

Powering your productivity

# PowerMILL



# Training Course

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# **2016 Customisation Contents**

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#### Contents

# **1. Templates**

# **Strategy Templates**

The default values/settings in a **Toolpath Strategy** dialog can be modified to those most likely to be required for a specific user's application.

Each modified strategy will be saved as a **Template** accessible from a new (user defined) tab at the top of the **Strategy Selector** dialog.

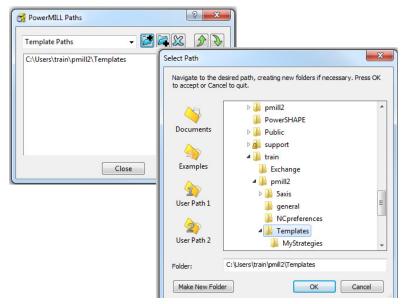
### Setting up a Strategy Template area

Once the set-up has been initiated, the user can easily update and save **Templates** to this chosen, area as and when required.

- 1 Select File > Delete All and Tools > Reset Forms.
- 2 From the **Desktop** open **Windows Explorer** and create the **Folder**:

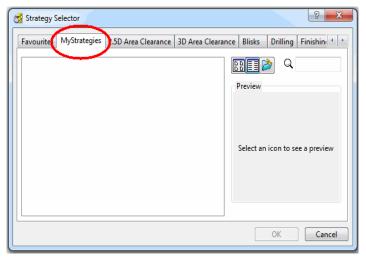
....\pmill2\Templates\MyStrategies

- 3 From the main menus, select **Tools** > **Customise Paths**.
- 4 Select **Template Paths** from the pull-down menu.
- 5 Select the Add path to top of the list icon to raise the Select Path dialog.



6 Browse to the folder location shown below for the required **Template Path**. In this case:- ....\pmill2\Templates

- 7 Close the **PowerMILL Paths** dialog.
- 8 Select Toolpath Strategies 🚫.
- 9 An additional tab called **MyStrategies** has been added to the dialog.



### **Creating Strategy Templates**

- 1 Select File > Delete All and Tools > Reset dialogs.
- 2 Select the **Model Area Clearance** strategy from the **Toolpath Strategies** selector Strategies dialog.

Model Area Clearance			
Toolpath	name	1	
Workplane		Model area clearance	
Block		Model area clearance	
		Style	
🔞 Limit		· ·	
🛱 🥩 🏈 Model area clearance			
Offset			
Step cutting			
			Offset model
Unsafe segment removal		- · · ·	
Flat machining		Cut direction Profile	Area
		Climb	
J Approach	=	Climb	Climb
Approach Automatic verification		Tolerance	
Cutter compensation		0.1	
Point distribution		0.1	
Tool axis		Thickness	
Machine axis control			U,
Rapid move heights			<u></u>
🗉 👿 Leads and links		Stepover	
		2.0	
		Stepdown	
🔁 Notes	-		
	Local Andrews	Automatic 👻 🕌	25.0
		Rest machining	

Thickness:- 0.5 Stepover:- 2 Stepdown:- 25



Do not include a **Tool**, **Boundary**, or **Pattern** in the **Template Strategy**, otherwise **PowerMILL** will attempt to create an incomplete one every time the resultant **Template** is selected.

1 Select the **High Speed** page from the local **explorer**.

Toolpath nam	e 1
Workplane	High speed
	✓ Profile smoothing Radius ( tool diameter units ) ✓ Raceline smoothing
Order     Approach     Approach     Content of the content of	Trochoidal moves Maximum overload 15.0 % Links Smooth

- 4 Input the High Speed settings and values exactly as shown above.
- 5 Select the Lead in page from the local explorer.

📆 Model Area Clearance	5 ×	
Toolpath na	me 1	
↓     Workplane       →     Block       →     Tool       -     ੴ Limit       →        ↓     Model area clearance	Lead in	
Offset     Set	Ist choice Ramp Distance 0.0 Angle 0.0 Radius 0.0 Ramp options	Lead In Ramp Opt 2 Ist Choice Znd Choice Max Zig Angle 4.0 Follow Circle
Cutter compensation Cutte	Overlap distance (tool diameter units) 0.0 Allow start points to be moved Add leads to short links Add leads at tool axis discontinuities <u>Angular threshold</u> 90.0	Closed Segments Only Circle Diameter (TDU) Ramp Height Type Incremental Height 5.0

- 6 Select the **Ramp options** tab and then in the **Lead In Ramp Options** dialog select the **1st Choice** tab.
- 7 In the same dialog Enter:

*Follow*:- Circle *Max Zig Angle*:- 4 *Circle Diameter*:- 0.6

- 8 Click OK (do not select Calculate) on the Model Area Clearance dialog.
- 9 In the **PowerMILL explorer**, right-click on the un-calculated toolpath and from the local menu, select **Save as Template**.

🖃 🚸 Toolpaths	
Cols     Tools     Patterns     Patterns     Patterns     Presture Sets     Workplanes     Levels and Se     Models     Stock Models     Macros     Macros     mill2     pmill2     pmus	1 Simulate from Start ✓ Activate Activate Workplane Settings Queue Recreate Block Select Surfaces
	View Picked Z Height Draw Drawing Options Colour Rename Save as Template

10 Left-click on Save in the Template Parameter Saving dialog.

😚 Template Parameter Saving
Save checked parameters only
Name
1
Output folder
D:\users\training\pmill2\Templates
<ul> <li>B- Machining</li> <li>Flat Machining</li> <li>Machining</li> <li>Flat Machining</li> <li>Flat Machining</li> <li>Flat Machining</li> <li>Flat Machining</li> <li>Flat Machining</li> <li>Machining</li> <li>Flat Machining</li> <li>Machining</li> <li>Flat Machining</li> <li>Flat Machining</li></ul>
Save Close

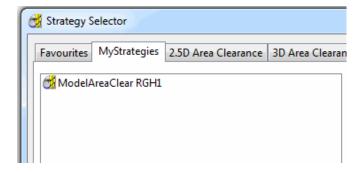
11 Double-click **MyStrategies**, type **ModelAreaClearRGH1** as the file name and click **Save**.

🥳 Save Too	lpath Templat	e File		×
	Save in: 🍶		G 🤌 📂 🛄 -	
	Name	*	Date modified	Туре
		No items match yo	ur search.	
	•			F
	File name:	ModelAreaClear-RGH1	•	Save
	Save as type:	PowerMILL Template (*.ptf)	•	Cancel



Once the **Template** has been saved the dialog will close automatically.

12 Select Toolpath Strategies 🚫 .



In Toolpath Strategies > MyStrategies the new *Template*, ModelAreaClearRGH1 will now be available.

**13** From the **Finishing** tab, select the **3D Offset Finishing** strategy.

📆 3D Offset Finishing	§ X
Toolpath name	2
<ul> <li>Workplane</li> <li>Block</li> <li>Tool</li> <li>Stock engagement</li> <li>Doffset finishing</li> <li>Automatic verification</li> <li>Point distribution</li> <li>Tool axis</li> <li>Machine axis control</li> <li>Rapid move heights</li> <li>Leads and links</li> <li>Start point</li> <li>Feeds and speeds</li> <li>Notes</li> <li>User defined settings</li> </ul>	3D offset finishing         Pattern         Image: Constraint of the second seco
	Tolerance     Cut direction       0.02     Climb       Thickness

14 In the **3D Offset Finishing** dialog tick both **Spiral** and **Smooth** and Enter: Tolerance: 0.02

Stepover: 0.5

- 15 Click OK (do not use Calculate) on the 3D Offset Finishing dialog.
- **16** In the **PowerMILL** *explorer*, right-click on the un-calculated **Toolpath** and select **Save as Template**.

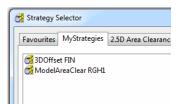
→          →          →          →	
Pools     Boundaries     Boundaries     Patterns     Patterns     Peature Sets     Workplanes     Covels and Se     Models     Groups     Groups     Macros     Macros     Macros     Macros     Macros	2 Simulate from Start Activate Activate Workplane Settings Queue Recreate Block Select Surfaces View Picked Z Height Draw Drawing Options Colour
	Save as Template
	Add to

- 17 As before, right-click on **Save** in the **Template Parameter Saving** dialog.
- **18** Double-click **MyStrategies**, type **3DOffsetFIN** as the file name and click **Save**.



Once the Template has been saved the dialog will close automatically.

## 19 Select Toolpath Strategies 🕸.



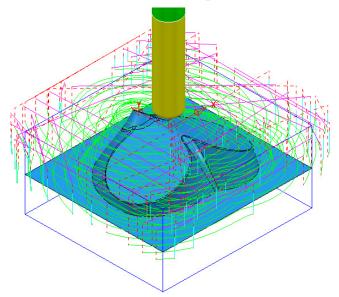
20 There are now two **Templates** in **MyStrategies**:- **ModelAreaClearRGH1** and **3DOffsetFIN** 

# **Project Templates**

In many applications the basic contents of a **Project** could be re-used as the basis for future jobs. These jobs would contain similar tooling, strategies, and associated settings. Any items that will differ from one **Project** to another must be deleted prior to saving it as a **Template**.

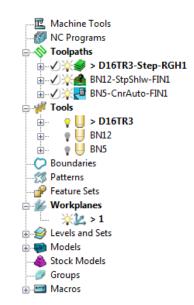
1 Select File - Open Project:-

....\PowerMILL\_Data\Projects\ProjectTemplate\_Start



2 Select File - Save Project As:-

....\COURSEWORK\PowerMILL\_Projects\ProjectTemplate-1



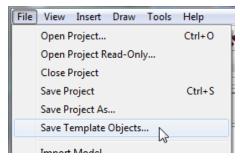
The **Project** contains **Toolpaths**, **Tools**, a **Workplane**, and a component **Model**.

Both the existing **Workplane** and **Model** will be deleted and all **Toolpaths** *Invalidated* before a **Project Template** is saved.

- 3 Delete the **Model** from the current **Project**.
- 4 Try to **Delete** the **Workplane** but note that this is not currently possible as it is *Locked* to each **toolpath** and the **NC Program**.
- 5 In the **PowerMILL** *explorer*, right mouse click on **Toolpaths** and from the local menu select **Invalidate All**.
- 6 Open the first **toolpath** and de-activate the **Workplane** before selecting **OK** to close the dialog (without processing the toolpath).
- 7 Repeat stage 6 on the other two **Toolpaths**.
- 8 Now delete the **Workplane** from the **PowerMILL** explorer.
- 9 In the PowerMILL explorer, right mouse click on Levels and Sets and from the local menu select Delete Empty Levels and Sets.

The **Project** now contains 3 un-processed **Toolpaths** and 3 **Tools**.

**10** From the **main** pull down menus select **File** – **Save Template Objects**.



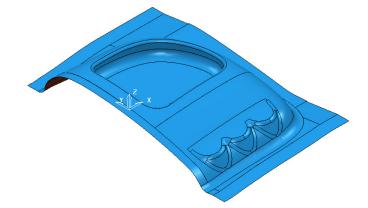
- 11 In the Save Template dialog:
  - a Save in: (Browse to) ... \COURSEWORK \PowerMILL\_Projects
  - **b** Input *File name*: **ProjectTemplate-A** before selecting **Save**.

Save in: 🎳	PowerMILL_Projects	- G 👂 📂 🖽-		
Name	^	Date modified	Туре	Size
🌗 2012Bet	aTest	07/03/2012 10:44	File folder	
🛃 EM16-N	lultiProfile	02/04/2012 14:51	File folder	
🛃 Flowline	e-EX4	24/02/2012 16:58	File folder	
过 MTD-Ex	ample1	10/04/2012 10:32	File folder	
🐌 NewPro	jects	10/01/2012 11:18	File folder	
过 Project T	emplate-1	17/04/2012 15:13	File folder	
过 Turbine	Blade-PartAsy	03/04/2012 15:50	File folder	
File name:	Project Template-A.ptf			- <u>s</u>

12 From the main pull down menus select File - Delete All and Tools - Reset Dialogs.

#### 13 Import the model:-

...\PowerMILL\_Data\Models\facia.dgk



14 Select File - Save Project As:-

#### ...\COURSEWORK\PowerMILL\_Projects\Facia-UsingTemplate-1

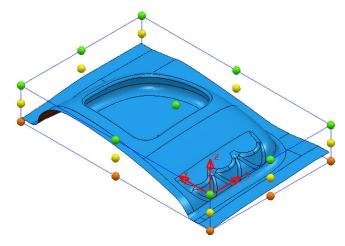
15 From the main pull down menus select Insert > Template Objects

File View	Insert Draw Tools	Help
🖻 🖪 👌	Project	Ctrl+I
	Toolpath	
	Template Object	s

16 In the browser, select the Template:-

...\COURSEWORK\PowerMILL\_Projects\ProjectTemplate-A.ptf

- 17 Calculate a Block defined by Box to the Model dimensions.
- 18 Select an **ISO1** view.
- **19** In the **PowerMILL explorer** right mouse click on **Workplanes** and select **Create and Orientate Workplane** > ...**Positioned using Block**.
- 20 Snap the sphere to the nearest top corner of the **Block**.



21 Activate the new Workplane.

The **Block** will move relative to the **Workplane's** co-ordinate system.

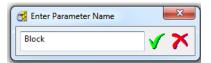
22 Calculate a Block defined by Box to the Model (and Workplane) dimensions.

Both the **Block** and **Workplane** need to be included in the un-processed toolpath strategies. This can be achieved collectively.

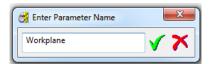
- 23 Calculate the Rapid Move Heights using the default settings.
- 24 In the **PowerMILL** *explorer* use the **left mouse** and **Shift** keys to select all 3 **toolpaths**.
- 25 Right mouse click over the selected **toolpaths** and from the local menu select Edit > Set Named Parameter.

Dolpaths     Toolpaths     P = 2     P =			
	Toolpaths	(3)	
D16TR3 D16TR3 D16TR3 BN12 BN12 BN5 Boundaries Patterns	Draw Selected Undraw Selected Add to Create Individual NC Programs	×	
Feature Sets     Workplanes	Edit	+	Transform
<b>%½_ &gt;1</b>	Delete Toolpaths		Invalidate Toolpaths
🕀 🥩 Levels and Sets 🛛 🛶			Set Named Parameter
🚊 🐚 Models			Set Start Doint

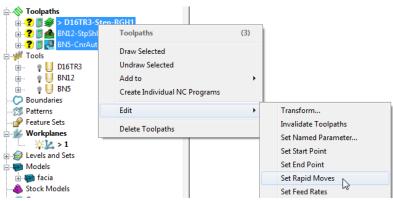
26 In the Enter Parameter Name dialog input Block.



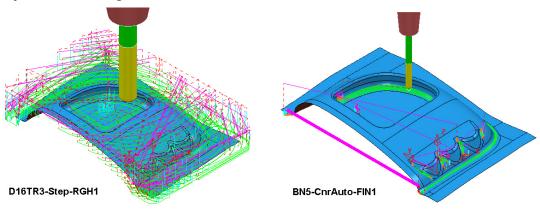
27 Repeat stage 23 but this time input **Workplane** in the **Enter Parameter Name** dialog.



28 Right mouse click over the selected **toolpaths** and from the local menu select Edit > Set Rapid Moves.



29 In the **PowerMILL** *explorer* right mouse click on **Toolpaths** and from the local menu select **Batch Process**.



All the strategies will be processed to include the added **Block**, **Workplane**, and **Rapid Move** settings.

30 Select File - Save Project:-

#### (....\COURSEWORK\PowerMILL\_Projects\Facia-UsingTemplate)

31 From the main pull down menus select File - Delete All and Tools - Reset Dialogs.

### **Exercise**

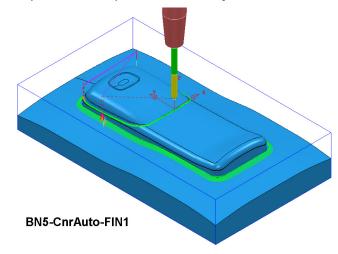
1 Import the model:-

...\PowerMILL\_Data\Models\phone.dgk

2 Select File - Save Project As:-

...\COURSEWORK\PowerMILL\_Projects\phone-UsingTemplate-2

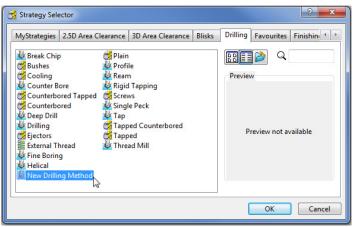
- 3 Create and Activate a Workplane at the *Top Centre* of the model.
- 4 Calculate a Block, and reset the Rapid Move Heights.
- 5 Insert the Template:-
  - ...\COURSEWORK\PowerMILL\_Projects\ProjectTemplate-A.ptf
- 6 Collectively set up and **Batch** process the **Toolpaths**.



# **Drilling Methods**

A **Drilling Method** is a specialised **Template** that defines a range of drilling strategies that will be assigned to specific **Hole** types. Initially you determine a selection criteria (which holes do you want to drill) followed by a set of drilling strategies (how do you want to drill them). This sequence can be repeated for a different selection of holes.

- 1 Select File Delete All and Tools Reset Dialogs.
- 2 Select the **Drilling** tab from the **Strategy Selector** dialog.
- 3 Select the **New Drilling Method** option from the menu then **OK**.



4 Select Add Process and input the Process Name as Dia10Tap.

🥳 Drilling Methods		? 🗾 🗙
Processes		
Dia10TAP		Add Process
		Process Name
		Dia10TAP
		Add Strategy
		Strategy Name
		Single Peck
Į.	×	
Selection		
Select By		Minimum Diameter
Diameter 👻		9.95
		Maximum Diameter
		10.05
		Minimum Diameter 9.9
	>	
4 III >		• III •
Tolerance		Component
		Largest 👻
Apply		Close
Арріу		ciose

5 Click on Dia10TAP in the *Processes* window and then *Select By* – Diameter with the above values (min 9.95 max 10.05).

6 Click on Add Strategy from the Drilling Methods dialog (This opens the Drilling Strategy dialog defaulted to Single Peck).

📆 Drilling Methods	8 X )	
	🛃 Drilling Strategy	? ×
Processes Dia10TAP Single Peck	Editing Method Tool	Toolpath Name Dia10TAP_Single_Peck
	<b></b>	Cycle Type Single Peck 👻
	Diameter	Define Top By Hole Top 👻
		Operation Centre Drill 🗸
	Tolerance	Sorting
	Thickness	Clearance Start 5.0 ↓ 5.0
	Links	Peck Depth Depth
	Short Links 🗸 🗸	
2	Long Links 🗸 🗸	Dwell Time
Selection		Feedrate Component
Select By		Feedrate Component
Diameter	Split Toolpaths	Spindle Speed (rpm)
	✓ Tolerance 0.01	1650.0 Drilling Cycle Output 📝
		Verification Thickness
	Gouge Check 📝	
	C	lose

7 Enter the values into the dialog exactly as shown above with the **Sorting** option

set to Along the Y direction, one way in X.

This **Single Peck** operation will identify all holes within the min/max range specified, dia **10mm** combined with a **Radial Thickness** of **2.5mm** in both the *Thickness* and *Verification Thickness* fields. This will result in all dia **10mm** holes being interpreted as dia **5mm** holes for the tool selection.

8 **Close** the **Drilling** dialog.

Processes	
<ul> <li>Dia10Tap</li> <li>Single Peck</li> </ul>	Add Process
Break Chip	Process Name
break emp	Dia10Tap
	Add Strategy
	Strategy Name
	Break Chip

- 9 Select Add Strategy and in the Drilling Strategy dialog input:- Cycle Type -Break Chip, Operation – Full Diameter, and Radial Thickness 0.75.
- 10 Close the dialog.

Before the **Tapping** operation the holes are to be drilled with a **Dia 8.5 Drill**. This **Break Chip** operation will identify all holes within the **min/max** range specified, dia **10mm** combined with a **Radial Thickness** of **0.75mm** in both the *Thickness* and *Verification Thickness* fields. This will result in all dia **10mm** holes being interpreted as dia **8.5mm** holes for the tool selection.

11 Select Add Strategy and in the Drilling Strategy dialog input:- Cycle Type – Tapping, Operation - Drill to Hole Depth, Axial Thickness 5, and Pitch 1.5.

📆 Drilling Methods	👸 Drilling Strategy	?
Processes Dia10TAP Single Peck Break Chip Tapping	Editing Method Tool Diameter	Toolpath Name Dia10TAP_Tapping Cycle Type Tapping Define Top By Hole Top Operation Drill to Hole Depth
	Tolerance Thickness 	Clearance 5.0 Peck Depth Depth Depth Dwell Time
Selection Select By Diameter	Split Toolpaths Tolerance 0.01 Gouge Check 7	Feedrate Component All Spindle Speed (rpm) Drilling Cycle Output Verification Thickness

**12 Close** the **Drilling Strategy** dialog.

13 Select the Save option from the Drilling Methods dialog.

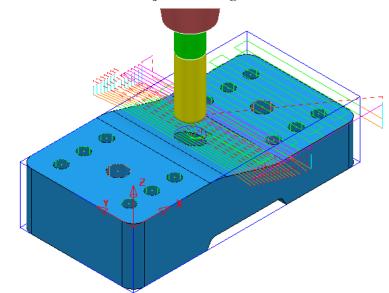


14 For **PowerMILL** to recognise the method in the **Tool Strategies** - **Drilling** dialog it must be saved with a suitable name (**Dia10Tap**) in the directory:-

#### C:\Program Files\Delcam\PowerMILLxxxx\file\templates\Drilling

Processes Dial0Tap Single Peck Break Chip Tapping	Add Process Process Name Dia10Tap Add Strategy Strateav Name Tapping	Save in: Drilling Save in: Drilling Name Sushes.ptf Cooling.ptf Counterbored.ptf Counterbored.Tapped.ptf Counterbored.Tapped.ptf Figetors.ptf New-Drilling-Method.ptf Plain.ptf Screws.ptf Tapped-Counterbored.ptf
Selection Select By Diameter	Minimum Diameter 9.95	File name: Dia10Tap Save as type: PowerMILL Template (".ptf)

- **15** Close the Drilling Methods dialog.
- 16 Select File Delete All and Tools Reset dialogs.
- 17 Select File Open Project:-



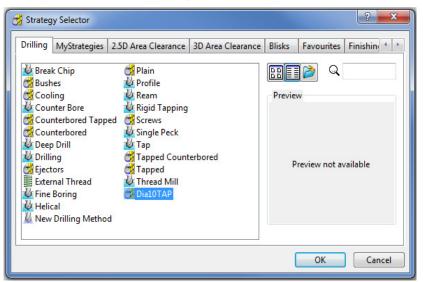
#### $... \label{eq:powerMILL_Data} Projects \label{eq:powerMILL_Data} The set of the set of$

18 Select File - Save Project As:-

#### ...\COURSEWORK\PowerMILL\_Projects\DrillingMethods-EX1

The **Project** contains **Dia 8.5**, **Dia 5 Drills**, and an **M10-Tap** will be identified and used by the **Drilling Method** saved earlier.

#### 19 Select the **Drilling** tab from the **Toolpath Strategies** dialog.

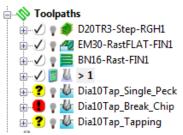


20 Select the newly created, **Drilling method** (**Dia10Tap**) as displayed in the above dialog and click on **OK**.

📆 Drilling Methods	? <mark>×</mark> )
Processes Dia10TAP Single Peck Break Chip Tapping	Add Process Process Name Dia10TAP
	Add Strategy Strategy Name
Selection	
Select By	
	Minimum Diameter 9.9 Maximum Diameter 10,
< <u>III</u> ►► Tolerance	Component
Apply	Close

**21** Select **Apply** at the bottom of the *Drilling Methods* dialog.

A set of Drilling/Tapping strategies are created on the Dia 10 hole **Features**.

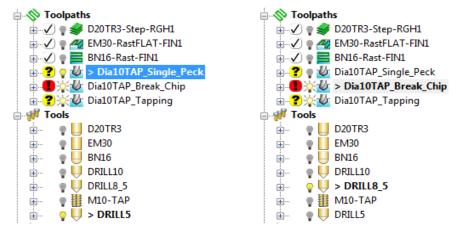


22 Simulate each of the 3 Drilling/Tapping Toolpaths.

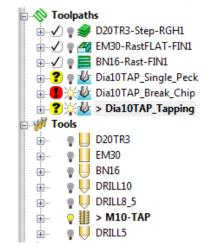
Note that the **Drilling Method** (**Dia10Tap**) has made the tool selection based on the stored information. The **Single Peck** has used a **Dia 5 Drill**, the **Break Chip** has used a **Dia 8.5 Drill** and the **Tapping** has used an **M10-TAP**.



- 23 Select and Delete the uncalculated Drilling Toolpath 1 created as a consequence of the Drilling Method being applied.
- 24 In the **PowerMILL** *explorer*, **Activate** the *toolpath* **D10TAP\_Single\_Peck** and the tool **DRILL5** used will also become **Active** (As shown below left).

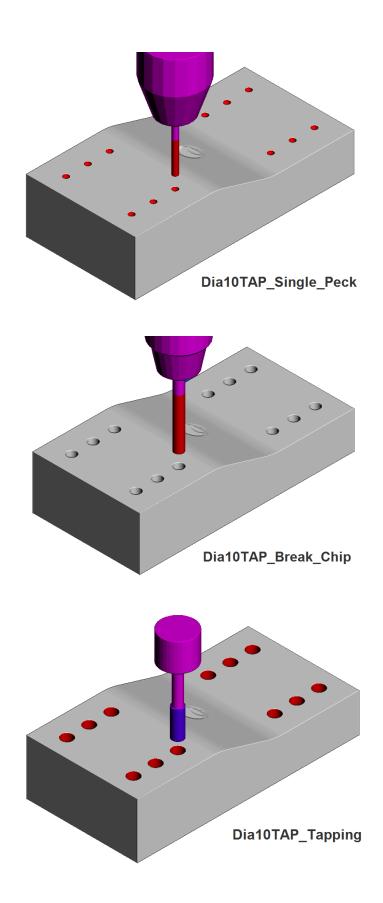


25 In the PowerMILL explorer, Activate the toolpath D10TAP\_Break\_Chip and the tool DRILL8\_5 used will also become Active (As shown above right).



Only the holes with diameters within the selection range (**DIA 9.95-10.05**) have been drilled and tapped. The actual **Drill** size selected is further controlled by inserting **radial thickness** values into the individual **Drilling Process** strategies.

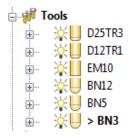
- 26 Select File Save Project.
- 27 Run a full **ViewMILL simulation** on all 6 **toolpaths** in the **Project**.



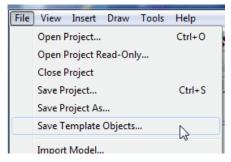
# **Tool Library Templates**

As well as being applied to customise machining strategies, **Templates** can also be created for other entities such as the definition of a tool library. A major advantage of applying **Templates** for tool libraries is the ease at which they can be updated and re-saved. It is also quicker to **Insert** a **Template** than, to run a **Macro**.

- 1 Select File > Delete All and Tools > Reset Dialogs.
- 2 In the **PowerMILL** *explorer* create the following tools including suitable **Shank/Holder** definitions and **Feeds/Speeds**.



3 From the File pull down menu, select the option Save Template Objects.



4 In the Save Template File dialog browse to:

#### C:\pmill2\MyToolSets

Sa	ve in: 📗	MyToolSets	-	G 🤌 📂 🛄 -	
	ame	*		Date modified	Туре
<ul><li>♪</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li><li>↓</li></ul>	] ToolSet-	1.ptf		09/01/2014 14:49	PTF File
×		m			
File	name:	ToolSet-1		-	Sav
		PowerMILL Template (*.pt	2		Cano



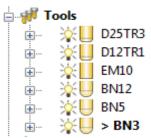
Do not save **Tool Library Templates** to the same area as **Toolpath Strategy Templates** as this will cause operational problems. 5 Input the file name **Tools-1** and click **Save**.

A major advantage of using **Templates** to input tooling into **PowerMILL** is that individual tools can quickly be modified and the Toolset updated by clicking on the **Save** tab.

- 6 Delete all of the Tools currently stored in the PowerMILL explorer.
- 7 From the Main pull-down menus select Insert > Template Objects and open the ToolSet-1.ptf template file in the Import Template Objects dialog.

Insert Draw Tools Help	🛃 Import Te	mplate Objects	×
Project Ctrl+I Toolpath		Look in: 🏭 Tool_Libraries 👻	G 🦻 📂 🖽 -
		Name	Date modified Type
Template Objects		Tools-1.ptf	
Session			
		<	•
	1	File name:	✓ Open
		Files of type: PowerMILL Template (*,ptf)	Cancel

8 All of the **tools** stored in the *template* will immediately appear in the **PowerMILL** *explorer*.



A series of **Tool Library Templates** can be created for such variants as different **Machine Tools** and **Material Types**.

This method of **Tool Definition** can be applied to each **Project** and any unused **tools** can, if required be deleted from the **PowerMILL** *explorer*.

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The above **Tools** could also be stored as separate **Templates Objects** to be imported into the **PowerMILL Project** as individual items.

# 2. Macros & User Menu

## Introduction

There are various ways in which the user can customise **PowerMILL**. This chapter looks at the creation of:

- Macros
- User Menus

### **Home Area**

The usual method to enable the **User Menu** to be recognised by **PowerMILL** is to set up and use a **home** area in *Windows*. This can be located to any convenient area on the hard disk. In the following example the **home** area is:-

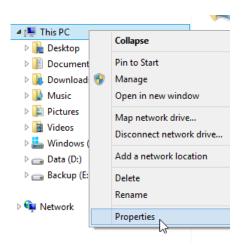
C:

To check if a Home area already exists on a computer;



#### 1 Open File Explorer

In the local explorer, right-click on **This PC** and select **Properties** to open the **System** dialog.



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Alternatively, at the lower left corner of the screen, right mouse click on

**Start** and from the local menu select **System**.

2 In the **System** dialog select the **Advanced** system settings option and then in the **System** Properties dialog, select **Environment** Variables.

	System	- 🗆 ×
🔄 🏵 🔹 🕆 🛃 🕨 Control Pan	el → All Control Panel Items → System 🗸 🖒	Search Control Panel 🔎
Control Panel Home Control Panel	View bas Windows e Windows e Window © 2013 System Process Installee View Profiles User Profiles User Profiles User Profiles Deducts extinge related to use price to	× •
	Desktop settings related to your sign-in           System         Desktop settings related to your sign-in           Pen and         Settings           Computer r         Statup and Recovery           Compu         System startup, system failure, and debugging information           Full cor         Settings           Compu         Settings	Change settings
	Domain Unidows a Window Product OK Cancel App	

3 If the home area is not already defined as shown below, select New...

Environment Variables		
Jser variables for dft		
Variable	Value	^
home	C:	
KEYSHOT_EXTE	C:\Program Files\Delcam\PowerSHAPE1	
TEMP	%USERPROFILE%\AppData\Local\Temp	
TMP	%USERPROFILE%\AppData\Local\Temp	$\mathbf{v}$
	New Edit Delete	

- 4 In the User Variables dialog, enter home in the Variable name field and C:\ in the Value field.
- 5 Click OK.

C C

You must have Admin rights to create a **New User Variable**.

6 If it does not already exist, create a folder named **pmill2** in the required **home** area (**C:\pmill2**).

If the **pmuser.mac**, **user\_menu** and any other **macro**s are being stored in this folder, then **PowerMILL** will have immediate access through the default **Macro** search paths.

## Macros

A **Macro** is a text file, which contains a sequence of commands to drive **PowerMILL** operations. These can be created by recording each command or by typing in the commands directly. **Macros** (which have a **.mac** extension) can then be run from the **PowerMILL** *explorer* or from a *user defined menu*.

When **PowerMILL** starts up, it will attempt to identify and run the **initialisation macro** (if it exists!) called **pmuser.mac**. By adding customised **PowerMILL** commands to the initialisation macro, the user can set up their own default settings and parameters.

For immediate use a **pmuser.mac** can be placed in the **pmill2** folder, directly below the users **Home** area. The **pmill2** directory is also a convenient location for storing other user-defined **macros** ideally arranged in suitable sub-folders. This will be covered later.

### Creating a pmuser macro

**Macros** are created in **PowerMILL** by recording the operations as they occur. Only flags or parameters that are physically changed will be recorded into the macro; therefore to record a value that is already set, it must be re-entered or a flag re-switched. For example, if the finishing tolerance is currently set to 0.1mm, and it is required that the macro stores the same value, then it must be re-entered over the existing copy in the form during recording.

1 Select File > Delete All.

÷...

2 To start recording, right-click on Macros in the PowerMILL explorer and select Record.

📰 Ma	cros	
		Macros
		Run
		Record
	<	Stop

3 Save **pmuser.mac** by first clicking on the existing folder displayed in Save in.

🥳 Select Re	cord Macro File		<b>X</b>
	Save in: 👔 train 👻	G 🎓 📂 🛄 -	
	Name	Date modified	Туре
	🕌 CopyCAD 2010 Data	02/07/2010 09:45	File folder
2	퉬 CopyCAD 2011 Data	01/12/2010 15:31	File folder
	퉬 CopyCAD Pro 8.0_Data	09/12/2009 12:11	File folder
	COURSEWORK	12/11/2010 15:30	File folder
1	퉬 Delcam-Draft Data	08/10/2010 09:28	File folder
	퉬 Exchange	24/06/2008 14:18	File folder
	🔒 pmill2	20/09/2010 16:26	File folder
2	PowerINSPCC	00 40 0000 45 57	File folder

4 Then, in the resultant dialog, browse to C:\pmill2 and at the bottom of the dialog enter the file name, **pmuser** before clicking **Save**.

•	III		4
File name:	pmuser	•	Save
Save as type:	Macro (*.mac)	•	Cancel
The Macro ico	n changes to red while reco	ordina is in proa	ress

The Macro icon changes to red while recording is in progress

The **pmuser.mac** automatically runs whenever **PowerMILL** starts up, thereby providing the user with custom default settings. It can also be run at any time during a session to reinstate the initialisation settings without having to restart **PowerMILL**.

All required data or options must be set or selected if they are to be included in a macro (Even if it is necessary to overwrite or switch them off first).

- 5 From the **Main** pull-down menus select **Tools** > **Options**.
- 6 Select Tools > Feeds and Speeds, change the Feed Rate Plunge Factor to
   0.2, tick the Auto Load Feed Rate box, and Accept the dialog.

<b>1</b>	Options	? ×
Tolerances 	Feeds and speeds	
Feeds and speeds	Feed rate plunge factor	0.2
• Boundaries	Lead in(%)	100.0
in View in Import	Lead out(%)	100.0
Export	Auto load f	feed rate 🗸
Project     NC Programs	Auto load dep	th of cut 🗌

7 Open the Leads and Links dialog and input Short/Long Threshold as 3, both *Short* and *Long* as Skim, and *Default* as Incremental.

<b>3</b>	L	eads and Lin	ks	? ×
Z heights	First lead in	Lead in	Lead out	Last lead out
Extensio	ns	Links	Point	distribution
	Short/Long threst			
Retract and a	pproach moves		Short	
	Along Tool axis	Skim	~	
- 🗸 Automat	ically extend		Long	
	Maximum leng	th 250.0	Skim	~
			Default	
	Retract dista	<u>nce</u> 0.0	Incremental	~
	Approach dista			

8 Accept the Leads and Links dialog.

9 In the **PowerMILL** *explorer*, right-click on **NC Programs**, and select **Preferences**.

Toolpaths Tools	NC Programs	C <b>1</b>	NC Prefere	nces	?	>
Pools Patterns Feature Set Workplane Levels and Models Stock Mod Groups Macros	Create NC Program NC Program Names Folder Names Deactivate Draw All Undraw All Write All		ere will not change existing NC Pr	er C:\Temp\NCProg	ırams	
Walteros	Setup Sheets		chine Option File			2
	Preferences	Output Worl	kplane 🖌 🖌	Part Name		
	Project Settings			Tool Value		~
	Create Folder	Automat	ic Tool Alignment On 🗸	Connection Moves	Simultaneous	~
	Text Blocks					
	Statistics					
	Delete All		Close			

- 10 On the NC Preferences dialog Output page, select the Machine Option File as heid400.opt.
- 11 Even if already set, select:

Use Project - On

Tool Value - Tip

Automatic Tool Alignment - On

Connection Moves - Move, Rotate

12 Select the Toolpath page and even if already set, select:-

**Tool Change - On New Tool** 

Tool Numbering - As Specified

**Tool Change Position - After Connection** 

Cutter Compensation: Length - Off

Radius - None

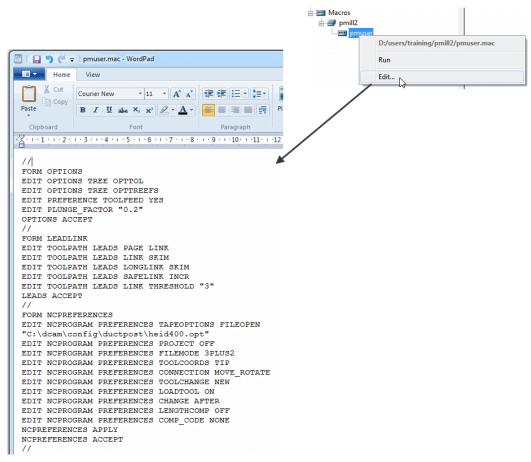
**13** Select **Apply**, followed by **Accept**.

It is important to remember to **Accept** and not to **Apply** forms that are opened while creating an **Initialisation Macro**, the only exception being the creation of **NC Program Preferences** (An initialisation file is for pre-setting forms but at this stage without executing the commands).

14 Select **Stop** from the local **Macros** menu to stop the recording process.

🖶 🛲 Mac	cros	
		Macros
		Run
	$\checkmark$	Record
		Stop
		En Massa

- **15** Select the plus (+) sign next to **Macros** in the **PowerMILL** *explorer* to open the tree.
- **16** Right-click **pmuser**, then select **Edit**.



This is a standard **Wordpad** document that can be edited with new values and then saved.

To try this out you will need to exit and re-open PowerMILL.

17 Select File > Exit and restart PowerMILL to check that the settings from pmuser.mac have been activated.

### **Other Typical Macro Applications**

Apart from tailoring **PowerMILL** by the creation of an initialisation macro other useful applications include macros for un-draw, draw and resetting **Leads and Links**, locating and inserting tooling **Templates**, setting **NC Preferences**, regularly used machining sequences or settings, and input of preview, commands not yet available on the GUI. Note the pmuser macro can be run through the browser at any time during a **PowerMILL** session to restore your settings.

### **Creating NC Preference macros**

1 From the **PowerMILL** *explorer*, record a **macro** called **Fanuc6m\_prefs** and save it in:-

#### C:\pmill2\NCpreferences\...

- 2 In the NC Programs > Preferences > Output tab select the Machine Option File as fanuc6m.opt.
- 3 Input the remaining settings exactly as set earlier for the **Heid400** in the pmuser macro.
- 4 Stop the **Macro** recording process.



Even if already set it is essential to re-specify settings if they are to be recorded into the macro.

A **macro** file (**Fanuc6m\_prefs.mac**) is now created that sets up **NC Preferences** for a post-processor option file and the command lines are shown below.

🛎 I 🔚 אופי 🗸	and fanuc6m_prefs.mac - WordPad
Home Home	View
Paste	Courier New     •     11     •     A*     Image: Ima
Clipboard	Font Paragraph
· Z · · · 1 · · · 2 ·	
EDIT NCPRO "C:\dcam\c EDIT NCPRO EDIT NCPRO EDIT NCPRO EDIT NCPRO EDIT NCPRO EDIT NCPRO EDIT NCPRO EDIT NCPRO EDIT NCPRO	GRAM PREFERENCES PROJECT OFF GRAM PREFERENCES TAPEOPTIONS FILEOPEN onfig/ductpost/fanuc6m.opt" GRAM PREFERENCES NORMAL OFF GRAM PREFERENCES FILEMODE 3PLUS2 GRAM PREFERENCES TOOLCOORDS TIP GRAM PREFERENCES CONNECTION MOVE_ROTATE GRAM PREFERENCES TOOLCHANGE NEW GRAM PREFERENCES LOADTOOL ON GRAM PREFERENCES LENGTHCOMP OFF GRAM PREFERENCES COMP_CODE NONE GRAM PREFERENCES ARCFIT OFF GRAM PREFERENCES CYCLES ON GRAM PREFERENCES COOLANT ON CES APPLY

### **Exercise**

5 Create two more independent NC Preference macros for the Hied400 and Mazak option (Use the filenames h400\_prefs.mac and mazak\_prefs.mac respectively for the macros), and save them to:

C:\pmill2\NCpreferences\...

## **User Menu**

In **PowerMILL** it is possible to create a *user menu* enabling the user to further streamline and customize the command structure. To access the *user menu*, right mouse click within an empty area of the **PowerMILL** *explorer*.

 Right-click in an empty area of the **PowerMILL** explorer to access the current user\_menu (if it exists).

This menu is created from a text file called user\_menu. It must be in the directory **pmill2** in the **Home** area of the computer for the individual user, and saved as a text file (not a word Document) and with no extension. If available it is easier to obtain a copy of an existing user\_menu and modify it as required.

A **user menu** can be setup to provide easy access to existing **PowerMILL commands**, Macros and Templates.

2 Load the in-active **user\_menu** file (which is in the **pmill2** folder) into **Wordpad**.

Below are instructions for the **user\_menu** command line input (these exist in the sample file).

A command line will be added to the above user\_menu to run the **h400\_prefs** macro.

#### I "heid400" 1 "macro C:\pmill2\ncpreferences\h400\_prefs"

3 Add the above command line to run the h400\_prefs macro directly from the user\_menu.

This line locates and runs the file **h400\_prefs.mac** created earlier in this chapter. It needs to include the correct drive and path where the macro is located. All lettering must be in the correct upper or lower case and include the inverted commas and hyphens.

A more complete version of a typical **user\_menu** is as shown below:

📓    🔚 😏 (C =    user_menu - WordPad	×
Home View	0
Image: Second	
· X · · · 1 · · · · 2 · · · · 3 · · · 4 · · · 5 · · · 6 · · · 7 · · · 8 · · · 9 · · · 10 · · · 11 · · · 12 · · · 13 · · · 14 · ½·15 · · · 16 · · · 17 · · ·	
<pre># ************************************</pre>	* T
U user_menu S T "WELCOME TO THE USER MENU" S	
<pre>T "[GENERAL]" S I "Unlock Project "1 "project claim" I "Reset My defaults (pmuser)" 1 "macro pmuser" I "Reset Leads-n-links" 1 "macro general\ResetLeads-n-Links" I "drop_bound" 1 "macro general\drop_bound" I "Draw Triangles (Ctrl-Alt-Tab)" 1 "macro general\DrawTriangles" S M "NC PREFERENCE Sub-Menu&gt;&gt;&gt;" I "heid400" 1 "macro NCpreferences\h400_prefs" I "heid426 (default)" 1 "macro NCpreferences\h426_prefs" I "fanuc6m" 1 "macro NCpreferences\fanuc6m prefs" I "mazak" 1 "macro NCpreferences\mazak_prefs" </pre>	
<pre>M "[SEPARATE TOOLS - STEEL]" S M "EndMill" I "EndMill" I "EM30" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM30" I "EM25" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM25" I "EM20" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM20" I "EM16" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM18" I "EM16" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM10" I "EM10" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM10" I "EM10" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM10" I "EM10" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM10" I "EM6" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM6" I "EM6" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM6" I "EM5" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM5" I "EM6" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM6" I "EM5" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM6" I "EM6" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM6" I "EM5" 1 "macro Tool_Libraries\SeparateTools-Steel\EndMills\EM6" I "EM6" 1 "macro Tool_Libraries\SeparateTools-Steel\EndM</pre>	
100% 🕞 🖳 🗍	÷

This is the **user\_menu** file as displayed in the **Wordpad**.

[My Menu]			
[GENERAL]			
Unlock Project			
Reset My defaults (pmuser)			
Reset Leads-n-links			
drop_bound			
Undraw Leads-n-links			
Draw Leads-n-links			
Preview Command list			
Draw Triangles (Ctrl-Alt-Tab)			
BACKGROUND COLOUR Sub-Menu>>>	×		
NC PREFERENCE Sub-Menu>>>	•	heid400	
		heid426 (default)	2
[SEPARATE TOOLS - STEEL]	+ I	fanucбm	*0
		mazak	

#### Note the **NC-Preferences** section uses a *sub-menu*:

- **M** denotes the start of the sub-menu.
- Z denotes the end of the sub-menu.

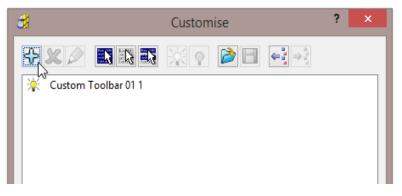
# **3. Custom Toolbars**

It is possible for the user to create **Custom toolbars** (example shown below). These can be set to run; **Menu**, or **toolbar** options, **Macros**, direct **PowerMILL** commands.

View Rot Selected Item	View Rotation Ctr	×
------------------------	-------------------	---

The above example provides quick access to switching the **View** - **Rotation Anchor** between being located at the centre of pre-selected items (**Selected items**) or at the screen centre (**View**).

1 From the main pulldown menus select; **View** - **Toolbar** - **Custom** - **Customise**.

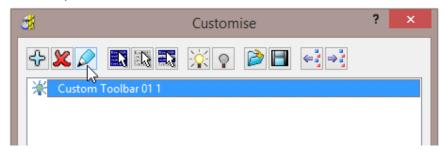


2 The above dialogue appears and if the is clicked, a new (empty) **Custom Toolbar** (as shown above) will appear both in the **PowerMILL** graphics area, Custom Toolbar 01 1

and as listed in the above dialogue window.

File	View	Insert	Draw	Tools	Help
<b>&gt;</b>	3	3	ហិ៍	Ī	🖳 🕻
1			~	1	
×			Ne	W	
l In		ति	ool	bar	1

Once the new **Custom Toolbar** is created a series of command actions can be added to it as required.



3 Select the new Custom Toolbar (Left Mouse Click) in the Customise dialogue and then select the 'Edits the selected toolbar' icon.

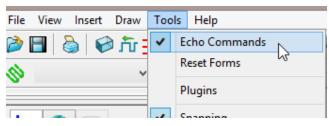
₫ <b>i</b>	Edit Cu	istom	Toolbar		?	×
Toolbar Name			$\oplus$	<i>i</i>	Ð	<u>[]</u>
Custom Toolbar 01 1						
Туре						
Command	*					
Command		16				
Description		] <b>-</b> € ⊰>				
		Close	e			.::

4 In the above dialogue, select *Type* – **Command**.

The equivalent text based, PowerMILL command for the **View** - **Rotatation Anchor** to be on a **selected item** is now inserted into the **Command** field.

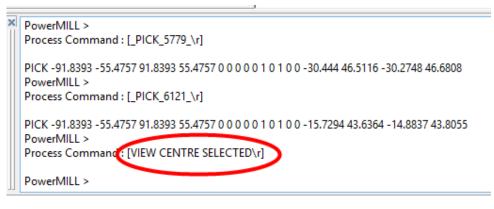
To obtain the correct syntax the relevent command can be **echoed** into the PowerMILL **command** window to be **Copied** and **Pasted**.

5 From the main pulldown menus select; **Tools** – **Echo Commands**.



The **Command** input window will appear below the **PowerMILL** graphics area.

6 From the main pulldown menus select; View – Rotation Anchor – Selected Items and the equivalent text based version will be echoed into the Command input window.



PICK -91.8393 -55.4757 91.8393 55.4757 0 0 0 0 0 1 0 1 0 0 · PowerMILL > Process Command : [VIEW CENTRE SELECTED r]

- 7 Drag the cursor across the required text (**VIEW CENTRE SELECTED**), right mouse click over it, and from the local menu select **Copy**.
- 8 Back in the **Edit Custom Toolbar** dialogue paste the above text into the *Command* field.

🥳 Edit C	ustom Toolbar	?	×
Toolbar Name	$\oplus$	🤣 🌶 📎	ŝ
Custom Toolbar 01 1			
Туре			
Command v			
Command	าโย		
VIEW CENTRE SELECTED			
Description	<u>1</u> ⊷+2		
View Rotation Selected Item	<b>4</b>		
	Close		
			.::

9 Input a suitable name in the **Description** field before selecting **Add selected** item.

en al constante a	Edit Custom Toolb	ar ? ×
Toolbar Name	$\oplus$	🗟 🎸 🔨 🌽
Custom Toolbar 01 1	Vie	w Rotation Selected Item
Туре		
Command	~	
Command	<u>1</u> [3	
Description		
	Close	]

10 Repeat the above process to create a new toolbar option to restore the View -Rotation Anchor to use the View centre (equivalent text input = VIEW CENTRE VIEW).

<b>3</b>	Edit Cus	tom	Toolbar		?	×
Toolbar Name			$\oplus$	<i>i</i>	Ð	<u>[]</u>
Custom Toolbar 01 1		[	View Ro	t Selected Ite	m	
Туре			View Ro	otation Ctr		
Command	¥					
Command		1				
Description		<b>}⊷</b> { ≁				
		Close	:			.4

The new custom toolbar (In the **PowerMILL** graphics area) should then look something like this:-

View Rot Selected Item	View Rotation Ctr	×

# 4. Tool Database

# Introduction

The **PowerMILL** Tool Database enables the user to **store** and **load** pre-defined **Tools** in a single database. A **Tool** stored in the database can include definition for the **Shank**, **Holder**, **Speeds**, **Feeds**, **Stepovers**, and **Stepdowns**. It is also possible to assign different **Speeds** and **Feeds** to the same **Tool** where it is assigned with alternative **Stock Material** types.

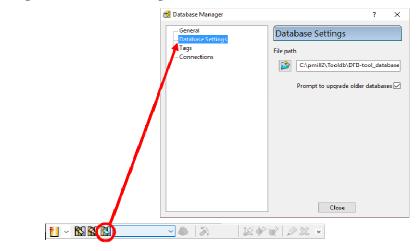
The following chapter explains how to use the **Tool Database**. It is your responsibility to ensure that values selected from the database are suitable for purpose. If in doubt, relevant advice can be obtained from specialist tooling suppliers.

# Accessing an existing Tool Database

The first step in the process is to register the location of the **Tool Database** to be used in **PowerMILL**. In this example we will use a pre-defined database located in:- ....\pmill2

- 1 In the **PowerMILL** *explorer* right mouse click on **Tools** and from the local menu select, **Toolbar**.
- 2 From the **Tool** toolbar select the **Database Manager** dialog.
- 3 In the selected **Database** dialog select 2 and browse to the file:

....\pmill2\Tooldb\Example-tool\_database.mdb



4 Close the Database Manager dialog.

# Loading Tools from the registered Database

5 In the **PowerMILL** *explorer*, right mouse click on **Tools** and select **Create Tool from Database**.

- 🗘 Bo	Tools		
∰ Pa 	Toolbar		
w	Create Tool	►	From Database
∲ Le ∳ M	Tool Names Folder Names	*	End Mill
- 📣 St	Deactivate		Tin Radiused

The **Tool Database Search** form will display all **Tools** stored in the currently registered **Tool Database** (Database path is displayed at the bottom of the dialog).

🕺 Tool Database Search									? ×
Search Settings Name		🔲 Diam	eter		Length				Tool Assembly Preview
Search String			Min	0.0		Min	0.0		1
Search Mode Like	-		Max	0.0		Max	0.0		
Tip Radius		Туре	Flu	ites	Tool Family				
Min 0.0		-51	1		CARBIDE		$\mathbb{N}$		
		<b>M</b> -		] [[	CANDIDE				
<u>Max</u> 0.0		🔲 Use Sto	ock Material		S	earch	Reset		
Stock Material				Holder					
ALUMINUM	- 10			Tool's Holder	-	CAT 30, Spindle		-	1
									i.
Search Results					1			_	
	Diameter	1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1		Assembly Length	Taper Height	Taper Angle	Flutes		1
endmillM1000:reg	10.0	19.05	0.0	63.5	0	0	2	=	1
endmillM1000:4reg	10.0	19.05	0.0	63.5	0	0	4		1
endmillM1000:long	10.0	38	0.0	100	0	0	2		
endmillM1050:reg	10.5	25.4	0.0	68.26	0	0	2		
endmillM1050:4reg	10.5	25.4	0.0	68.26	0	0	4		
endmillM1100:reg	11.0	25.4	0.0	68.26	0	0	2		<u> </u>
endmillM1100:4reg	11.0	25.4	0.0	68.26	0	0	4		i i
endmillM1150:reg	11.5	25.4	0.0	68.26	0	0	2		
endmillM1150:4reg	11.5	25.4	0.0	68.26	0	0	4	-	
endmillM1200•reg ∢	120	25.4	0.0	82 55	0	0	2		
29 Tools Found							Create To	ols	
C:\Users\train\pmill2\Tool	ldb\Examp	le-tool_da	tabase.mdb						
				Close					88
									(**

Any displayed **Tool** can be loaded into the **PowerMILL** session, by double clicking on its name in the list.

To perform a more specific **Search**, reduce the options by selecting such criteria as the **Tool Type**, **Stock Material**, **Diameter range**, **Length range**, **etc** and select the **Search** button.



- 6 Select the *Tool* **Type** option as **Tip Radiused**.
- 7 Tick the box named **Diameter** and input a range of **Min 16** and **Max 25**.

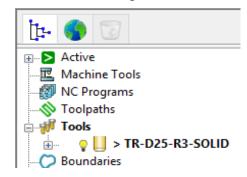
🕳 Tool Database Search						?	$\times$
Search Settings Name Search String		Search Mode	Like	Flutes	- Tool Assembly Preview		
Diameter <u>Min</u>	16.0 <u>M</u>	ax 250.0	CARBIDE	✓ X			
	0.0 <u>M</u>	<u>ax</u> 0.0					
Tip Radius	<b>).0</b>	<u>ax</u> 0.0	Use Stock Material	Search Reset			

8 Click on the **Search** button to display the filtered down choice of **Tools**.

All available **Tip Radiused tools** will be listed within the specified **Diameter range** - (2 Tools found).

	rch					? >
Search Settings				_		Tool Assembly Preview
Name Search Str	ing	5	Search Mode Like	Type	Flutes	
🗹 Diameter			Птоо	I Family		
M	<u>in</u> 16.0	Max	25.0 CARBI	DE		l.
Length			Too	l Tags		l.
M	<u>in</u> 0.0	Max	0.0			
Tip Radius					Search	
M	in 0.0	Max	0.0 Use	Stock Material	Reset	
Search Results						
Tool ID	Diameter	Length Tip Radi	us Assembly Length	Taper Height Taper A	ngle Flutes Tool	
D16T3	16.0	60 3	3.0 100	0	0 1	
TR-D25-R3-SOLID	25.0	60	3.0 185	0	0 1	
<			Holder		>	
< Stock Material ALUMINUM		7 🚱 🗶 🖉	Holder Tool's Holder	~ CAT 30. S		
Stock Material ALUMINUM 2 Tools Found			1			
Stock Material	d		1		Spindle 🗸	

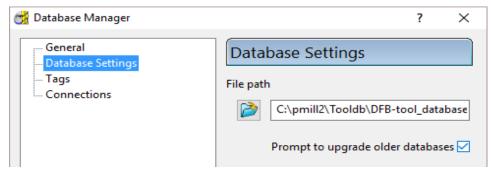
- 9 Double left mouse click on the displayed Tool (*TR-D25-R3-SOLID*) in the Search Results area to load it in to the PowerMILL Project.
- 10 Close the Tool Database Search dialog.



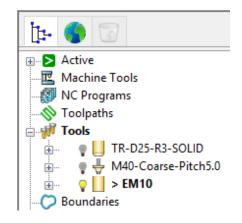
## **Exercise**

- 11 <u>Do not delete</u> the existing **Tool** *TR-D25-R3-SOLID* from the current **Project**.
- 12 Switch to a different Tool Database:- ....\pmill2\Tooldb\dfb-tool\_database.mdb
  - *To switch to the new Database select from the Tool toolbar to open*

the **Database Manager** and browse the new **File Path** *i* to the required **Tool Database**.



13 Load in the *Routing Tool* - M40-Coarse-Pitch5.0 and the *End Mill* - EM10.





<u>Do not delete</u> the above **Tools** from this **PowerMILL Project** as they are required in the next section.

# **Creating a new Tool Database**

A copy of an empty **Tool Database** is stored within the installed **PowerMILL** software:-

C:\Program Files\Delcam\PowerMILL 20.0.10\file\tooldb\tool\_database.mbd

This can be copied to a more accessible location such as:-

....\pmill2\Tooldb\tool\_database.mbd

The copied file can be re-named as required, eg:-

My\_tool\_database.mbd

In the following tutorial a copy of the supplied (empty) **Tool Database** has already been copied and re-named to:-

....\pmill2\tooldb\tool\_database.mbd

1 From the **Desktop** select **Windows Explorer** and in the dialog browse to the folder:-

....\pmill2\tooldb

2 Make a copy of the file tool\_database.mbd and re-name it as:-

My\_tool\_database.mbd

3 From the **Tool** toolbar select **Database Manager** and in the dialog, browse to the new **Tool Database** to access the following page:-

🙀 Database Manager	? ×
General Database Settings	Database Settings
Tags	
Connections	File path
	C:\pmill2\Tooldb\MY_tool_database.
	Prompt to upgrade older databases 🗹
	🥳 Tool Database File Path
	Look in: Tooldb
	Name
	🖉 amdale_database.mdb
	DFB-tool_database.mdb
	MY_tool_database.mdb

4 **Open** the **Tool Database File Path** browser **W** and locate the file:-

....\pmill2\Tooldb\My\_tool\_database.mbd

- 5 Select **Open** to register the required **Tool Database** to the **PowerMILL** session.
- 6 Accept the *Options* dialog.

# Adding tools to a PowerMILL Tool Database

7 In the **PowerMILL** *explorer* right mouse click on the tool **EM10** and from the local menu select **Add Tool to Database**.

Tool Database Export	2 ×
Export Options	
	Tool Geometry 📝
	Holder Geometry 🗹
	Cutting Data 📝
Stock Material	- 😥
Tool Family:	
Export Details Tool Geometry A new record will be create 'End Mill', with ID 'EM10'. Holder Geometry A new holder record will be name '1'. Cutting Data No cutting data will be ex- database, because no st been defined.	e created with holder
Export	Cancel



If there is a problem a warning message will be displayed in red text in the **Export Details** window.

8 Select Select stock material name dialog and input the text **ToolSteel** and click on the *green tick* to accept.

🖌 Tool Database Export	?	×	
Export Options		_	
	Tool Geometry		
	Holder Geometry		
	Cutting Data		
Stock Material			
ToolSteel	~ 🏀		
xport Details ToolStee	el		
Tool Geomet The record for the tool of with ID 'EM10' will be ov	of type 'End Mill', verwritten.		•
The record for the tool of	verwritten.		
The record for the tool of with ID 'EM10' will be ov Holder Geometry A new holder record wil holder name 'EM10'. Stock Material Inform The stock material 'Too'	verwritten. I be created with Lation		•
The record for the tool of with ID 'EM10' will be ov Holder Geometry A new holder record wil	verwritten. I be created with Lation	~	•

9 Select Export and the End Mill EM10 will be saved (along with the stored Cutting Data) in the Tool Database group for the Stock Material - Tool Steel.

# Adding Cutting Data for different Stock Materials

In **PowerMILL** suitable **Cutting Data** (Feeds, Speeds, Stepovers, etc) can be assigned to an individual tool.

🛃 End Mill Tool	2 X
Tip Shank Holder Holder Profile Cutting Data bescript	tion
Cutting Data for Material: Aluminium	
Tool Family Tool ID	Coolant
✓ ₩ EM10	None 🔻
Edit Cutting Data	
Toolpath Type: Finishing Operation: General	Radial 0.0
Tool Properties	0.0
Tool ID: EM10 Tool Family:	
Diameter: 10.0 Number of Flutes: 1	
Tool/Material Properties	
Stock Material:	
Axial Depth of Cut Radial Depth of Cut	
Surface Speed Feed/Tooth	
49.008845 m/min 0.628205 mm	poth and Depth of Cut in TDU
Edit Feed/Tooth and Depth of Cut in TDU	Hide Empty Rows 🔽
Cutting Conditions	
Spindle Speed Cutting Feed Rate	j.
1560.0 rpm 980.0 mm/min	
Close	

In this case the **Spindle Speed 1560** and **Cutting Feed Rate 980** are stored in the **EM10** tool definition.

In the **PowerMILL Tool Database** different **Cutting Data** can also be set up for different materials (Tool Steel, Aluminium, Graphite, etc) on an individual **Tool**.

10 In the PowerMILL explorer right mouse click on the Tool EM10 and from the local menu select Settings.



Tool Family	Tool ID	Coolant
Edit Cutting Data		None -
Toolpath Type: Finishin	g Operation: General	
Tool Properties		I Radial
Tool ID: EM10	Tool Family:	0 0.0
Diameter: 10.0	Number of Flutes: 1	
Tool/Material Propertie	s	
Stock Material:		
Axial Depth of Cut	Radial Depth of Cut	
0.0 mm	0.0 mm	
Surface Speed	Feed/Tooth	
76.96902 m/min	0.44898 mm	
Edit For data	ur and Depth of Cut in TDU	
		d/Tooth and Depth of Cut in TDU
Cutting Conditions		Hide Empty Rows 🔽
Spindle Speed	Cutting Feed Rate	M
2450.0 rpm	1100.0 mm/min	-

11 In the *End Mill* Tool dialog select the Cutting Data page.

- 12 Select the Edit the cutting data option.
- 13 Change the Spindle Speed to 2450 and Cutting Feed Rate to 1100.
- 14 In the **PowerMILL** *explorer* right mouse click on the **Tool EM10** and from the local menu select **Add tool to Database**.

🛃 Tool Database Export	? ×	
Export Options		
	Tool Geometry 🔽	
100 (NO	Holder Geometry 🔽	
$\frown$	Cutting Data 🔽	
Stock Material Aluminium	- 🙆	
Tool Family:		
Export Details Tool Geometry The record for the tool of type 'End Mill', with ID 'EM10' will be overwritten. Holder Geometry The holder record with holder name 'EM10' will be overwritten. Cutting Data The cutting data record specific to the tool with ID EM10 and stock material Aluminium will be modified.		
Export	Cancel	

- 15 Set Stock Material to Aluminium and then click on Export.
- 16 Edit the EM10 Tool, to have a Spindle Speed of 2880 and Cutting Feed Rate of 1650.
- 17 Export the EM10 Tool to the Tool Database again but this time with the Stock Material set to ToolSteel.

When the **EM10** tool is created from the **Tool Database** the stored **Spindle Speed** and **Cutting Feed Rate** will be different for an **Aluminium** or **ToolSteel**, **Stock Material** selection.

# **5. Interactive Macros**

# Introduction

In this chapter selected, existing **macros** will be enhanced to include more comprehensive, interactive control options such as; On Screen User Prompts, Error and Invalid Input Checking, Loops, etc.

# **Initial Macro file management**



- 1 From the desktop, open a Windows Explorer Lexplorer dialog.
- 2 Browse to:-

...\PowerMILL\_Data\InteractiveMacroTraining

3 The folder contains the following 2 PowerMILL macro files.

Name	Date modified	Туре
drop_bound.mac	04/04/2003 12:34	MAC File
StpShlw-RGH1-basic.mac	27/06/2012 16:26	MAC File

4 Make a copy of both macro files;

(Shift, select both files, right mouse click on them, and from the local menu select **Copy**, then right mouse click in the explorer window and from the local menu select **Paste**).

04/04/2003 12:34	MAC File
04/04/2003 12:34	MAC File
27/06/2012 16:26	MAC File
27/06/2012 16:26	MAC File
	04/04/2003 12:34 27/06/2012 16:26

### 5 Rename the 2 new files as:-

#### NewDropBound.mac and StpShlw-RGH -Interactive.mac

drop_bound.mac	04/04/2003 12:34	MAC File
NewDropBound.mac	04/04/2003 12:34	MAC File
StpShlw-RGH-basic.mac	27/06/2012 16:26	MAC File
StpShlw-RGH-Interactive.mac	27/06/2012 16:26	MAC File

# **Drop Boundary Macro**

Development of an *interactive macro* starting from a basic *Drop Boundary* macro:-

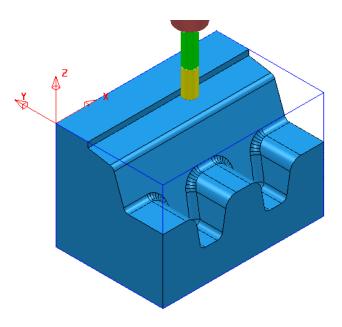
- Setting up a **Boolean** variable.
- Use of the **IF** statement to trap an error condition.
- Input suitable commands that only allow the macro to continue if a specified entities are Active (*Boundary* and *Tool*).
- Locate the correct syntax for parameter identifiers (Help Parameters -Summary).
- Input suitable commands that only allow the macro to continue if a Block exists (Assumes the Block is valid if it has a Z height (Zmax-Zmin = 0)).

# Setting up ready for the DropBound.mac enhancements

- 1 From the *main* pull down menus, select File Import Model:-...\PowerMILL\_Data\models\Zlimits.dgk
- 2 Select File Save Project As:-...\Coursework\PowerMILL\_Projects\MacroTests
- 3 Select an **ISO 1** view and **Activate** the imported **Workplane 1**.
- 4 From the local *user menu* import the '*TipRad'* tool D12TR1:-

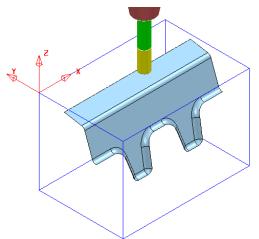
(**Tip** Length 25 -- **Shank** Length 40 -- **Holder1** Dia (Lower 25 Upper 40) -- **Holder2** Dia 40).

- 5 Calculate a Block using the default settings.
- 6 **Calculate** the **Rapid Move Heights** using the default settings.

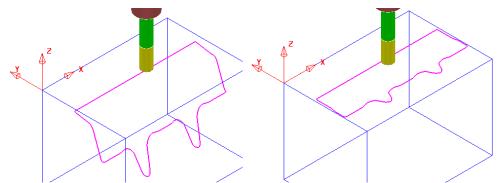


# Creation of NewDropBound.mac enhancements

1 Back in **PowerMILL** create a default *Selected Surface* Boundary using the following faces of the model.



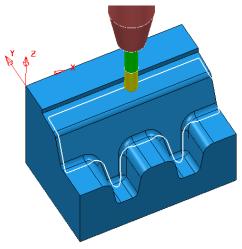
2 Right mouse click on the **Boundary** and from the local menu select **Edit** – **Flatten**.



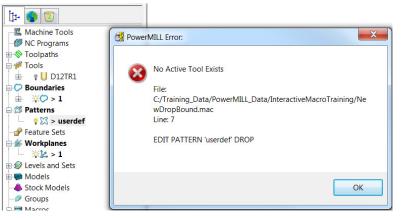
3 From the main pull down menus select **Tools** – **Customise Paths** and in the dialog browse to:-

...\PowerMILL\_Data\InteractiveMacroTraining

4 From the **PowerMILL** *explorer* select **Macros** – **InteractiveMacroTraining** and from the list **Run** the macro **NewDropBound**.

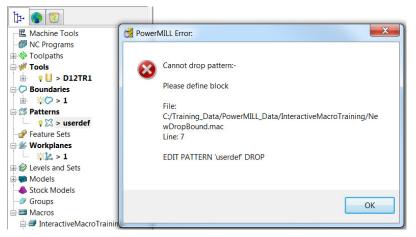


- 5 Right mouse click on the **Boundary** and from the local menu select **Edit** Flatten.
- 6 De-Activate the **Tool D12TR1** and then **Run** the macro **NewDropBound**.



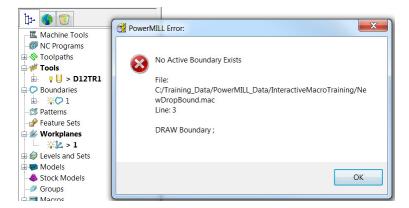
A standard **PowerMILL Error** dialog is opened reporting that **No Active Tool Exists**. The original **Boundary** is un-changed and the processing has not prevented the creation of an unwanted, empty **Pattern userdef**.

- 7 In the **PowerMILL Error** dialog select **OK** to close.
- 8 Delete the Pattern userdef.
- 9 Activate the Tool D12TR1 and in the Block dialog, delete all dimensions
- **10** From the **PowerMILL** *explorer* select **Macros InteractiveMacroTraining** and from the list **Run** the macro **NewDropBound**.



A standard **PowerMILL Error** dialog is opened reporting that it **Cannot drop pattern** – **Please define block**. The original **Boundary** is un-changed but as before the processing has not prevented the creation of an unwanted, empty **Pattern userdef**.

- 11 In the **PowerMILL Error** dialog select **OK** to close.
- 12 Delete the Pattern userdef.
- 13 Activate the Tool D12TR1.
- 14 In the **Block** dialog select **Calculate** followed by **Accept**.
- **15** From the **PowerMILL** *explorer* select **Macros InteractiveMacroTraining** and from the list **Run** the macro **NewDropBound**.



If the **Boundary** is not **Active**, the **Tool** is **Active**, and the **Block** correctly defined, further processing is impossible and the empty **Pattern** *userdef* will not be created.

16 In the **PowerMILL Error** dialog select **OK** to close.

As demonstrated this **macro** will only work correctly if certain conditions apply (*Active Boundary* - *Active Tool* – *Defined Block*). If these conditions apply the **macro** will work (even if the empty **Pattern** *userdef* still exists). It would however be more efficient to in-build some preliminary checks into the macro to both advise the user and stop the macro from processing.

17 In the Windows Explorer dialog open the file NewDropBound.mac in either Wordpad or Notepad.

// // DRAW Boundary ; EXPLORER SELECT Boundary ; NEW EXPLORER SELECT Pattern 'userdef' NEW EDIT PATTERN 'userdef' INSERT BOUNDARY ; EDIT PATTERN 'userdef' DROP **DELETE BOUNDARY**; CREATE BOUNDARY ; SKETCH FORM BOUNDARY EDIT BOUNDARY PREINSERT PATTERN "userdef" EDIT BOUNDARY ; INSERT PATTERN FROM COMBO **BOUNDARY ACCEPT** EXPLORER SELECT Pattern 'userdef' NEW **DELETE PATTERN 'userdef'** REFRESH VIEWMILL RESIZEVIEW // //

#### 18 Input a Title and Description at the start of the macro NewdropBound.

Two forward slashes **//** form a blank line and are used for gaps or text only lines. Note: A real blank line can also be used as a gap in the macro but obviously will not support text comments.

19 Next add the following combination of comment and command lines to check that an Active Boundary exists (*Command lines* displayed in red text)).

//
// \*\*\*\* Check that an Active Boundary exists \*\*\*\*
//

// Setup a default Boolean variable to trap the possible error of no Active Boundary

// A Boolean value can either = 0(false) or 1(true)

```
bool $ActiveBoundCheck = 0
```

// Now use the ERROR boolean function to check if an Active Boundary exists.

```
// Test this in PowerMILL by typing: PRINT = ERROR entity('boundary','').name
$ActiveBoundCheck = ERROR entity('boundary','').name
```

// If \$ActiveBoundCheck returns TRUE, then there is no Active Boundary.

// We will print an error message and exit the macro.

IF (\$ActiveBoundCheck) {

message error "There is no Active Boundary. Activate a Boundary and try again!" return

```
}
```

//

20 Repeat the above command lines replacing the variable name

\$ActiveBoundCheck with \$ActiveToolCheck and entity boundary with tool.

```
//
// **** Check that an Active Tool exists ****
//
bool $ActiveToolCheck = 0
  $ActiveToolCheck = ERROR entity('tool','').name
IF ($ActiveToolCheck) {
  message error "There is no Active Tool. Activate a Tool and try again!"
  return
  }
//
```

### **Exercise**

- 21 Next create a test for a valid **Block** by using the situation of **Max Z** and **Min Z** values being set to 0. This can be used to trap the error in an **IF** statement. The format is similar to the previous two checking actions apart from the calculation line to trap a value for the **Boolean**, test.
  - a Use \$CalculatedBlockCheck as the **Boolean variable** name (set to false).
  - b You need to trap a value into \$CalculatedBlockCheck from the Block dialog using the calculation Zmax-Zmin=0 for an error condition.

From the main pull down menus select **Help** – **Parameters** – **Summary** and scroll down the HTML page to locate the correct parameter identifier:-

Eg. For the **Zmax** value the correct parameter identifier is **Block.Limits.ZMax**.

In the macro replace **Zmax** and **Zmin** (shown below) with the correct syntax strings as located in **Help** – **Parameters** – **Summary**.

```
$CalculatedBlockCheck = (( Zmax - Zmin) == 0)
```

- c Input the IF statement lines:-
  - //

```
IF ($CalculatedBlockCheck) {
```

message error "There is no defined Block. Create a Block and try again!" return

}

//

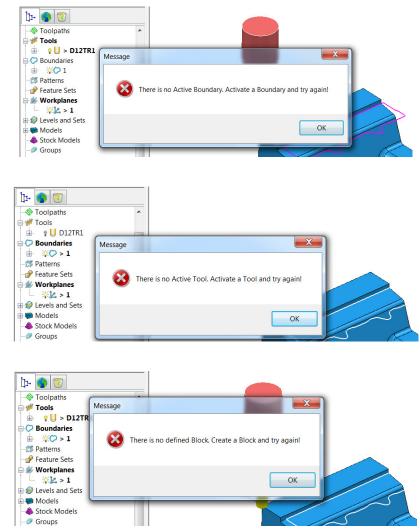
### End of Exercise section!

- 22 A further enhancement to the macro would be to ensure that the resultant dropped Boundary is calculated to fixed finished **Thickness** and **Tolerance** values.
- 23 Insert the following comment and command lines into the macro immediately after the 3 boolean checks:-

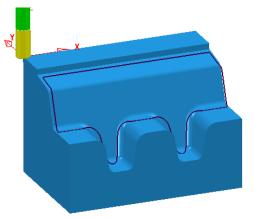
```
message error "There is no defined Block. Create a Block and try again!"
return
}
//
// *** Ensure that the Finishing Tolerance and Thickness are set ***
EDIT PAR 'Tolerance' "0.01"
EDIT PAR 'Thickness' "0"
//
DRAW Boundary ;
EXPLORER SELECT Boundary ; NEW
```

```
EXPLORER SELECT Pattern 'userdef' NEW
```

24 Thoroughly test the new features in the **macro** by re-running with no **Active** *tool*, no **Active** *boundary*, no defined **Block**.



25 Then try the **macro** with all valid conditions active.



- 26 Delete all Boundaries from the Project.
- 27 Select File Save Project to update the stored entities.
- 28 <u>Do not</u> close the **Project** as it will be used in the next example.

# **Steep and Shallow Roughing Macro**

The development of an *interactive macro* that uses the **Steep and Shallow Finishing** strategy to produce an alternative 3D Roughing process.

Stage -1

- Setting up a **Boolean** variable.
- Use of the **INPUT** option to prompt the user to enter a **Maximum** Thickness value.
- Use of ELSE and ELSEIF statements to filter out invalid input to the Maximum Thickness value.
- Use of DO WHILE loop option that returns the process back to the prompt line to enter a new *Maximum Thickness* if the specified value is invalid.

Stage -2

- Addition of a DO WHILE loop that will continually produce Steep and Shallow Finishing toolpaths. The loop will continue while the progressively, decreasing Thickness value is greater than 0.5.
- Addition of an IF NOT command to allow the macro to recognise and delete an un-calculated toolpath (Thickness value too large for the Toolpath to fit within the Block dimensions).
- Finally each toolpath will be *collision checked* using a Verification Thickness value of 0.5.

# **Development of the StpShlw-RGH-Interactive.mac**

## Stage 1:-

In the Windows Explorer dialog open the file;
 StpShlw-RGH-Interactive.mac in either Wordpad or Notepad.

```
// *** Set up the parameter $thic to use Real values ***
real $thic = 0
$thic = INPUT "Thickness"
//
//
IMPORT TEMPLATE ENTITY TOOLPATH TMPLTSELECTORGUI
"Finishing\Steep-and-Shallow-Finishing.002.ptf"
EDIT PAR 'InterConstzOrder' 'combined'
EDIT PAR 'InterConstzOrder' 'combined'
EDIT PAR 'Overlap' "0"
EDIT PAR 'Overlap' "0"
EDIT PAR 'CutDirection' 'climb'
EDIT PAR 'ShallowCutDirection' 'climb'
EDIT PAR 'RadialDepthOfCut.UserDefined' '1' EDIT PAR 'ShallowStepover.Value' "3"
```

EDIT PAR 'ShallowStrategy' 'raster' EDIT TPPAGE RASTERPAGE EDIT TPPAGE STEEPSHALLOW EDIT PAR 'Tolerance' "0.1" EDIT PAR 'Thickness' \$thic // EDIT TOOLPATH ; REAPPLYFROMGUI EDIT TOOLPATH ; CALCULATE SteepShallowFin ACCEPT DRAW TOOLPATH ; //

The start of this **macro** creates a variable ( that will accept **Real** numbers, and then assigned with an initial value of **0**.

The first task is to create a **Boolean variable** to both prompt the user to enter a value and to test for a valid input.

2 Input the following lines after; real \$thic = 0 (Note: command lines are displayed in Red text).

### // b

// Create a boolean variable which will be used with the "ERROR" function to check the users response

bool \$err = 0 do {

\$thic = INPUT "Enter Maximum Thickness"

// Check the user entered a real number. err will be FALSE if the value is good.

\$err = ERROR \$thic

 $/\!/$  If the users did not enter a good value, print an information message explaining the error.

if \$err {

message error "Thickness Value must be numerical. Please try again."

 $/\!/$  If the user entered a real number less than or equal to 0.5, print an error message.

```
} elseif ($thic <= 0.5) {</pre>
```

message error "Value must be greater than 0.5 --- Please try again."

}

// If the user entered an incorrect value, go back to the "do" command (Ask
for Thickness again!)

```
} while ($err or $thic <= 0.5)
//</pre>
```

- 3 Save the file, but <u>do not</u> close it down as further commands will be added in 'Stage 2' after testing the latest additions.
- 4 Thoroughly test the new features of the **macro** by entering the following invalid inputs at the user prompt stage:-

Enter Maximum Thickness	X
Dave	<b>√ X</b>
C Enter Maximum Thickness	×
C Enter Maximum Thickness	×
Enter Maximum Thickness	× ×
45	× ×



Only the last 2 user inputs are valid, allowing the **macro** to continue processing beyond this stage.

The *Maximum Thickness* value **1** entered above is the only user input that produces a physical **Toolpath**.

When the valid, input value **45** is entered above, an uncalculated **Toolpath** appears in the **PowerMILL** *explorer*. This is due to **Thickness** value of **45** being fully outside the **Block** dimensions relative to the **Model** form.

In 'stage 2' some **command lines** will be added that will automatically delete any resultant, uncalculated **Toolpaths**.

5 Assuming all the above checks out, you are now ready to proceed to Stage 2.

### Stage 2:-

A second **Boolean variable** (\$count) will be added at the start of the **macro** that will only accept **Integer** values. It will be assigned with a default value of **0**.

6 Input the following line int \$count = 0 between the existing lines:-

```
bool $err = 0
int $count = 0
do {
```



The default value **Boolean variable** value 0 must be input before the start of the do loop.

7 Just after the do – while options and immediately before the Steep and Shallow, set up and machining commands insert the following:-

```
//
$Count = $thic/2
While Count > 0 {
//
```

The **\$Count**, integer value is based on the **Maximum Thickness** value divided by 2. This will allow for the **Thickness** value being progressively reduced by 2 for each subsequent toolpath.

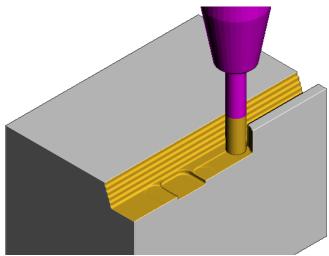
8 Immediately following the **Steep and Shallow**, set up and machining commands insert the following:-

```
//
$Count = Count - 1
$thic - $thic - 2
}
//
```

The current value stored in **Count**, is reduced by 1 and **thic** by 2 ready for the return to the start of the **do** loop ().

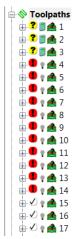
- 9 Save the file, but <u>do not</u> close it down as further commands will be added in after testing the latest additions.
- 10 Test the new features of the **macro** by entering 24 as the **Maximum Thickness** value at the user prompt stage:-

It will be noted that the first **Toolpath** listed in the **PowerMILL** *explorer* is taking a heavy cut into the material block. The **Maximum Thickness** prompt needs a higher value to allow for the maximum distance between the **model** and the **block**.

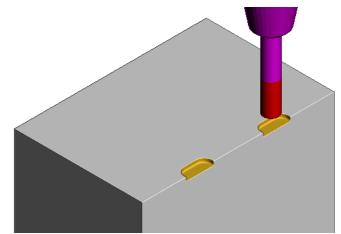


11 Delete all toolpaths and re-run the macro but this time with 46 as the *Maximum Thickness* value at the user prompt stage:-

It will be noted that 3 un-processed **Toolpaths** exist at the start of the list in the **PowerMILL** *explorer*.



However the first of the *calculated* toolpaths (4) in the list is applying the required depth of cut of around 2mm.

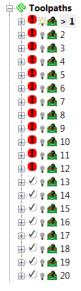


If a **toolpath** cannot be calculated (due to being outside the **Block** limits) then the **macro** can be set up to delete it from within the **DO** – **WHILE** loop.

29 At the end of the current macro, just before the updates to \$Count and \$thic add the following command lines:-

```
//
IF NOT computed {
  Delete Toolpath ;
  }
//
//
$Count = Count - 1
$thic - $thic - 2
  }
//
```

- **30 Save** the file, but <u>do not</u> close it down as further commands will be added in after testing the latest additions.
- 31 Delete all **Toolpaths** in the **PowerMILL** explorer.
- 32 Test the new features of the **macro** by entering 46 as the **Maximum Thickness** value at the user prompt stage:-
- 33 This time there are no un-calculated toolpaths in the **PowerMILL** explorer list. The first **Toolpath** in the list is applying the required 1<sup>st</sup> depth of cut of around 2mm (as shown in the previous image).



Most of the **Toolpaths** in the top half of the above list are displaying the red gouge/collision warning. This has occurred due to the high **Thickness v**alue used.

The final stage for the **Interactive** part of the **macro** is to apply a *gouge check* to all toolpaths using a **Verification Thickness** value of **0.5**.

This will be inserted at the end of the **DO** – **WHILE** loop just after the check and deletion operation for an un-calculated **Toolpath**.

- 34 Record a temporary macro containing the necessary commands to perform a gouge check that uses a separate Verification Thickness:-
- 35 Insert the contents of the temporary macro at the end of the main macro, just before the updates to \$Count and \$thic:-

EXPLORER SELECT Toolpath ; NEW FORM COLLISION EDIT COLLISION TYPE GOUGE EDIT COLLISION STOCKMODEL\_CHECK N EDIT COLLISION SCOPE ALL EDIT COLLISION SPLIT\_TOOLPATH N EDIT PAR 'Verification.UseVerificationThickness' 1 EDIT PAR 'Verification.Thickness' "0.5" EDIT COLLISION APPLY COLLISION ACCEPT

//

```
$Count = Count - 1
$thic - $thic - 2
}
//
```

The final addition to the *interactive* part of the **macro** is to stop **PowerMILL** from issuing *messages* while the **toolpath verification** process is running.

**36** Insert the following lines (shown red) before and after the **toolpath verification** command section as shown below.

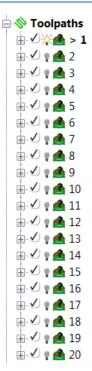
```
//
// *** Temporarily switch off messages ***
DIALOGS MESSAGE OFF
11
EXPLORER SELECT Toolpath ; NEW
FORM COLLISION
EDIT COLLISION TYPE GOUGE
EDIT COLLISION STOCKMODEL CHECK N
EDIT COLLISION SCOPE ALL
EDIT COLLISION SPLIT TOOLPATH N
EDIT PAR 'Verification.UseVerificationThickness' 1
EDIT PAR 'Verification. Thickness' "0.5"
EDIT COLLISION APPLY
COLLISION ACCEPT
11
// *** Switch on messages ***
DIALOGS MESSAGE ON
//
```



Note it is good policy to include **comment lines** wherever appropriate to explain key actions in the macro (An example of one shown above:-// \*\*\* Switch on messages\*\*\*).

- 37 Save the file, but <u>do not</u> close it down as further commands will be added in after testing the latest additions.
- 38 Delete all Toolpaths in the PowerMILL explorer.
- **39** Test the new features of the **macro** by entering **46** as the **Maximum Thickness** value at the user prompt stage:-

This time all toolpaths should display the **tool**, **gouge safe** symbol (black tick on white background).



# **Exercise**

The **macro** is currently creating a series of toolpaths with progressively decreasing **Thickness** values that start at the user's max specified value reducing in steps of **2**.

40 Copy the original, Steep and Shallow finishing command lines from the macro and Paste back in after the DO – WHILE process.



No need to include the recently added toolpath verification command lines!

- 41 Change the new section to produce a final pass with a fixed **Thickness** value of **0.5**.
- 42 Save the file.
- 43 Delete all Toolpaths in the PowerMILL explorer.
- 44 Test the new features of the **macro** by entering 46 as the **Maximum Thickness** value at the user prompt stage:-

The toolpaths produced should start from the initially **entered** max **Thickness** value of **46**, progressively drop down in increments of 2 with the final passes being performed a **2** and **0.5** respectively.

If an **odd** value for **max thickness** is entered then the final 2 passes will be performed at 3 and 0.5 respectively!

# End of Exercise section!