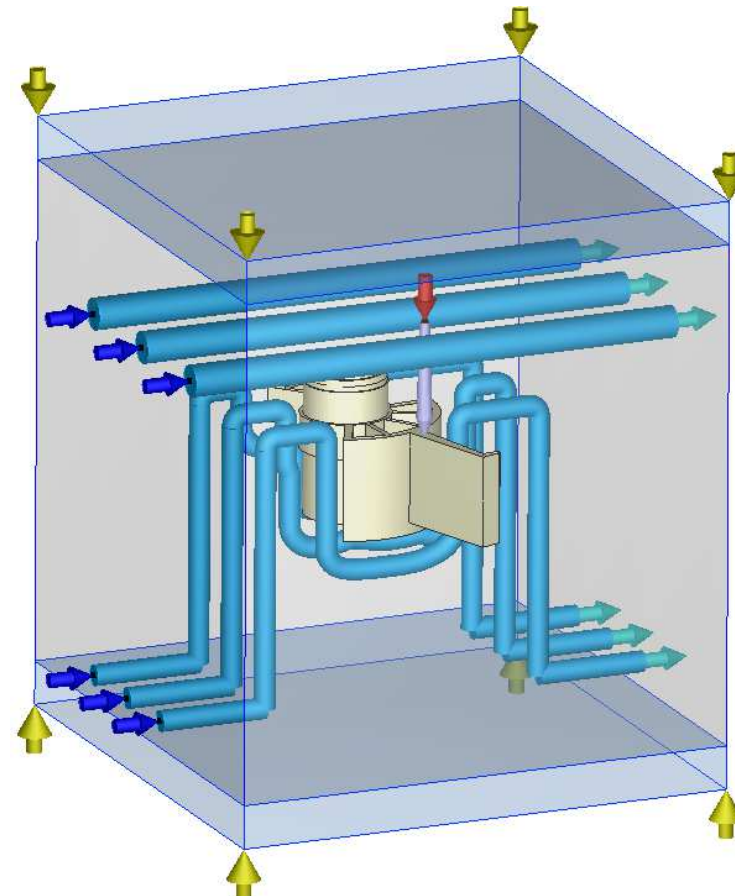
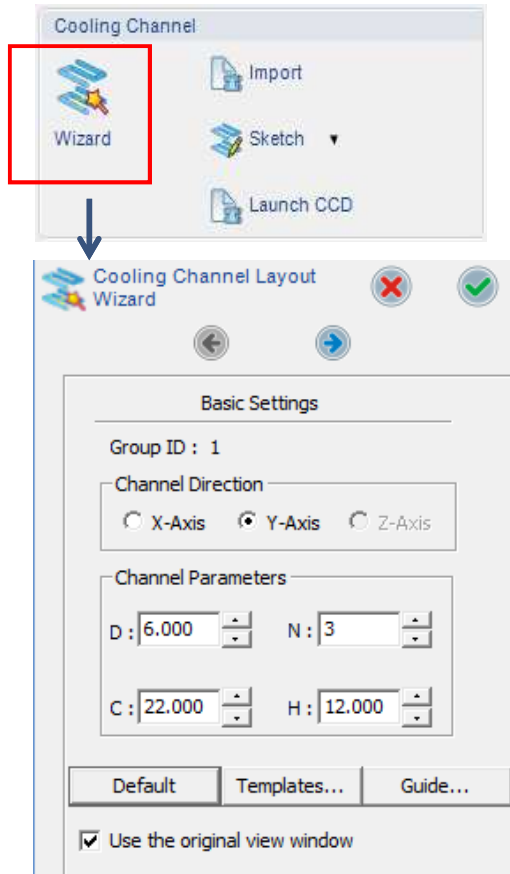


Cooling Channels Modification in Moldex3D Designer Interface

Modify Cooling Channels in Moldex3D Designer

- > Use Cooling Channel Wizard function in Moldex3D Designer to add cooling channels if necessary
- > In this case, we add 3 straight channels on top of the cavity

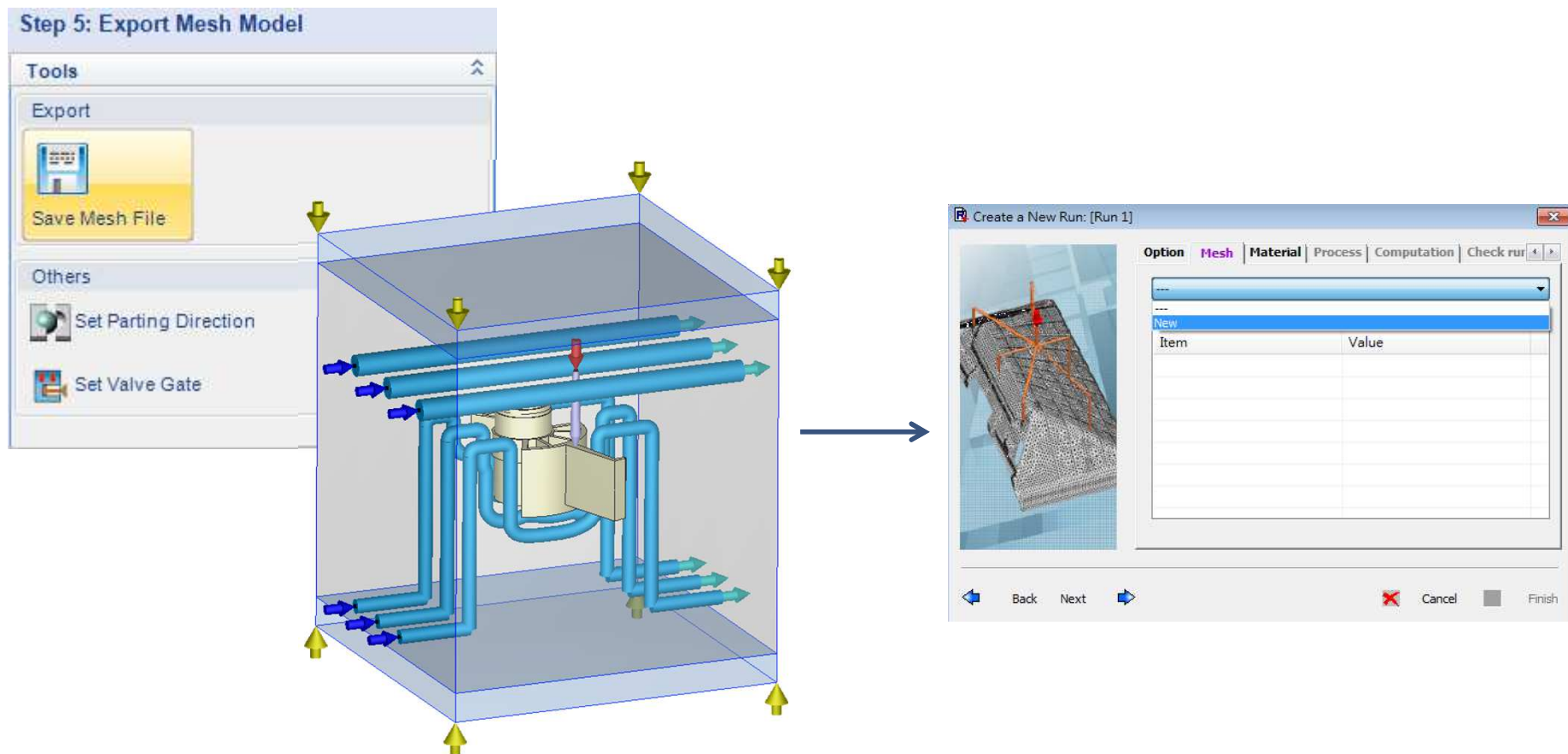
Moldex3D Designer



Moldex3D

Import Model to Moldex3D Project

- > After the pre-processing settings, export the mesh file to Moldex3D Project for 3D Coolant CFD analysis





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