

# Minute! Flute Designer Operation Manual

2017.July.18  
Revision 3  
Division Engineering

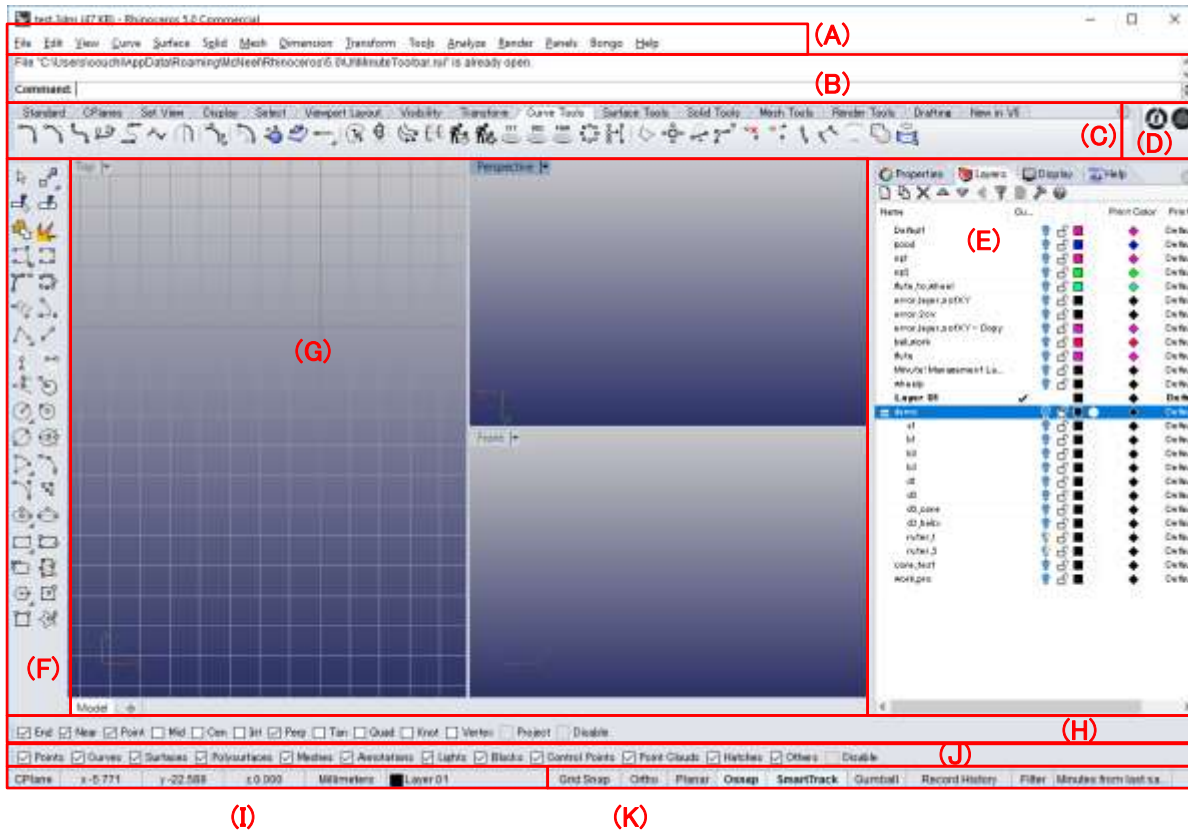
## Table Of Contents

Common.....	2
User Interface .....	2
Wheel Configuration.....	4
Common Rule of Wheel.....	5
Wheel Configuration Tab.....	5
Work Configuration .....	7
Work Configuration Tab .....	7
Flute Sim .....	12
Flute Sim Tab .....	13
Wheel Sim .....	14
Wheel Sim Conditions .....	14
Wheel Sim Tab.....	14
System .....	16
System Tab.....	16
Contact.....	16

# Common

## USER INTERFACE

### Rhino Window

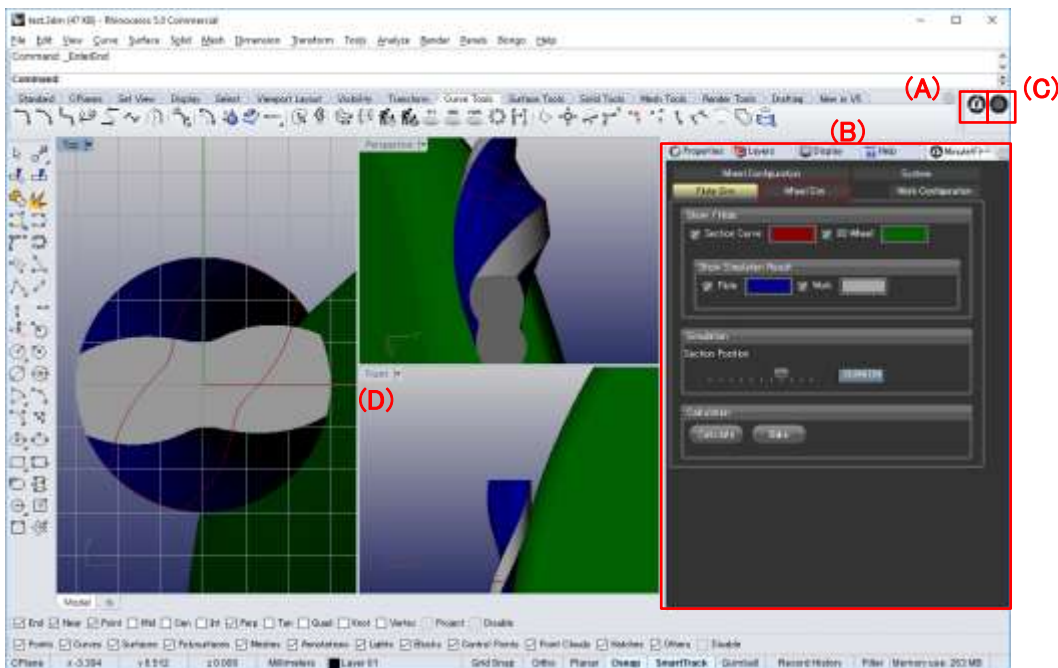


Rhino is a Direct Modeler which has precise NURBS engine. GUI components of Rhino are as follows:

#	Description	Function
(A)	<b>Menu</b>	
(B)	<b>Command History Window And Command Prompt</b>	Displays the previous commands and prompts. Text from this area can be copied and pasted into the command prompt, macro editor, button command, or any application that accepts text. Displays prompts for command actions, allows typing command names and options.
(D)	<b>Minute! Flute Designer</b>	Show and Hide dedicated panel.

ToolBar		
(C)	<b>Rhino Standard Toolbar</b>	Contain graphical icons for initiating commands.
(F)		
(G)	<b>Viewports</b>	Displays the Rhino working environment including object display, viewport title, background, construction plane grid, world axis icon.
(E)	<b>Layer Panel</b>	
(H)	<b>Osnap Toolbar</b>	The Osnap control lets you select which object snaps are currently in effect.
(J)	<b>Selection Filter</b>	The selection filter restricts any selection mode (SelWindow, SelCrossing, SelAll, etc.) to specified object types.
(I)	<b>Status Bar Pane</b>	Click the Info pane to display information about the current Rhino session. The Info pane cycles through the list of specified categories.
(K)	<b>Snap Control Pane</b>	You can choose snap or non-snap. E.g. Set snap grid to true.

### Flute Designer Panel

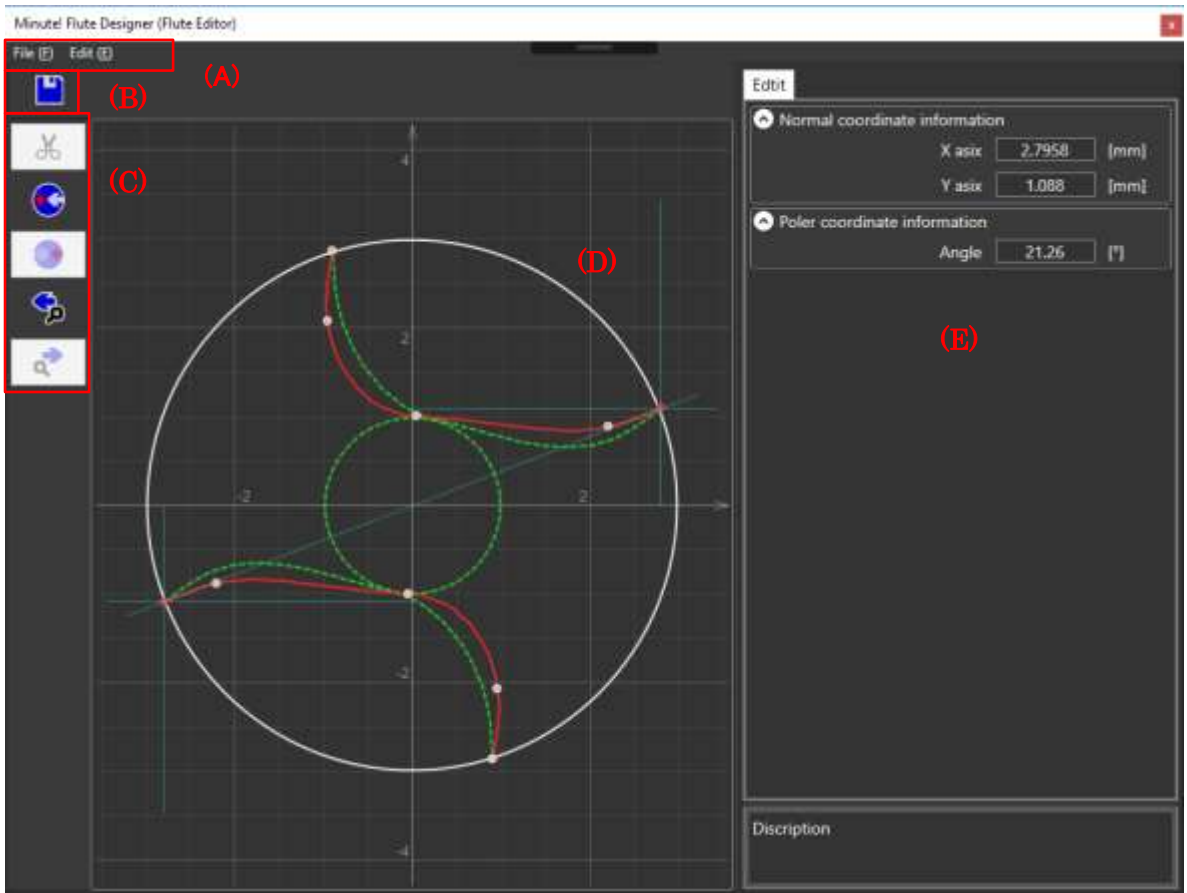


#	Description	Function
(A)	Show Minute Flute Designer	Click the button, and you can see panel
(B)	Minute Flute Designer Panel	The panel has 5 Tabs:
	Flute Sim Tab	Calculate Flute Shape from Wheel Profile.
	Wheel Configuration Tab	Configure Wheel Profile

	Work Configuration Tab	Configure Work
	Wheel Sim Tab	Calculate Wheel Shape from Flute Profile
	System Tab	Import and Export paramters
(C)	Hide Minute Flute Designer	Click the button, and then hide panel
(D)	3 View	Minute! Flute Designer switch to 3-view and dedicated View.

### Flute Editor Window

Edit a Flute Profile. Flute Profile can be modified or created with Rhinoceros also. You can create the profile with this tool also.



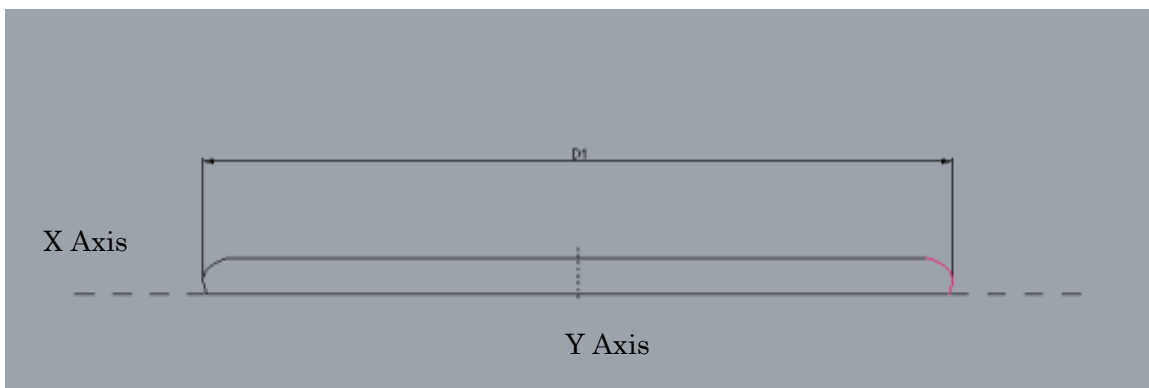
#	Description	Function
(A)	Menu	
(B)	Save	You can save profile to Rhinoceros Layer
(C)	ToolBar	
(D)	Editor	You can add or remove control points. And you can drag control points.
(E)	Parameter Tab	

### Wheel Configuration

Configure Wheel in order to running calculate Flute Shape.

## COMMON RULE OF WHEEL

Rule No	Description
W-1	Geometries are projected on XY Plane
W-2	Geometries are under condition : $X \geq 0$ and $Y \geq 0$
W-3	Rotation Center is Y Axis
W-4	Ignore side of front and side of back. In the below figure red curve is target shape.
W-5	Front is connect to X Axis
W-6	The widest diameter : D1

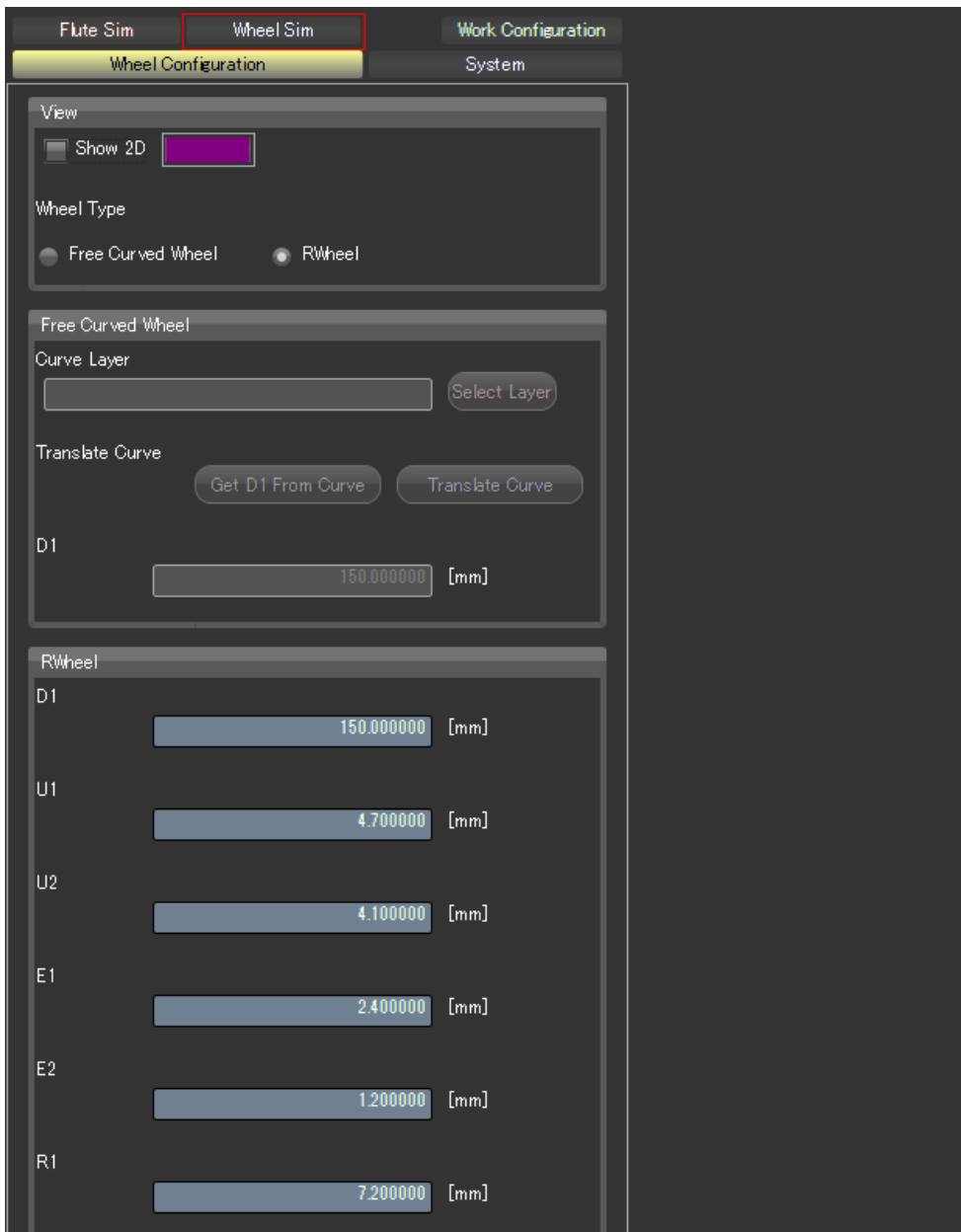


## Wheel Type

There are 2 type of wheel.

Wheel Type	Note
RWheel	3 Arc.
Free Curved Wheel	1 NURBS Curve. Multi segment is acceptable.

## WHEEL CONFIGURATION TAB



### Show 2D

If it is true, you can see current curve of wheel in Top View(XY Plane).

### Wheel Type

You can choose wheel type.

### Free Curved Wheel

#### Select Layer

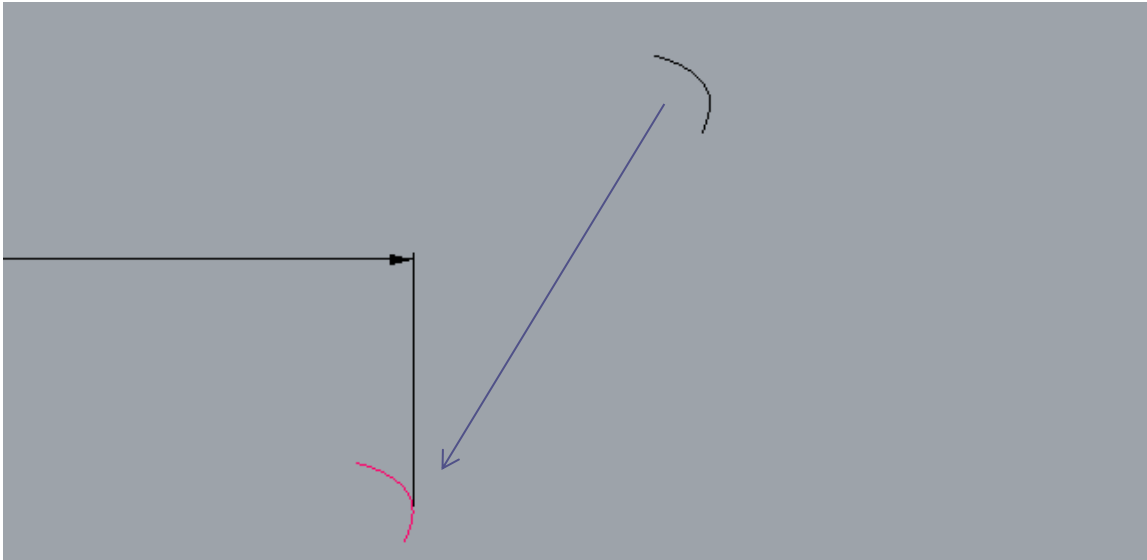
Choose Free Curved Wheel as Wheel Type in advance. And Click Select Layer, you can see Layer Select Window. And then you can choose Layer of Wheel Curve.

### Translate Curve – Get D1 from Curve

System get D1 from the curve.

### Translate Curve – Translate Curve

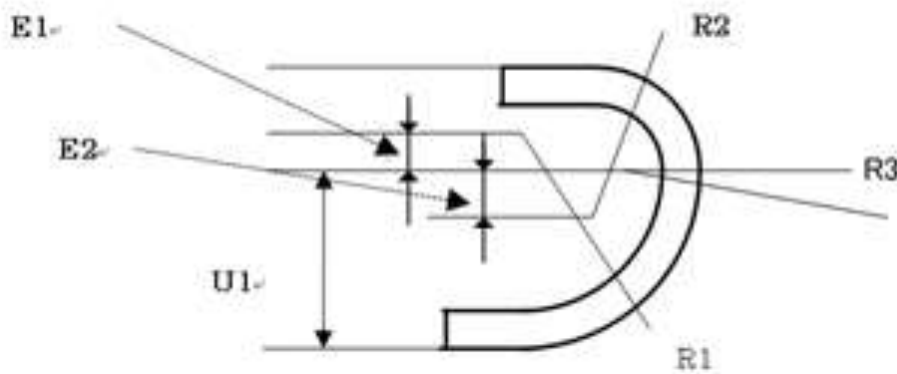
If selected curve doesn't follow Common Rule, select the button. System translate the curve.



### RWheel – U1,U2,D1,E1,E2,R1,R2,R3

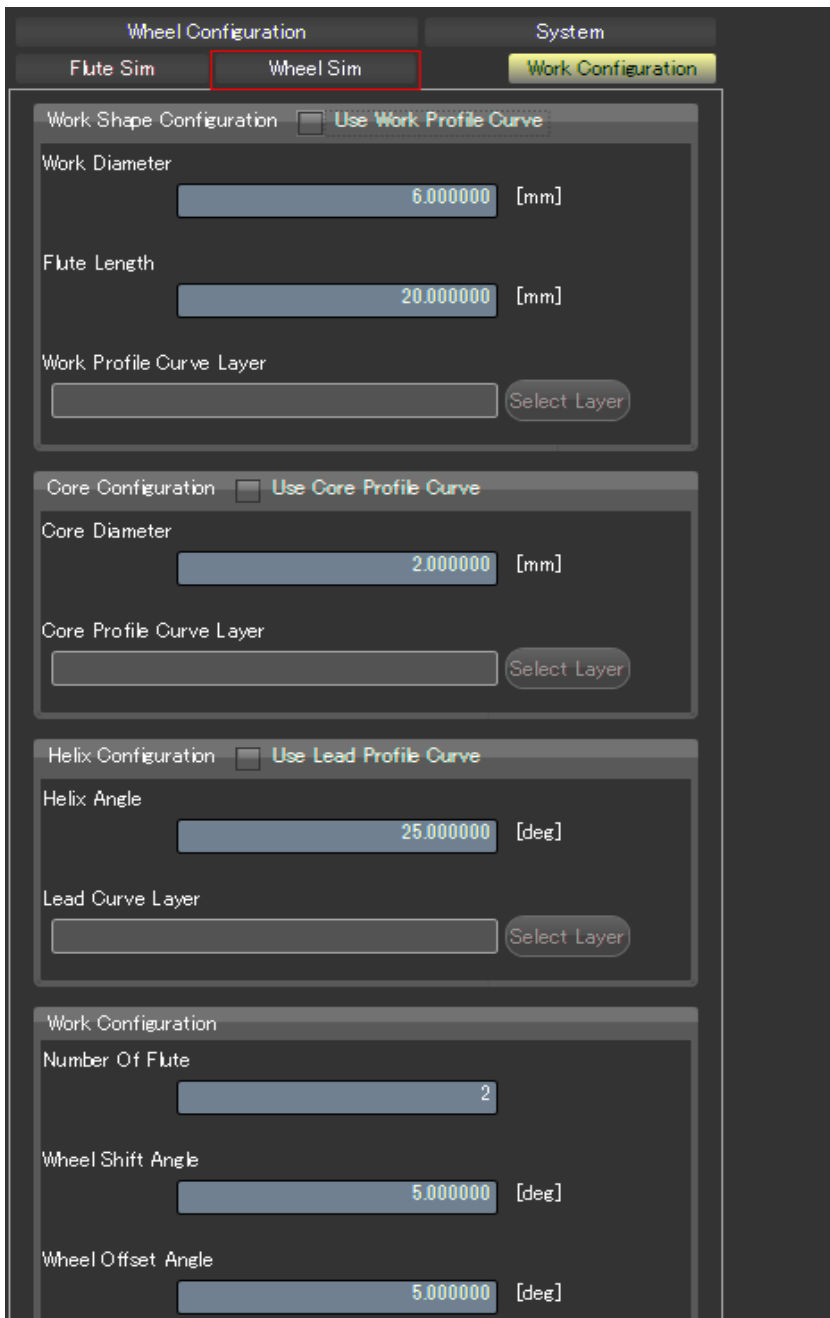
Choose RWheel as wheel type in advance.

### Specification of RWheel



## Work Configuration

### WORK CONFIGURATION TAB



### Work Shape Configuration

Type	Description	Configuration Items
<b>Fixed</b>	Define a Cylinder.	Work Diameter is Cylinder Diameter. Flute Length is Cylinder Height.
<b>Use Profile Curve</b>	Define a Free Curved Cylinder. Profile Curve is on XY Plane and $Y > 0$ .	Choose one Layer which contains curve.



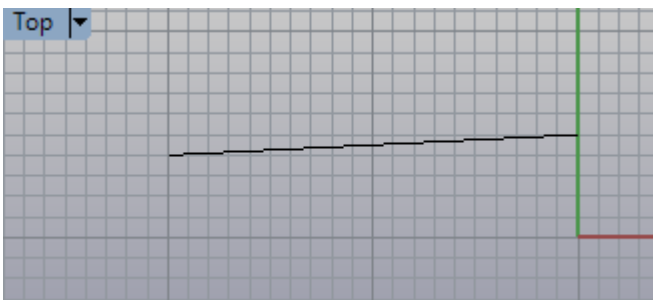
e.g. Below curve indicates Work Profile Curve of Ball Endmill.



### Core Configuration

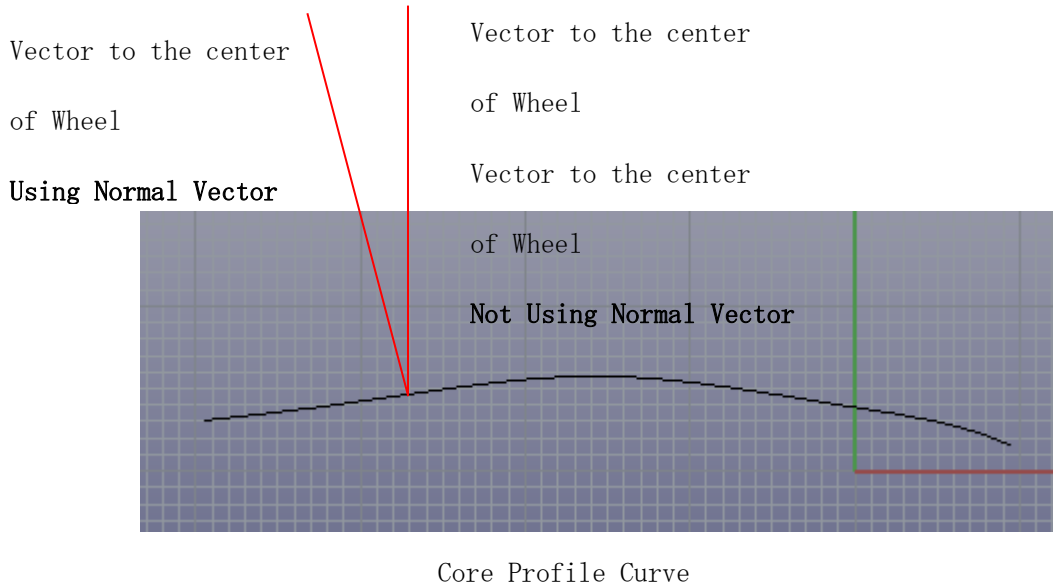
Type	Description	Configuration Items
<b>Fixed</b>	Define A Fixed Core.	Core Diameter is Core Cylinder Diameter.
<b>Use Core Profile Curve</b>	1 Curve on XY Plane. $Y > 0$ .	Choose one Layer which contains curve.

e.g. Below curve indicates a Back Taper Core Profile..

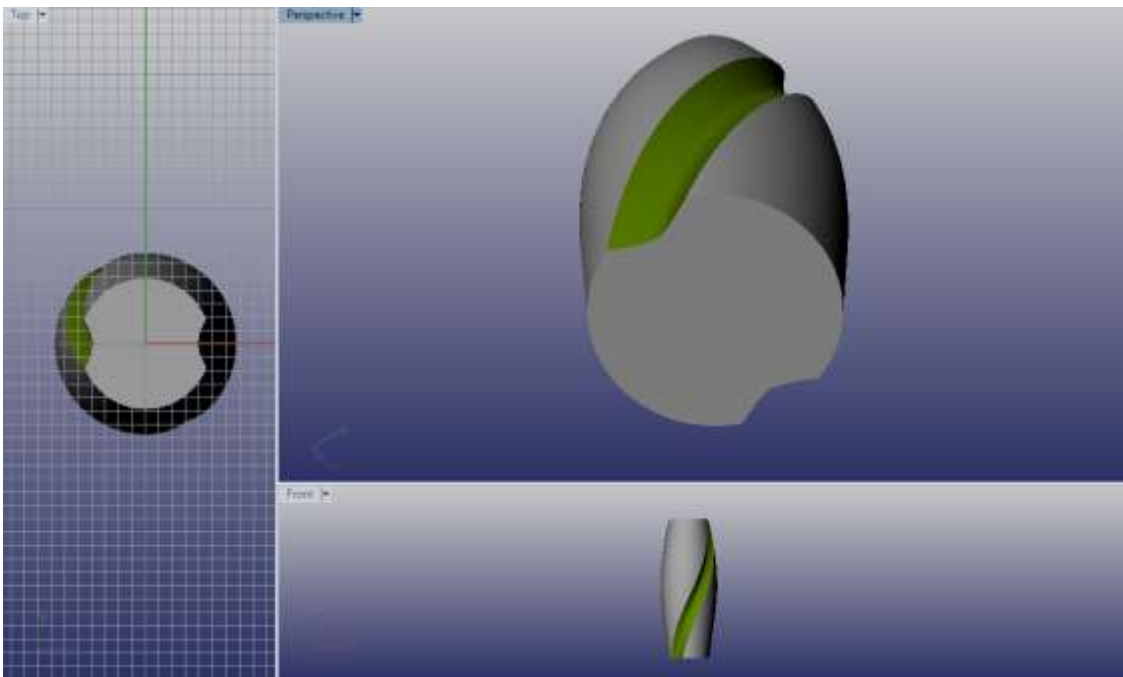


### Use Normal Vector

While using “Use Core Profile Curve” you can enable this check box.



e.g. Use “Core Profile Curve”, “Work Profile Curve” and “Normal Vector of Core Profile”



### Helix Configuration

Type	Description	Configuration Items
<b>Fixed</b>	Define A Fixed Helix Angle.	Helix Angle
<b>Use Lead Curve</b>	1 Curve on XY Plane. $Y > 0$ .	Choose one Layer which contains curve.

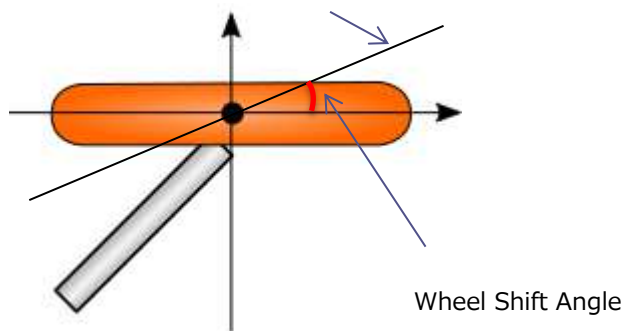
### Work Configuration Number of Flute

Define the number of Flute.

### Wheel Shift Angle

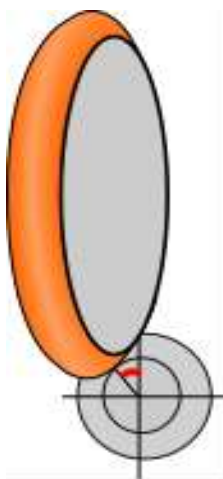
Below figure indicates Wheel Shift Angle.

Base Line : Delivered from Helix Angle



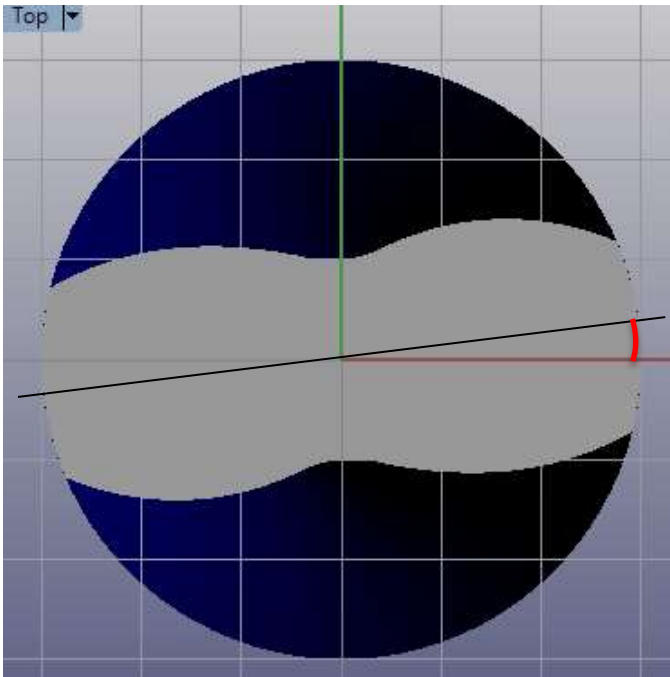
### Wheel Offset Angle

Below figure indicates Wheel Offset Angle.

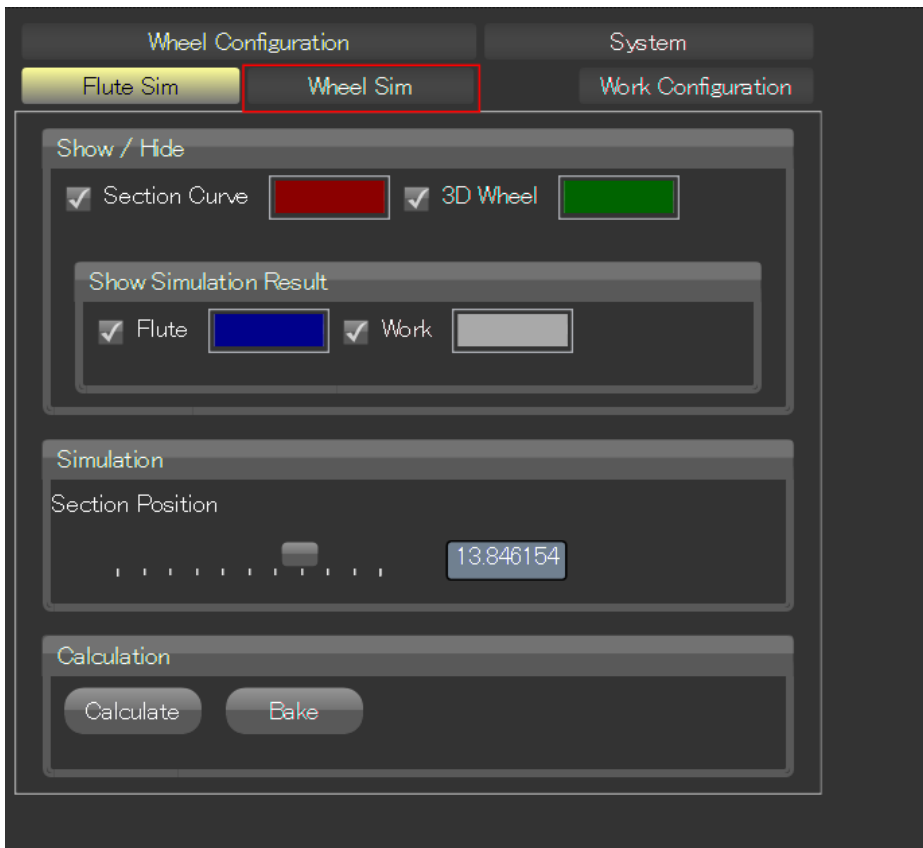


## Phase Angle

Rotation Flute Shape in Flute Sim.



Flute Sim



## FLUTE SIM TAB

### Section Curve

Show/Hide Section Curve

### 3D Wheel

Show/Hide 3D Wheel

### Flute

Show/Hide Flute

### Work

Show Hide Work

### Section Position

You can change section position.

### Calculate

Update Flute and Work.

### Bake

After calculation and enable some checkboxes you can see 3d shapes. But they are rendered as Overlay. If you use them as CAD Model, click Bake.

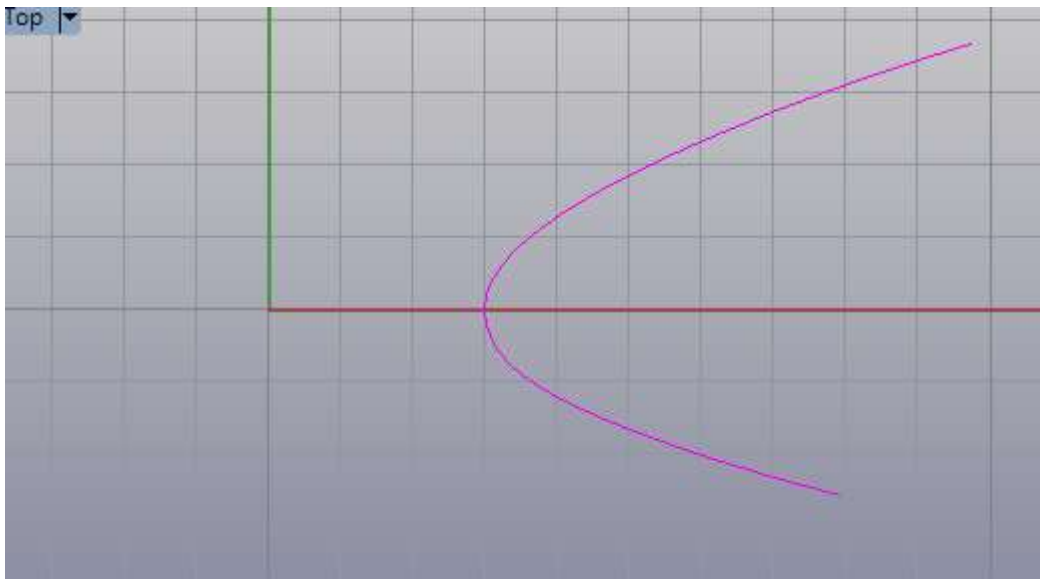
## Wheel Sim

Wheel Sim calculate dressed wheel from flute profile. You can import curve from various CAD Model or you can draw curve as flute profile.

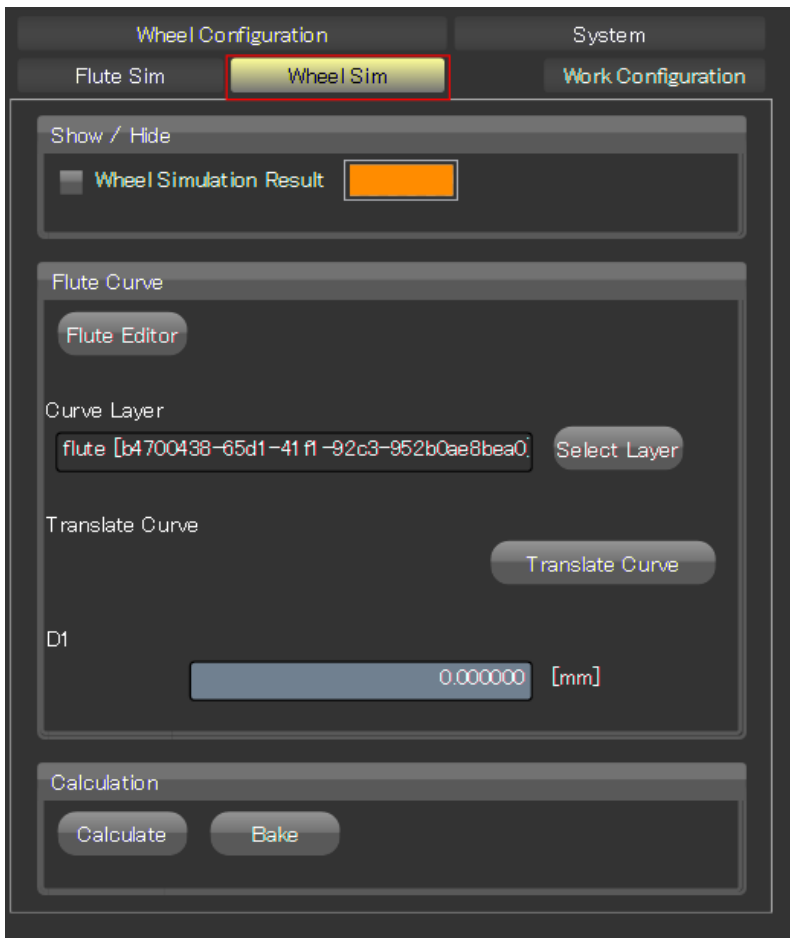
### WHEEL SIM CONDITIONS

#	Conditions
WS-1	Fixed Work Shape in Work Configuration
WS-2	Fixed Core in Work Configuration
WS-3	Fixed Helix in Work Configuration
WS-4	Flute Profile Curve is on XY plane
WS-5	Flute Profile Curve Domain : $X \geq \text{Core Diameter} / 2.0$
WS-6	Minimum X value is the same as Core Diameter / 2.0. In such case Y=0
WS-7	Curve is well extended over tool diameter

E.g. Sample of Flute Profile Curve



### WHEEL SIM TAB



## Wheel Simulation Result

If you checked after calculation, you can see wheel simulation result as 1 curve.

## Flute Editor

You can launch Dedicated Editor.

## Select Layer

You can select curve layer as flute curve profile.

## Translate Curve

In order to follow Wheel Sim Conditions system tries to translate curve in the layer. You must Select Layer as Flute Curve in advance.

## D1

Wheel D1 value.

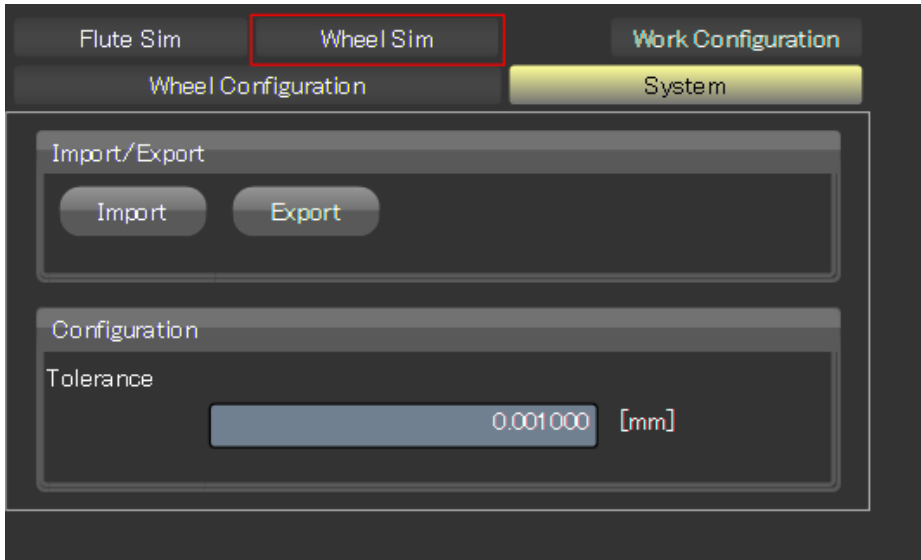
## Calculate

System tries to calculate wheel profile curve. You can show the result with “Wheel Simulation Result”

## Bake

After calculation you can see wheel profile curve. But it is rendered as Overlay. If you get it as CAD Model, click Bake.

## System



## SYSTEM TAB

### Import

You can import from file.

### Export

You can export to file.

### Tolerance

We use this value in calculation.

## Contact

EMAIL : [info@division-engineering.com](mailto:info@division-engineering.com)