

Creo TOOL DESIGN

Creo Tool Design course has been developed with great emphasis on the practical application of the software to solve real world problems. The self-study course starts from the very basic concepts and teaches advanced techniques step by step. After completing the course an Engineer or Designer will be able to create the advanced parting geometry, split the mold into Core and Cavity halves, create Sliders and Lifters, define multi-cavity molds, create runners, gates, sprue, cold slugs, create cooling channel and check their clearance from neighboring surfaces.

The training material is divided into sections. Each section is accompanied with exercises to practice the concepts learned.

1. [Introduction](#)
2. [Parting Surfaces](#)
 - a. [Manual Parting Surfaces](#)
 - b. [Automatic Parting Surfaces](#)
3. [Sliders and Lifters](#)
4. [Multi-Cavity Molds](#)
5. [Feed System and Molding](#)
6. [Water Line and Ejector Pins](#)
7. [Mold Analysis](#)
8. [Mold Layout And EMX](#)

Prerequisites

The user should have basic concepts in the following

- 1) Solid Modeling
- 2) Surface Modeling
- 3) Assembly

Stats

Total Pages: **662**

Total Exercises: **38**

INTRODUCTION

The Introduction section elaborates the following concepts.

- ❖ Manufacturing model
- ❖ Reference model
- ❖ Shrinkage
- ❖ Automatic workpiece
- ❖ Concept of Accuracy in Creo MOLD
- ❖ Analyzing a part for its moldability
- ❖ Concept of Parting Surface
- ❖ How a split works
- ❖ Creating mold components

EXERCISE 1

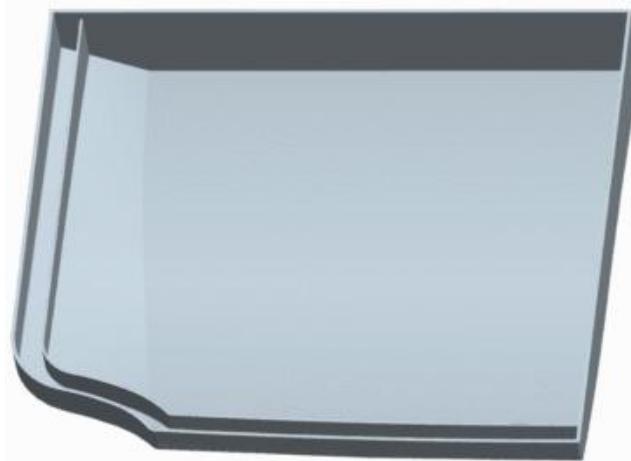
In this exercise user will practice the following

- ❖ Creating a new manufacturing model
- ❖ Assembling the reference model
- ❖ Analyzing the part with Draft Check tool for its moldability
- ❖ Analyzing the part for uniform thickness using Thickness Check tool
- ❖ Adding shrinkage to reference model
- ❖ Creating the Automatic workpiece
- ❖ Defining the style state for workpiece
- ❖ Creating the Flat parting surface.
- ❖ Splitting the workpiece into two volumes
- ❖ Extracting components out of split volumes
- ❖ Creating an Extruded parting surface
- ❖ Splitting a volume to One Volume
- ❖ Splitting a volume to Two Volumes

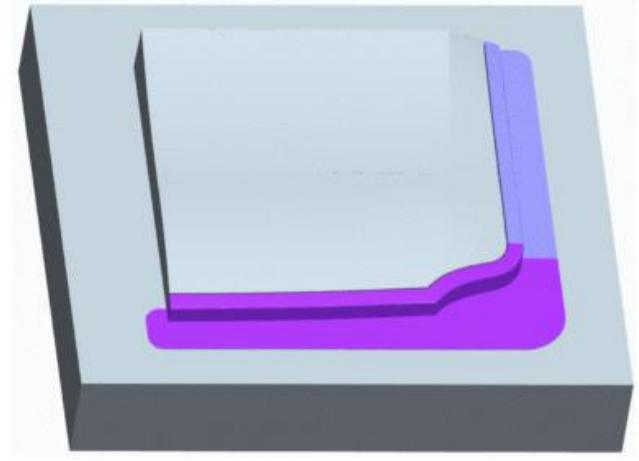
EXERCISE 2

In this exercise user will practice the following

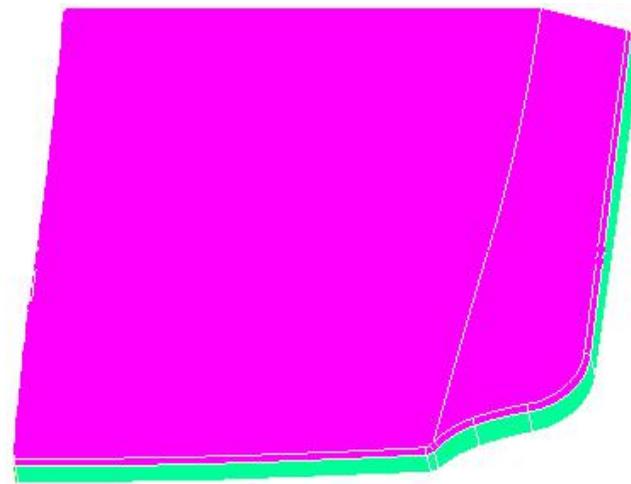
- ❖ Retrieving a mold model
- ❖ Redefining the Workpiece
- ❖ Modifying a parting surface



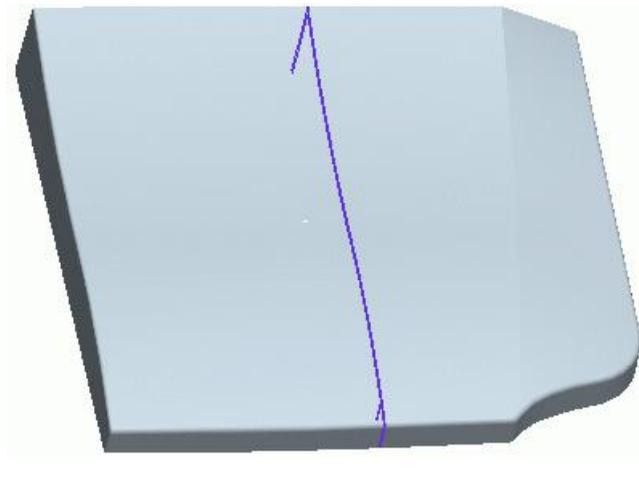
Reference Part



Creating a Multi-Insert Core



Analyzing with Draft Check Tool



Analyzing with Thickness Check Tool

PARTING SURFACES

In this section we will learn in detail how to build parting surfaces for simple and complex parts using manual and automatic techniques.

Manual Parting Surfaces

In this sub-section we will learn how to build the parting surfaces using manual surfacing techniques i.e. Extrude, Revolve, Surface Copy, Advanced Variable Section Sweep, Flat, Offset and Free Form surfaces.

EXERCISE 1

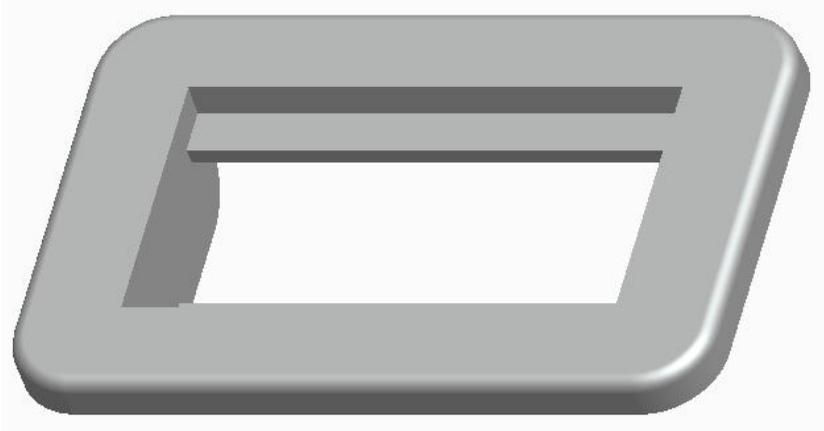
In this exercise user will practice the following

- ❖ Creating a parting surface by using Extrude tool
- ❖ Creating a parting surface by using Flat tool
- ❖ Splitting the workpiece into two volumes using multiple parting surfaces

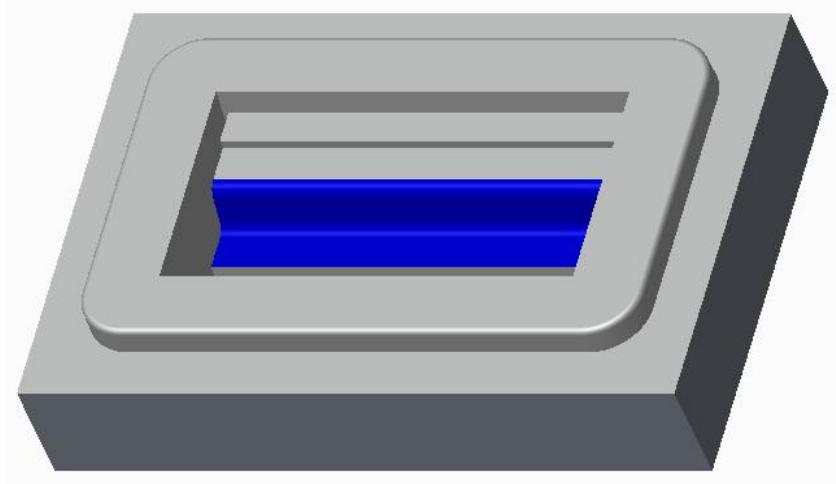
EXERCISE 2

In this exercise user will practice the following

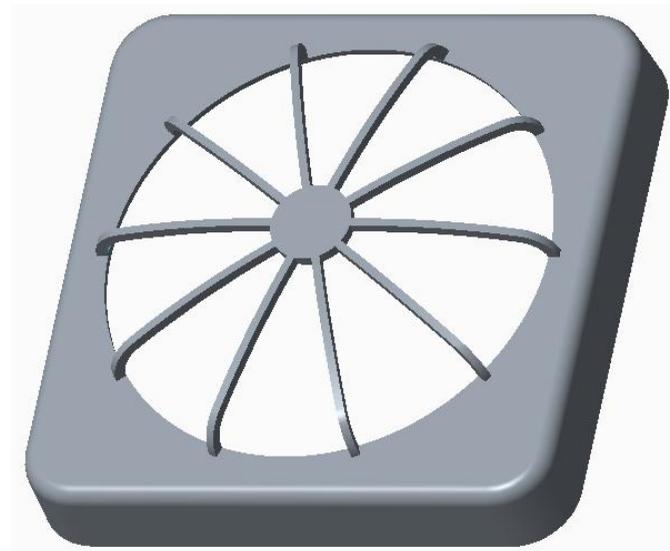
- ❖ Creating a parting surface by using Revolve tool



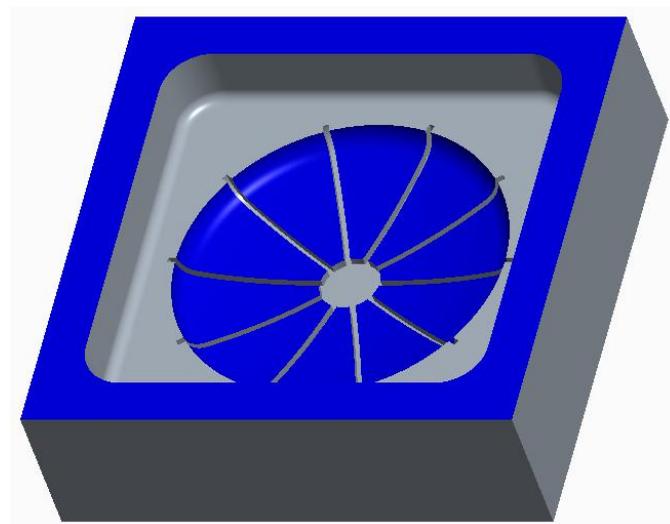
Reference Part



Core



Reference Part



Cavity

EXERCISE 3

In this exercise user will practice the following

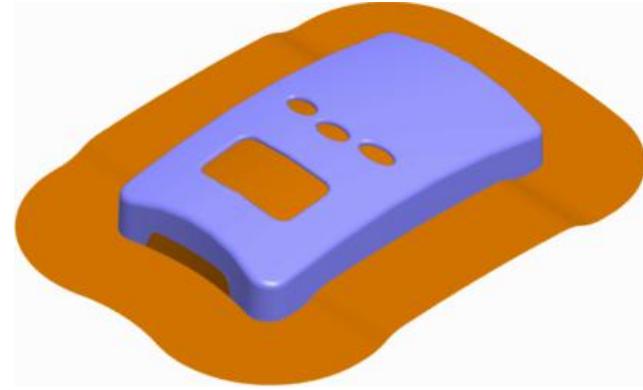
- ❖ Creating the parting surface using Copy Surface and Variable Section Sweep technique
- ❖ Splitting the workpiece into two volumes using multiple parting surfaces.
- ❖ Extracting components out of split volumes.



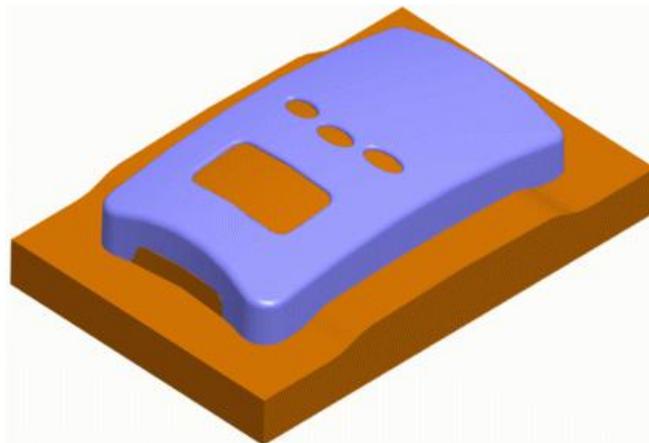
EXERCISE 4

In this exercise user will practice the following

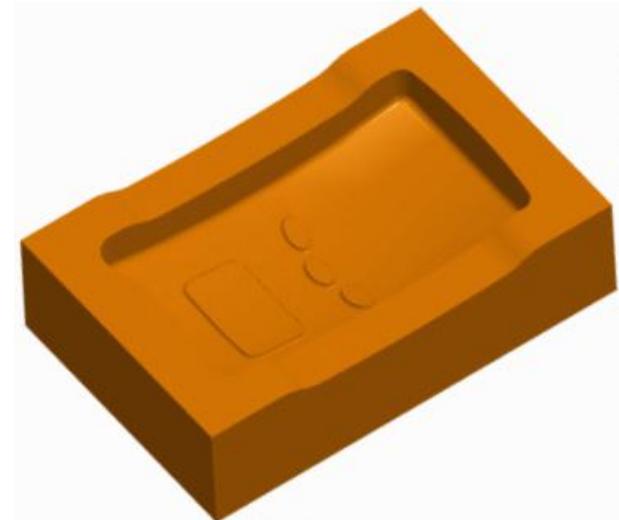
- ❖ Analyzing the part with Draft Check tool to determine the suitable location of parting surface
- ❖ Filling the loops in a Copy surface
- ❖ Creating an Offset parting surface
- ❖ Creating the parting surface using “untrim” technique
- ❖ Trimming a surface using edges of the reference part
- ❖ Merging the surfaces
- ❖ Splitting the workpiece into two volumes using multiple parting surfaces.



Parting Surface and Reference Part



Core Half with Reference Part

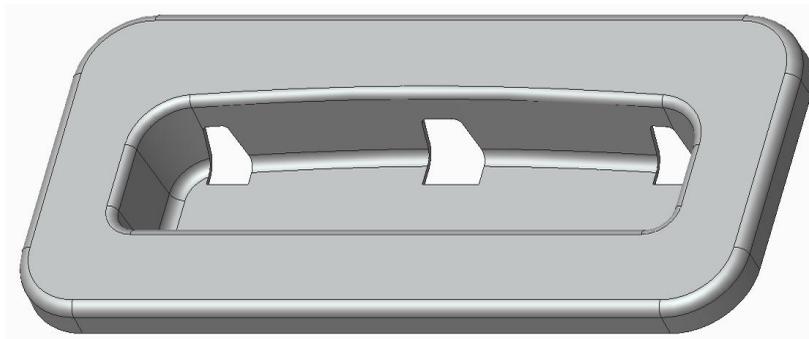


Cavity

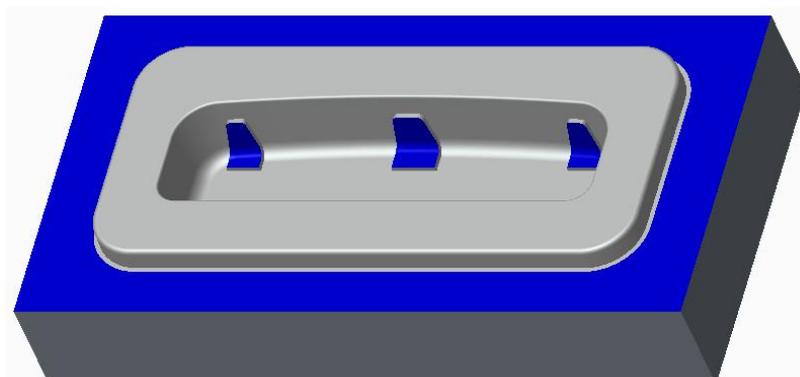
EXERCISE 5

In this exercise user will practice the following

- ❖ How to fill a cut that cannot be filled with regular Creo Tool Design tools



Reference Part



Cavity

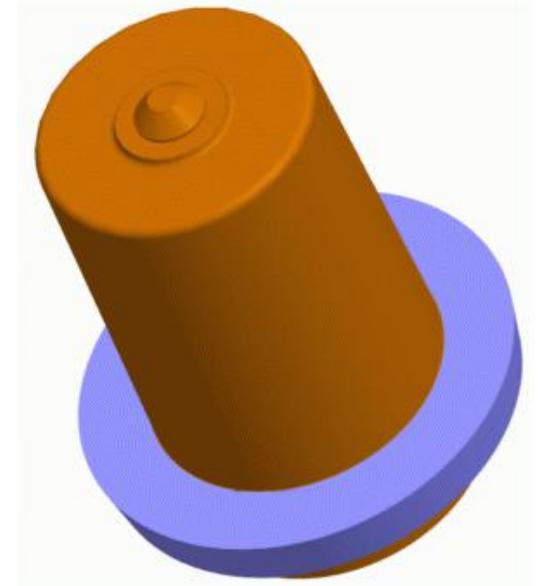
EXERCISE 6

In this exercise user will practice the following

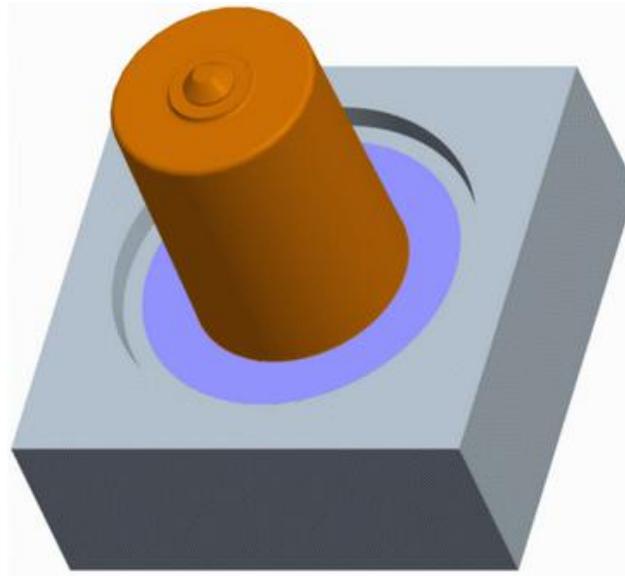
- ❖ Creating a revolved surface
- ❖ Creating parting surface interlocks
- ❖ Creating stripper ring for ejecting the part off the Core



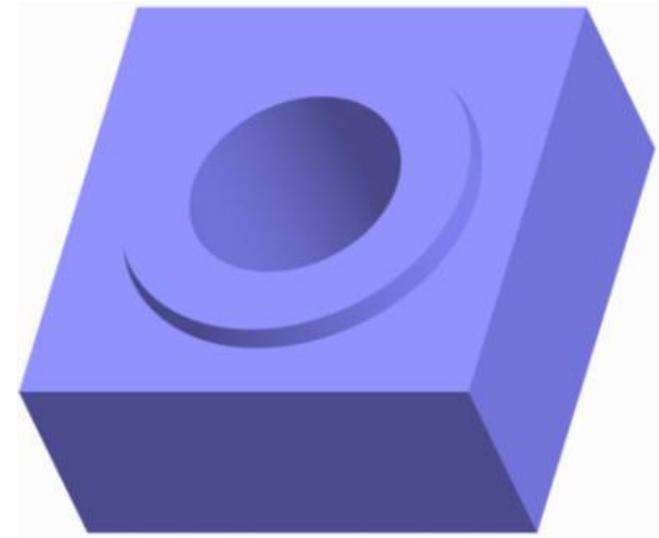
Reference Part



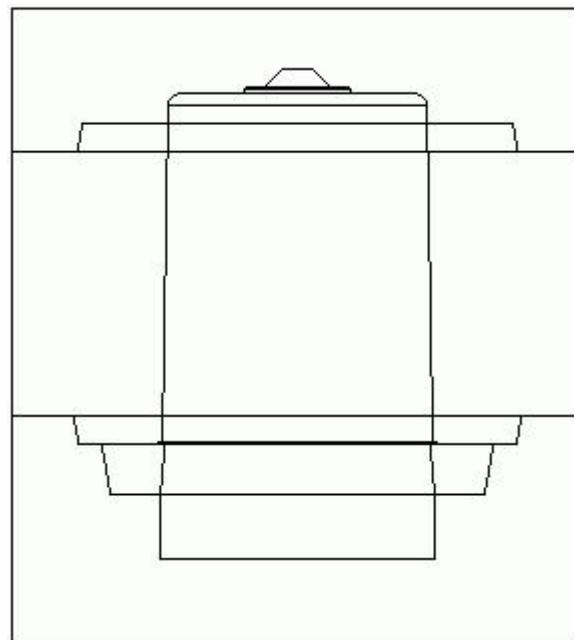
Core Insert with Stripper Ring



Moving Half: Core Insert, Stripper Ring and Base Plate



Cavity Plate with Interlocks



Complete Mold

EXERCISE 7

In this exercise user will practice the following

- ❖ How to create the local insert
- ❖ How to split a mold that requires a local insert



Reference Part

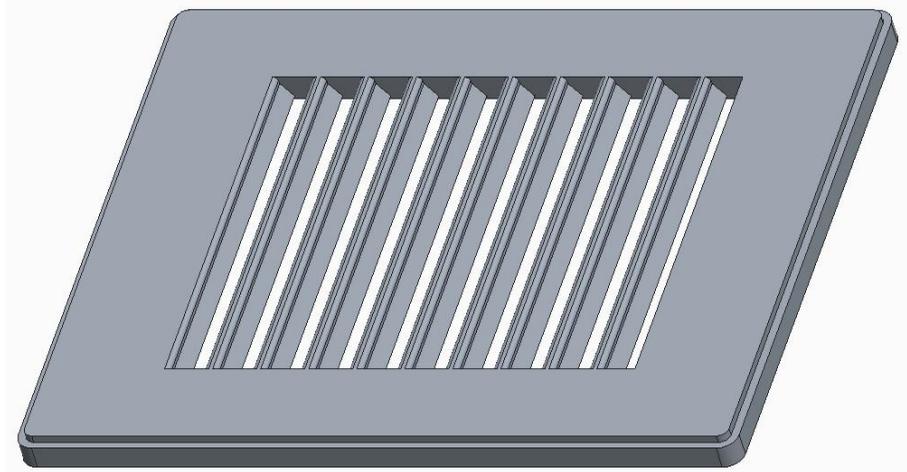


Cavity and Insert

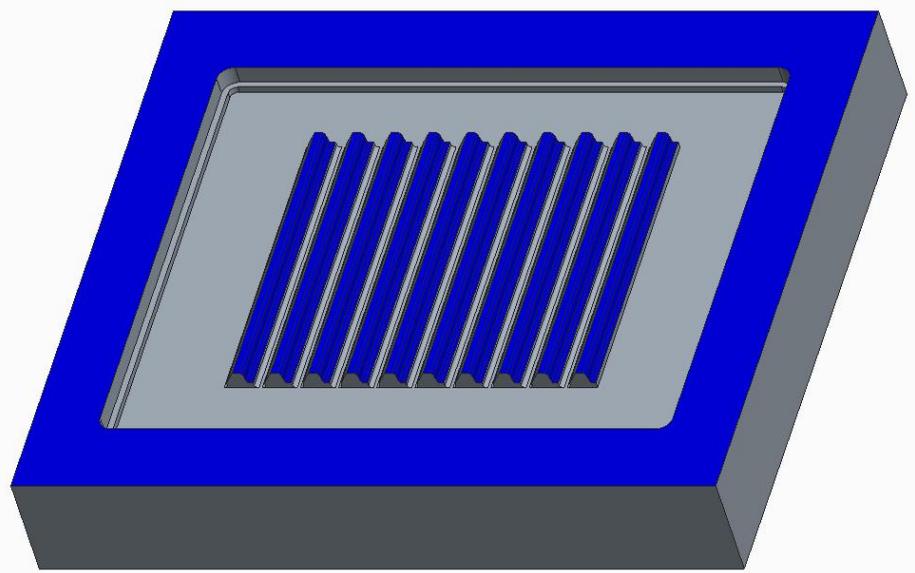
EXERCISE 8

In this exercise user will practice the following

- ❖ How to reference pattern a parting surface



Reference Part

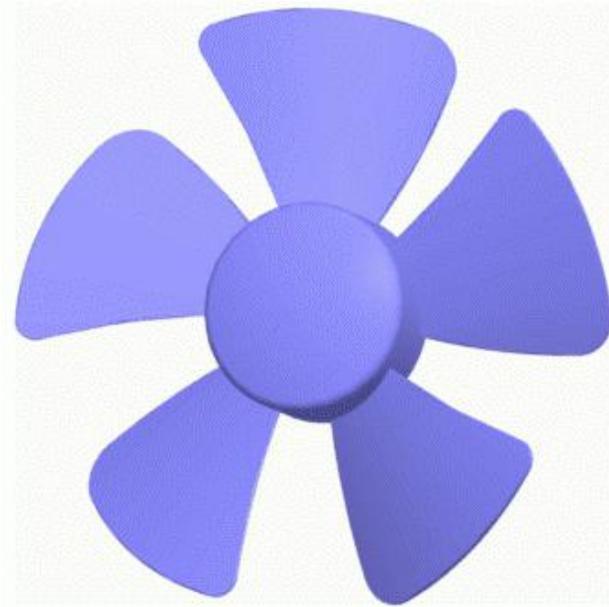


Core

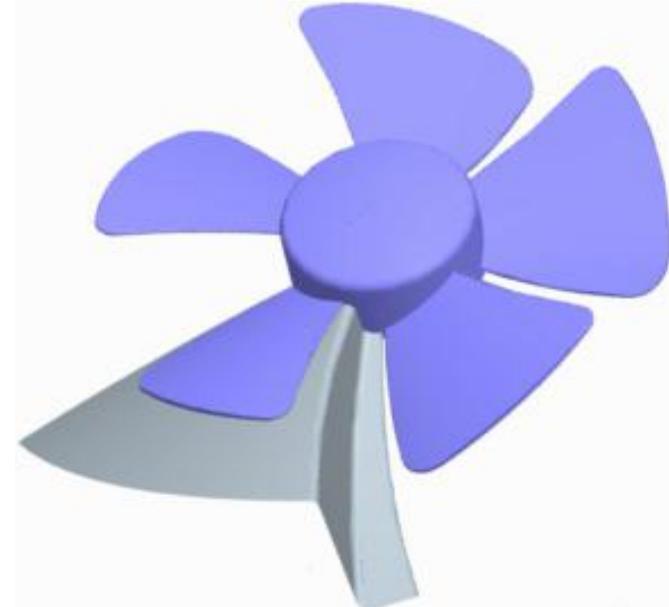
EXERCISE 9

In this exercise user will practice the following

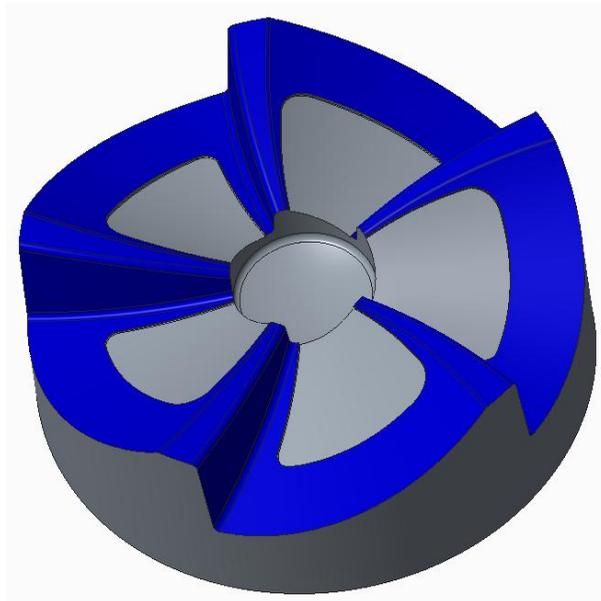
- ❖ Creating a round workpiece
- ❖ Trimming a surface to desired size
- ❖ Transforming a surface
- ❖ Creating variable section sweep surfaces
- ❖ Merging the surfaces
- ❖ Patterning a parting surface



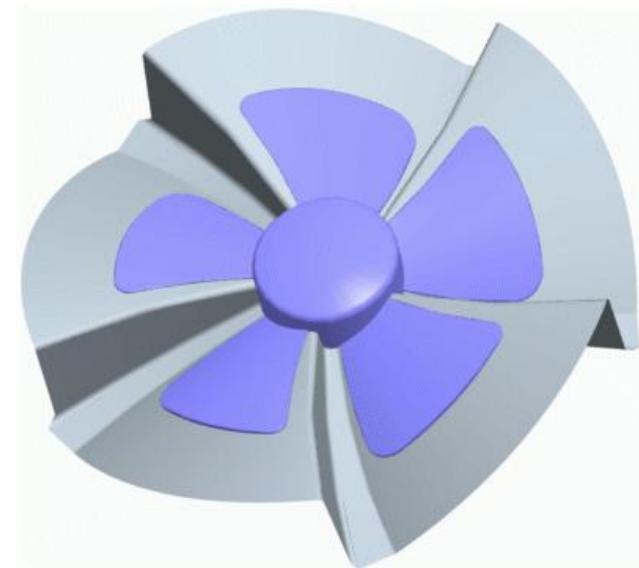
Axial Fan



Parting Surface for a single wing



Cavity Half



Parting Surface and Reference Part

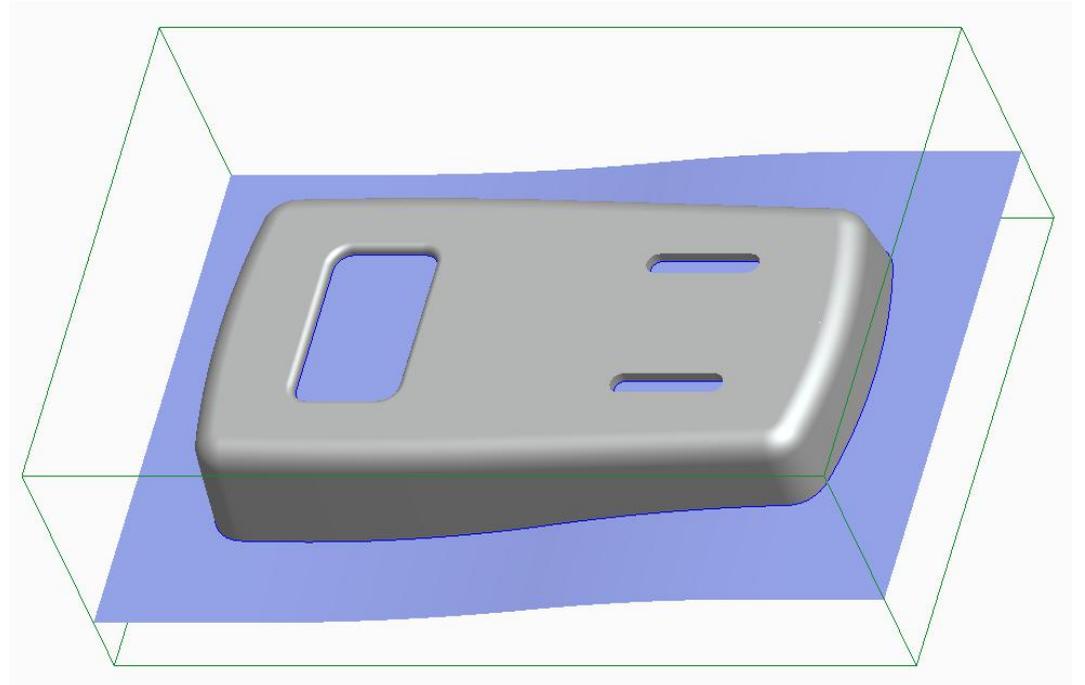
Automatic Parting Surfaces

In this section we will learn how to build the parting surfaces using Silhouette Curve and Skirt Surface techniques.

EXERCISE 1

Topics covered in this exercise are as follows

- ❖ Creating an Automatic Parting Line using Silhouette Curve
- ❖ Creating the Automatic Parting Surface using Skirt feature

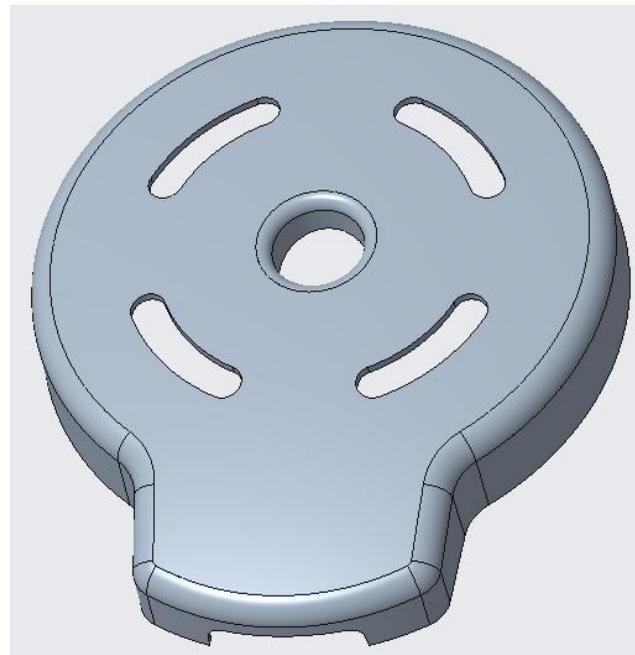


Reference part with skirt parting surface

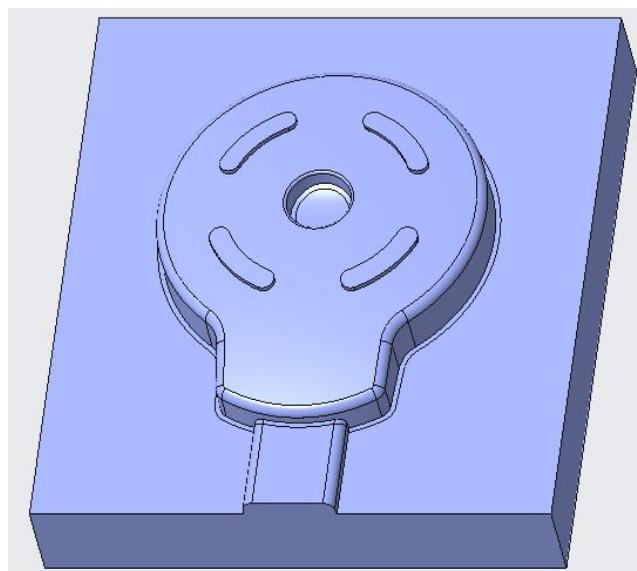
EXERCISE 2

Topics covered in this exercise are as follows

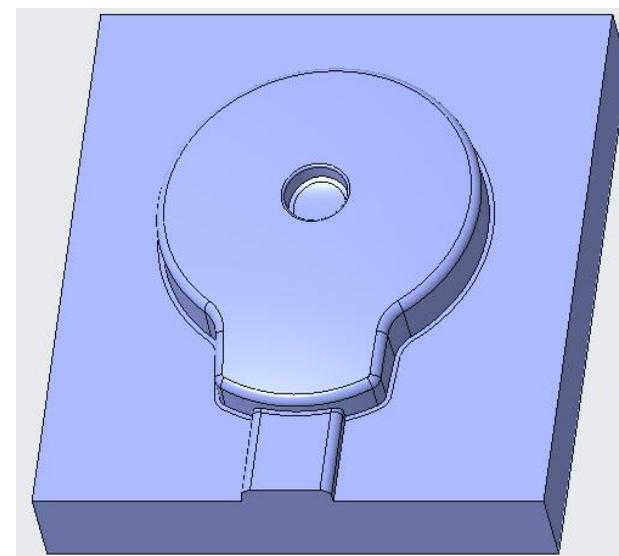
- ❖ Creating an Automatic Parting Line using Silhouette Curve
- ❖ Creating the Automatic Parting Surface using Skirt feature
- ❖ Selecting the required loop for non-drafted walls



Reference Part



Design 1: Projections on core



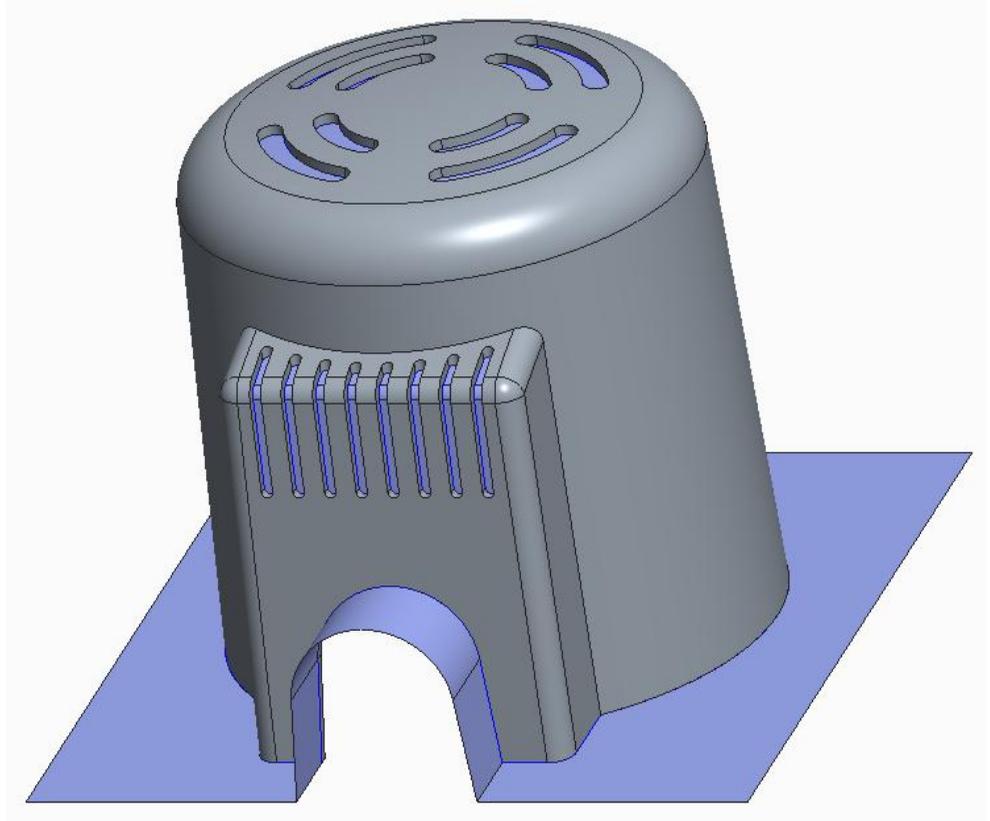
Design 2: Projections in cavity

Design options while handling Non-Drafted Walls

EXERCISE 3

Topics covered in this exercise are as follows

- ❖ How the Direction of Silhouette Curve affects the resultant curve



Reference Part with parting surface

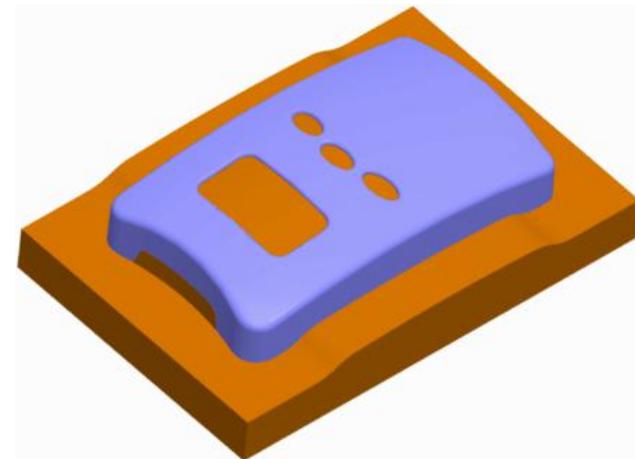
EXERCISE 4

Topics covered in this exercise are as follows

- ❖ Creating an Automatic Parting Line using Silhouette Curve
- ❖ Creating the Automatic Parting Surface using Skirt feature
- ❖ Customized filling of inner loops using Loop Closure option



Reference Part



Design 1



Design 2

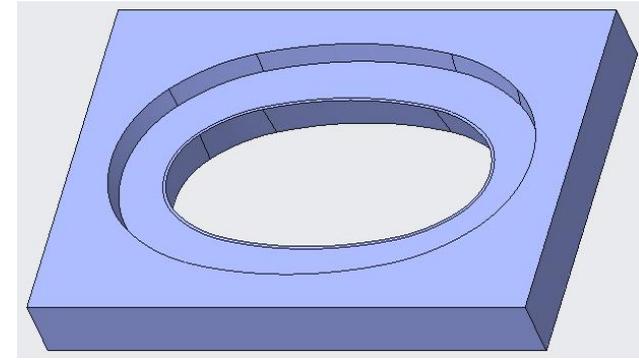
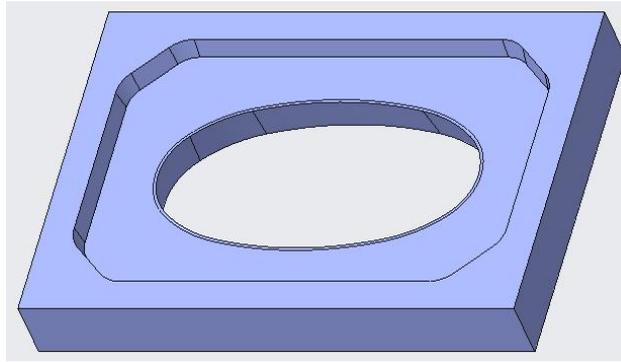
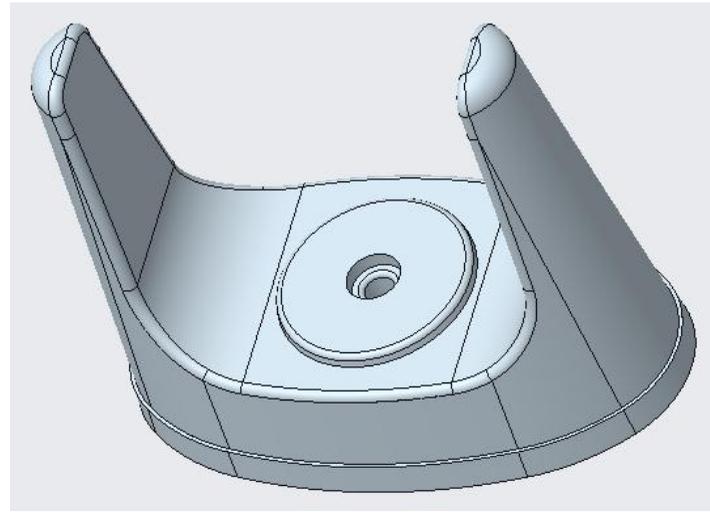


Design 3

EXERCISE 5

Topics covered in this exercise are as follows

- ❖ Creating a slider for undercut condition
- ❖ Handling undercuts during Silhouette curve definition
- ❖ Using the Shutoff functionality of skirt surface to create parting surface interlocks



Stripper Plate with Interlock -- Design 1

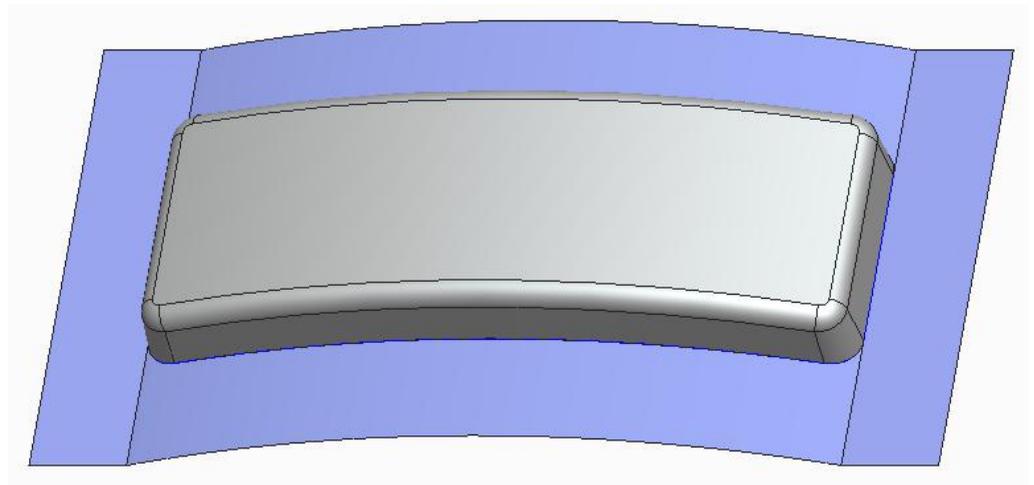
Stripper Plate with Interlock -- Design 2

Skirt Surface: Different Shutoffs

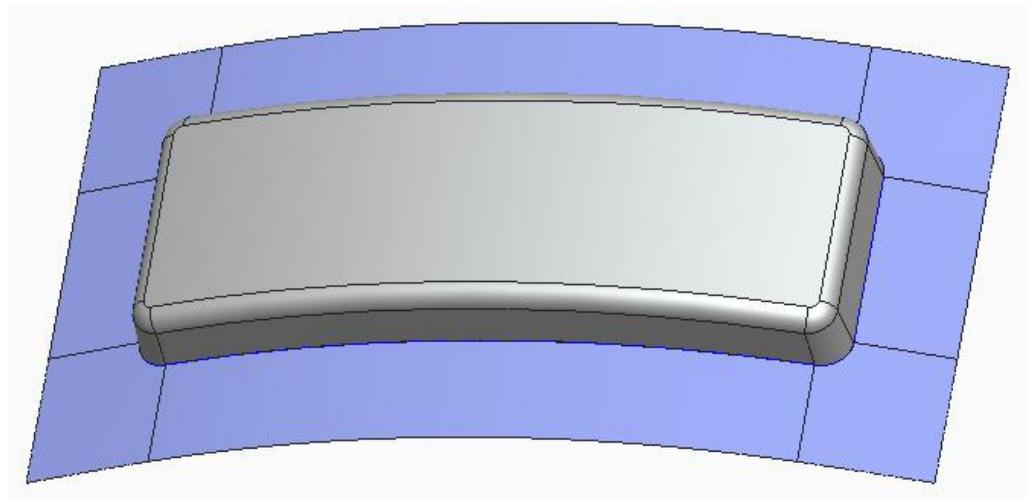
EXERCISE 6

Topics covered in this exercise are as follows

- ❖ How to control the tangency of the skirt surface with reference part surfaces



Parting surface without Tangency conditions

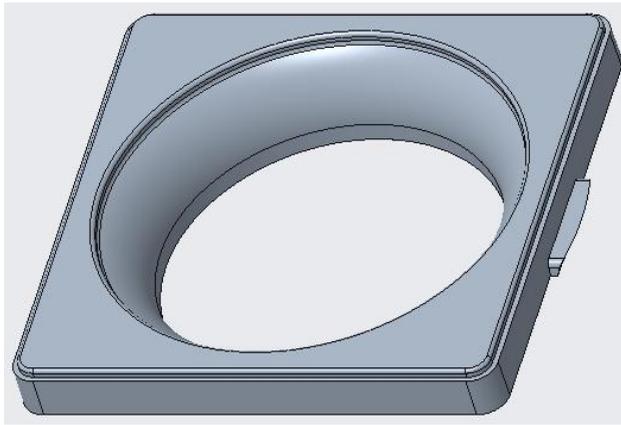


Parting surface with Tangency conditions

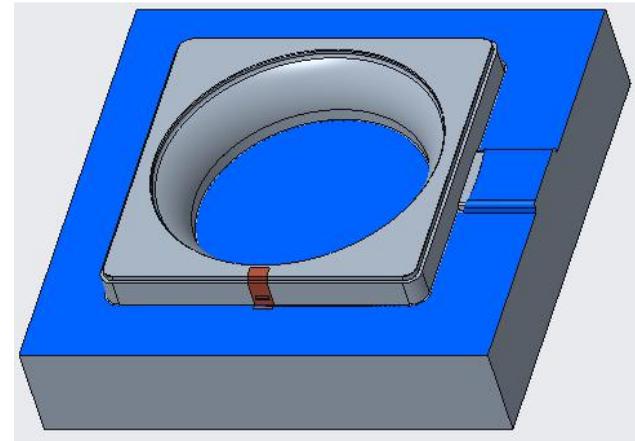
EXERCISE 7

Topics covered in this exercise are as follows

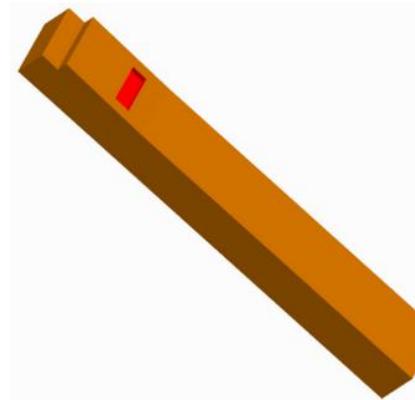
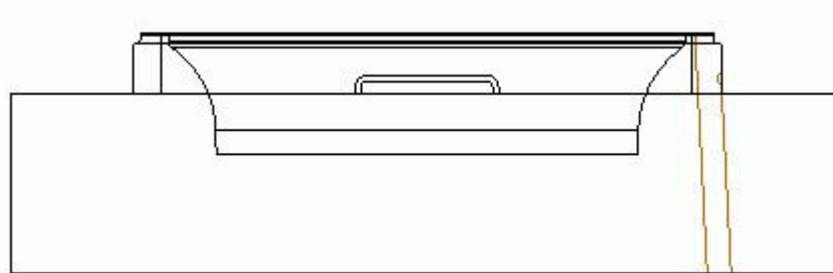
- ❖ Creating an Automatic Parting Line using Silhouette Curve
- ❖ Creating the Automatic Parting Surface using Skirt feature
- ❖ Using the Extension Control dialog box to exclude the unwanted segments of the selected curve from extension process.
- ❖ Using the Extension Control dialog box to change the default direction of extension for skirt surface
- ❖ Creating a lifter to form the undercut in reference part



Reference Part



Core with Lifter

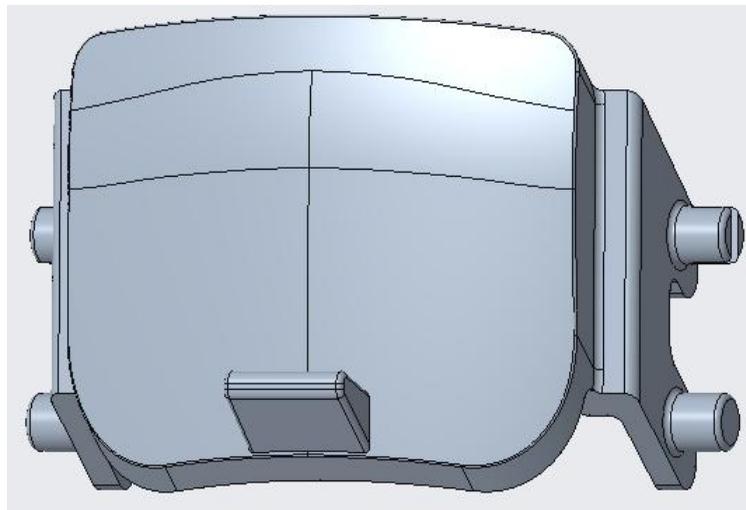


Lifter

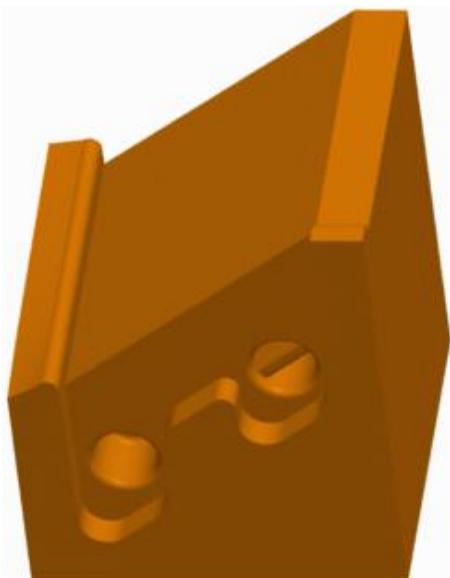
EXERCISE 8

Topics covered in this exercise are as follows

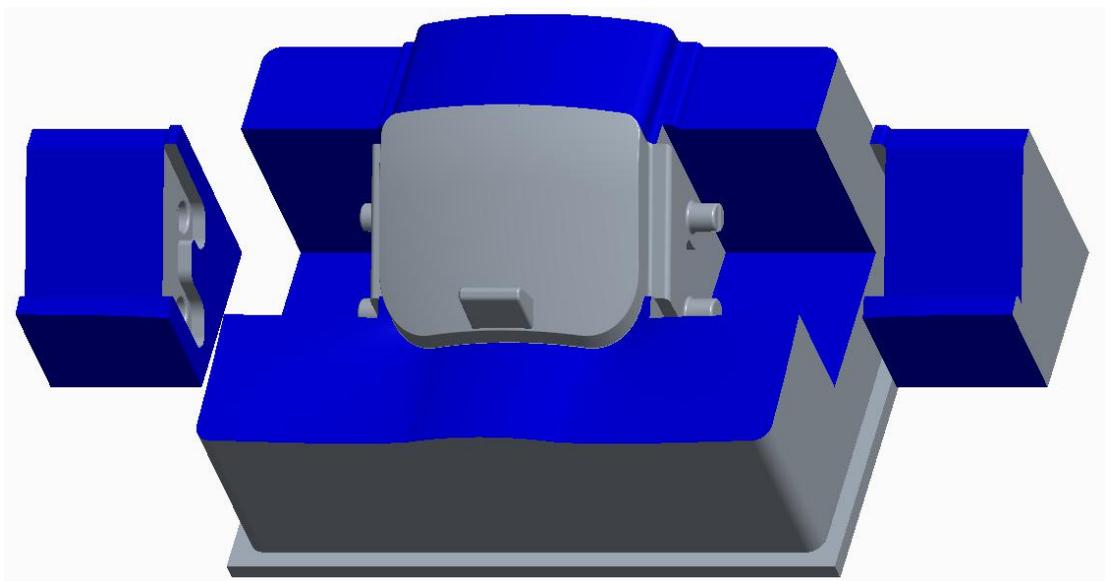
- ❖ Adding a flange to the Automatic workpiece
- ❖ Creating an Automatic Parting Line using Silhouette Curve
- ❖ Excluding the unwanted Loops of Silhouette Curve
- ❖ Creating the Skirt surface for only the selected segments of silhouette curve
- ❖ Defining multiple skirt surface features within single parting surface
- ❖ Creating sliders



Reference Part



Slider



Core with Sliders

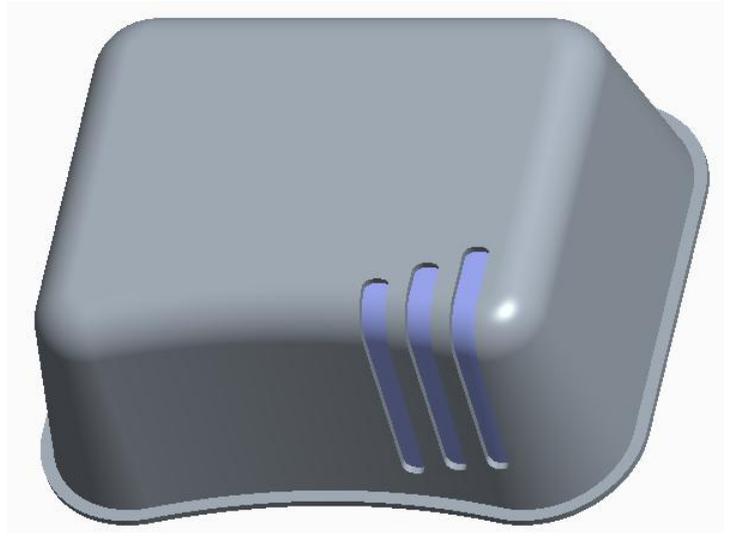
EXERCISE 9

Topics covered in this exercise are as follows

- ❖ Creating a parting surface using the Shutoff tool



Reference Part



Shutoff parting surface

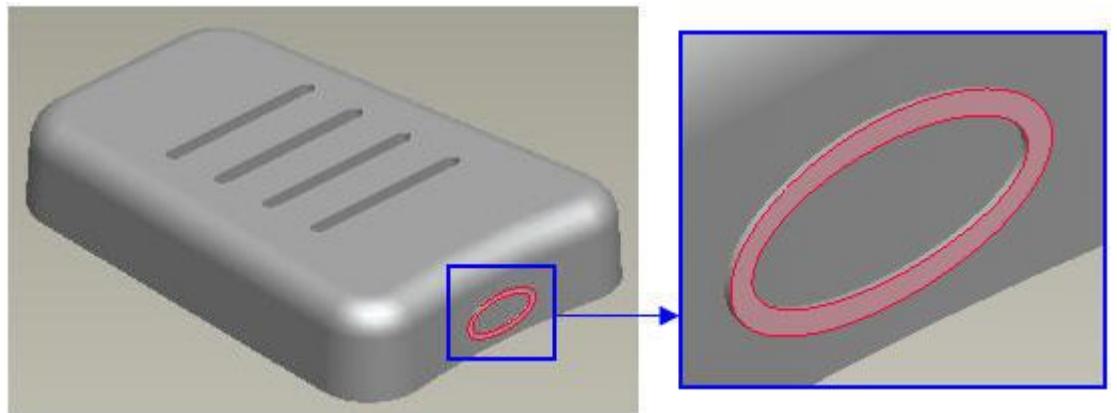
SLIDERS AND LIFTERS

Sliders and lifters are an essential part of the mold assembly as they allow to form the undercuts in the product. In the following exercises we will learn different techniques to create the sliders and lifters with least effort.

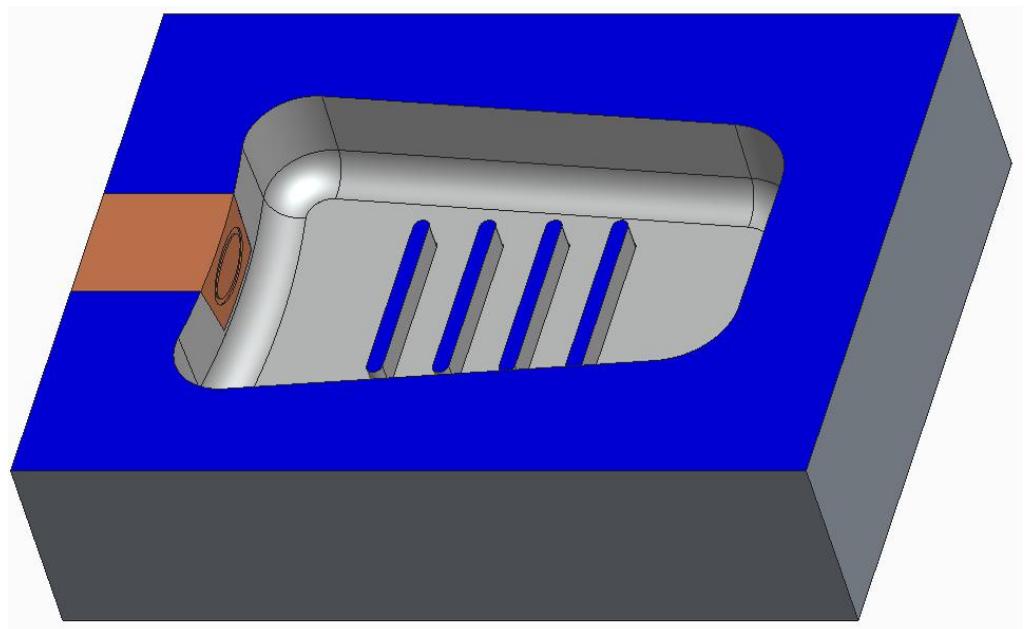
EXERCISE 1

Topics covered in this exercise are as follows

- ❖ Creating a slider for an undercut



Reference Part

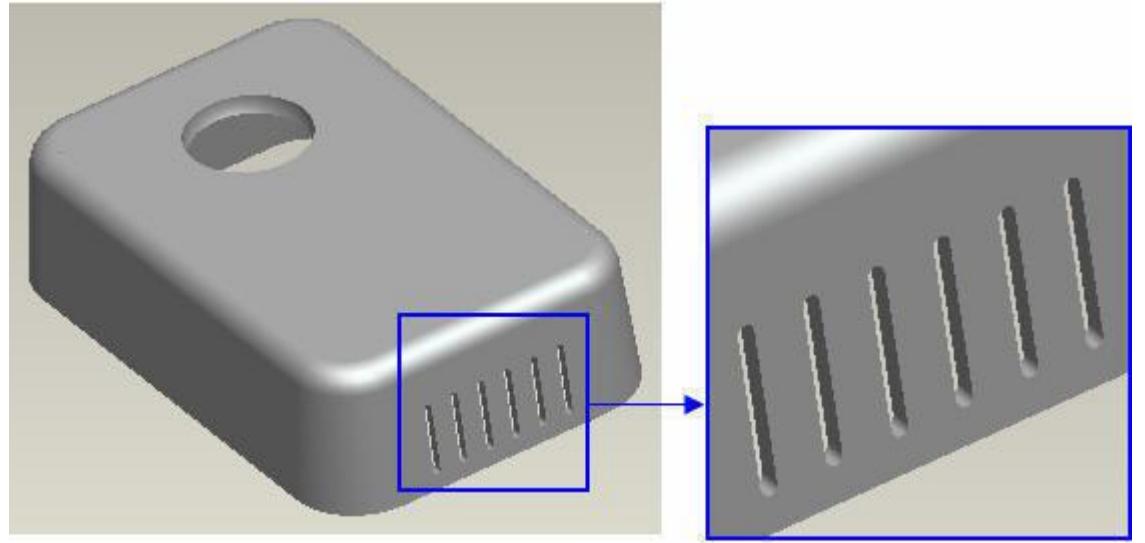


Cavity and Slider

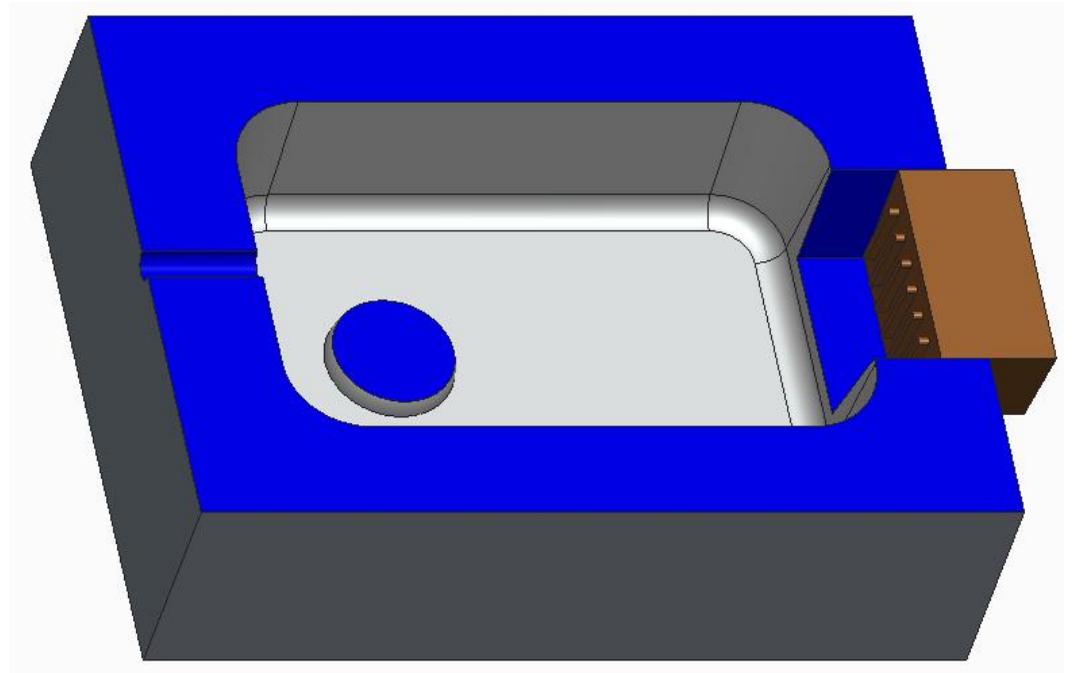
EXERCISE 2

Topics covered in this exercise are as follows

- ❖ Creating a Slider for the openings in the side wall of the reference part.



Reference Part

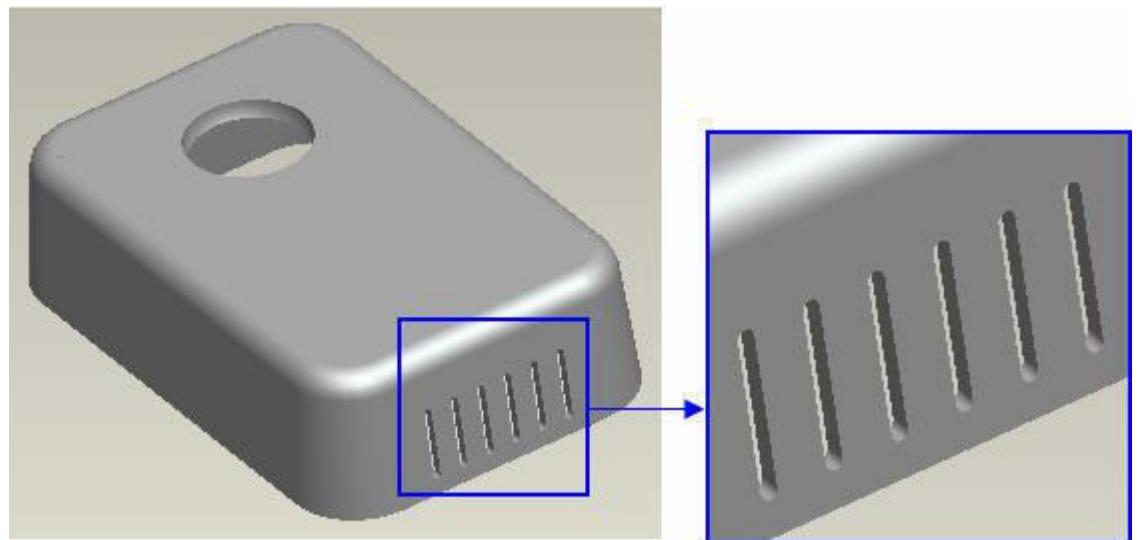


Cavity and Slider

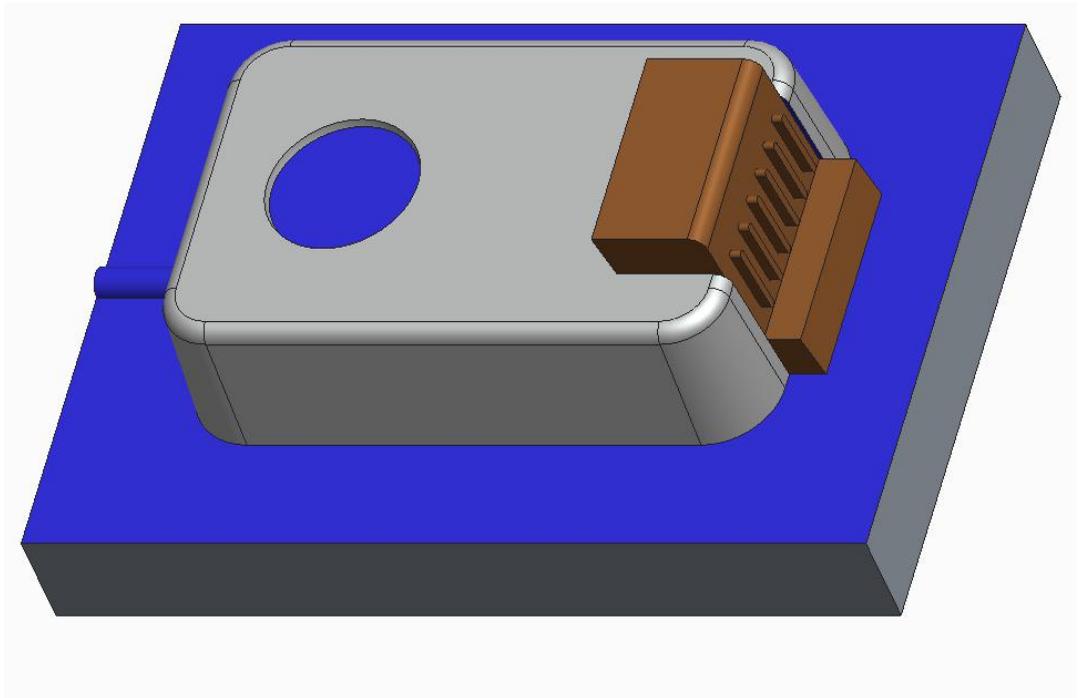
EXERCISE 3

Topics covered in this exercise are as follows

- ❖ Creating a Lifter for the openings in the side wall of the reference part.



Reference Part

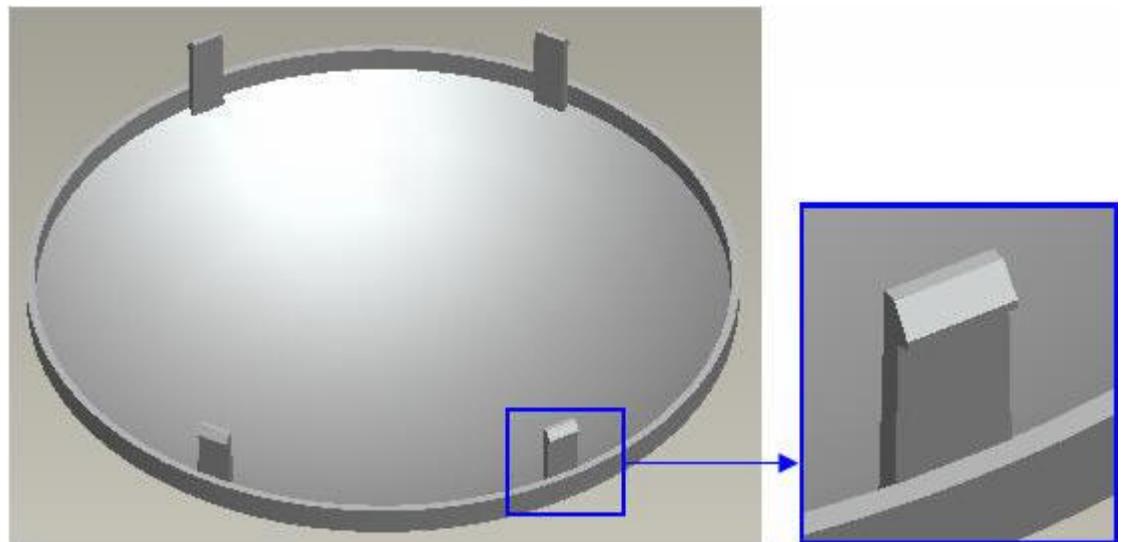


Lifter and Core

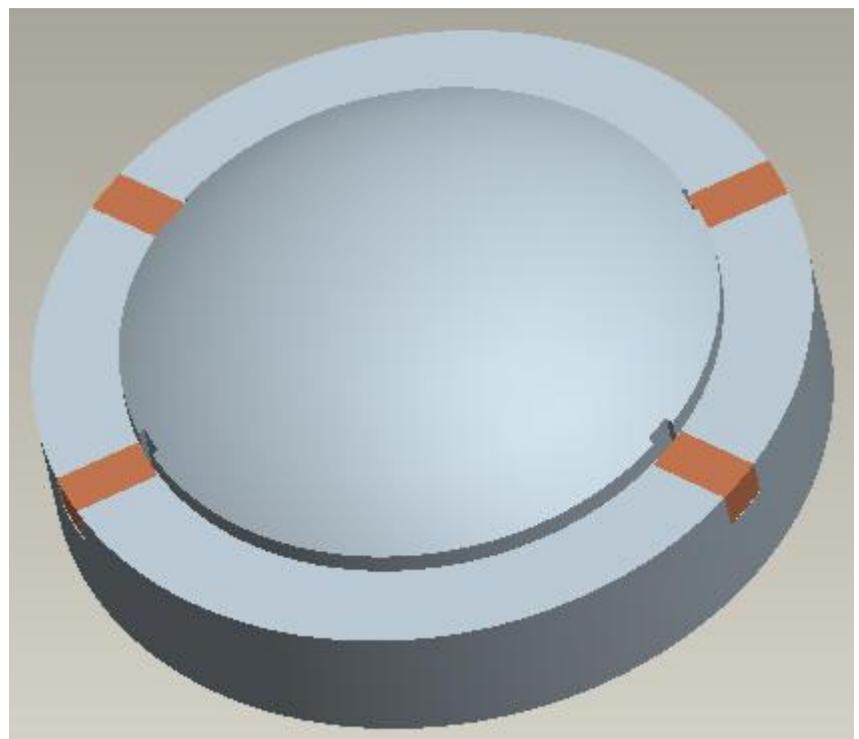
EXERCISE 4

Topics covered in this exercise are as follows

- ❖ Creating a Slider for a cantilever snap
- ❖ How to reference pattern a volume.



Reference Part

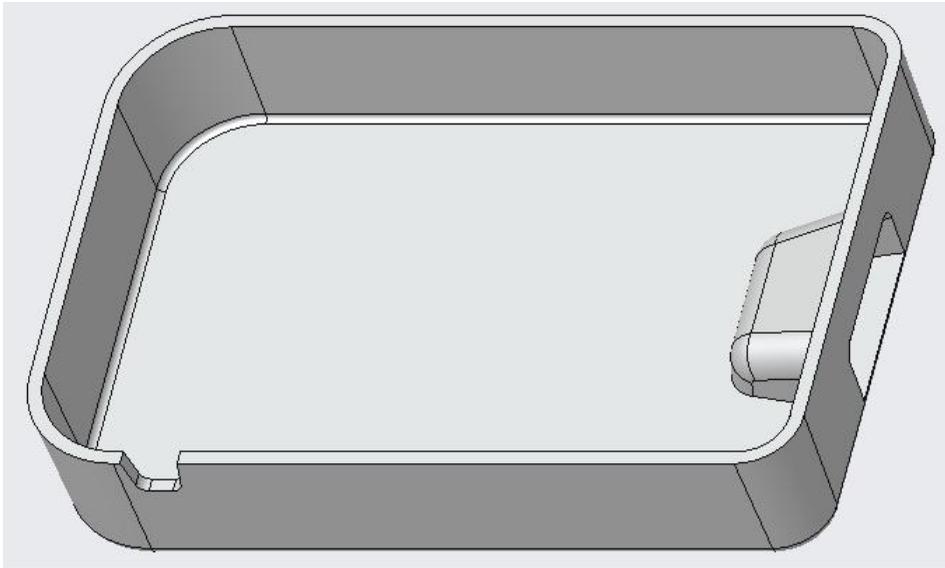


Core and Sliders

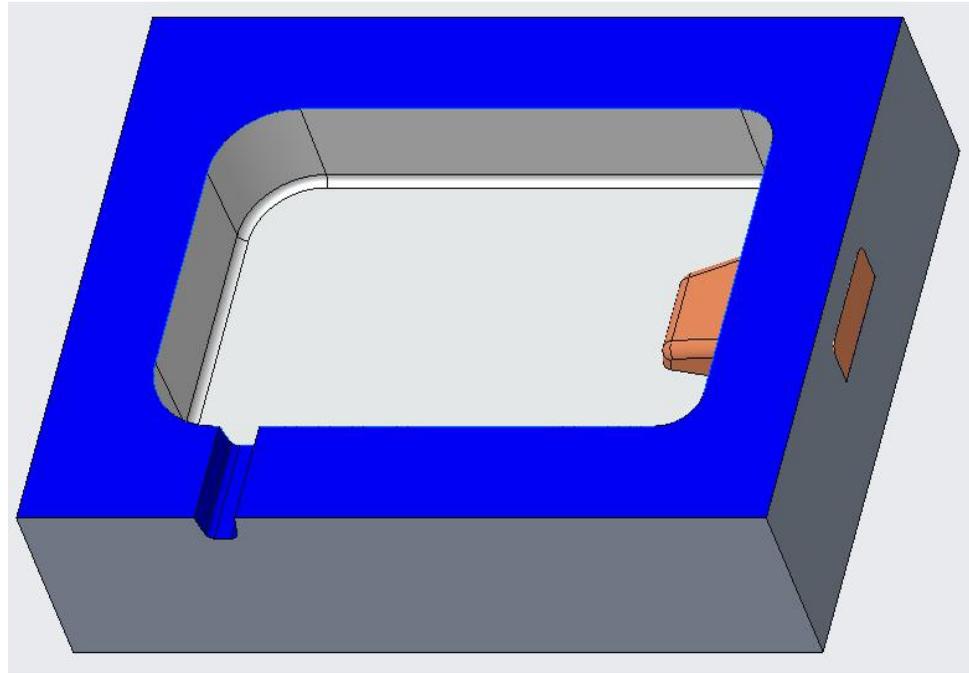
EXERCISE 5

Topics covered in this exercise are as follows

- ❖ Creating a Slider by Gather technique.



Reference Part

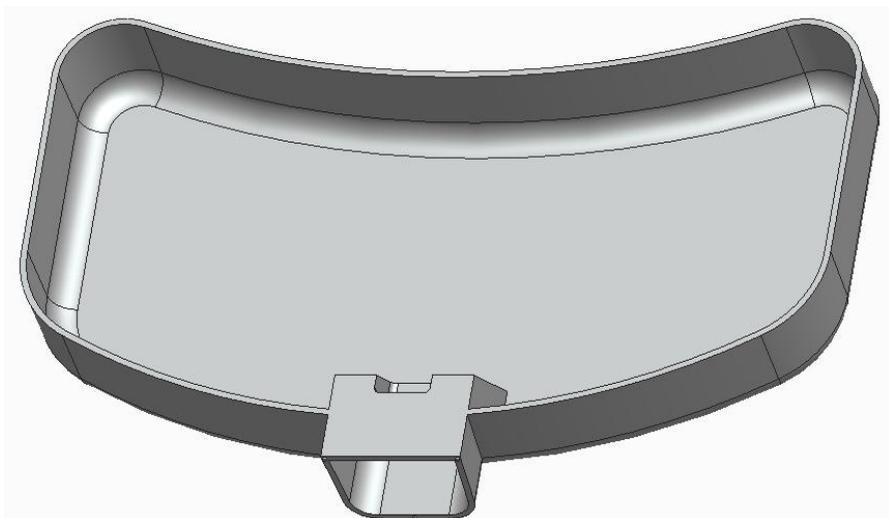


Cavity and Slider

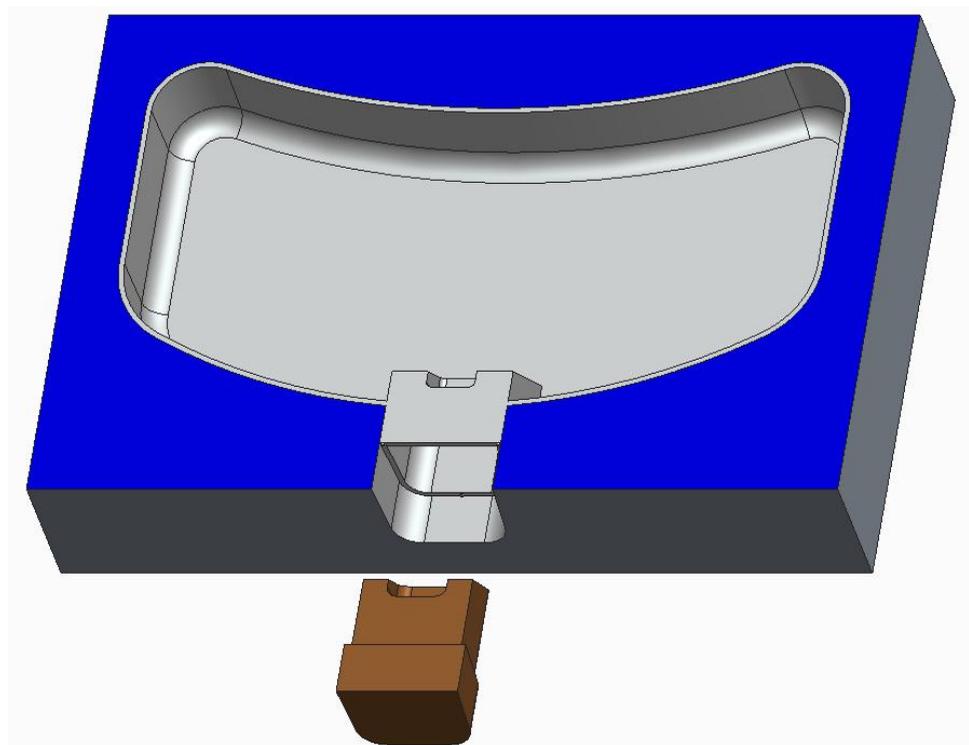
EXERCISE 6

Topics covered in this exercise are as follows

- ❖ Creating a Slider by Gathering and Sketching technique



Reference Part

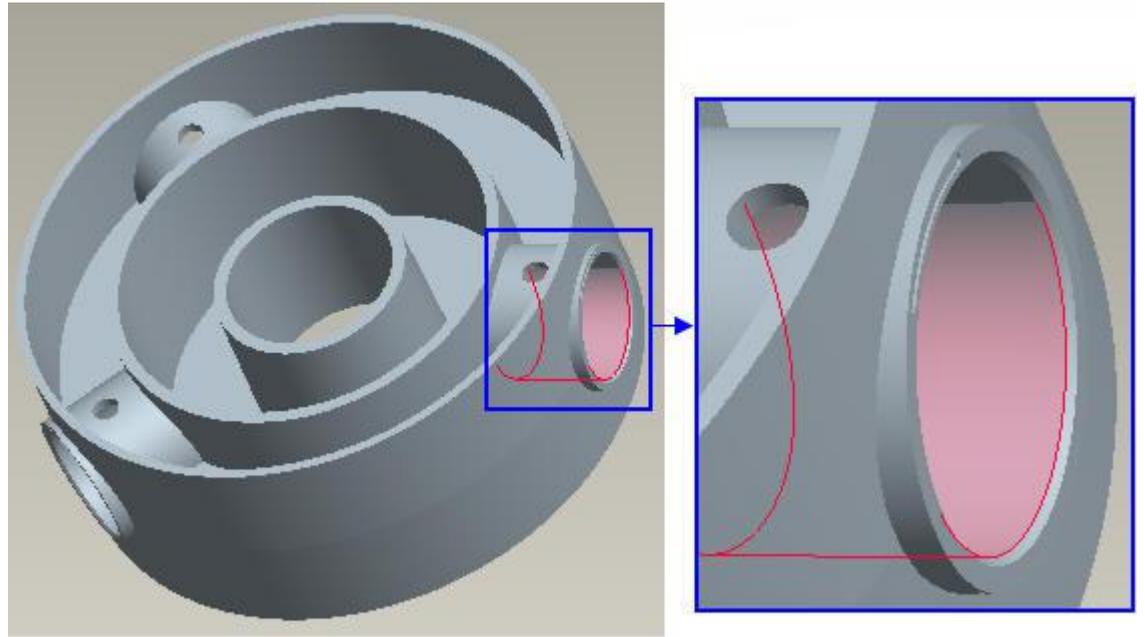


Cavity and Slider

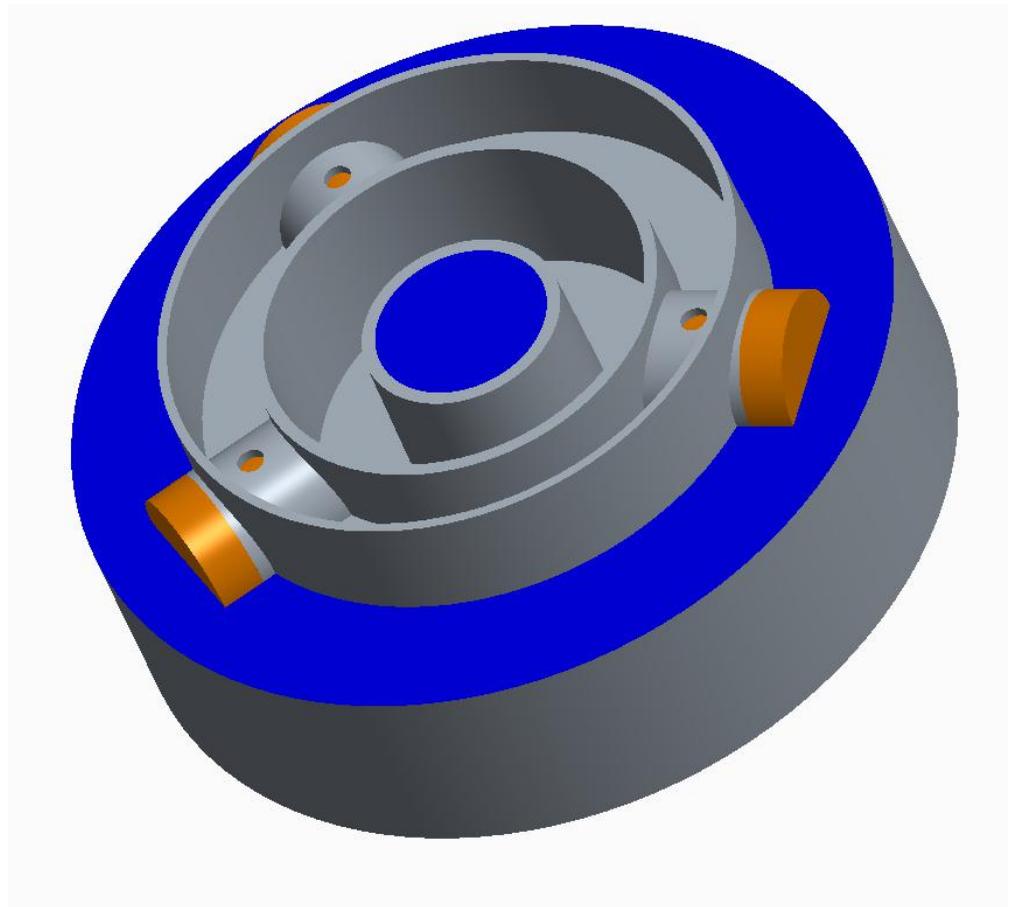
EXERCISE 7

Topics covered in this exercise are as follows

- ❖ Creating a Slider by Gather and Offset technique



Reference Part



Core and Sliders

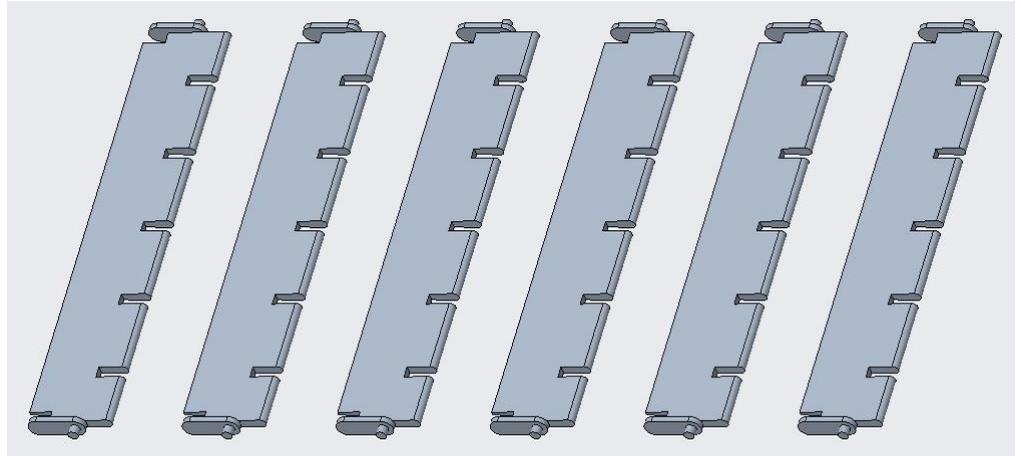
MULTI-CAVITY MOLDS

In this section we will learn how to create pattern of reference parts for multi-cavity molds using the Layout dialog box.

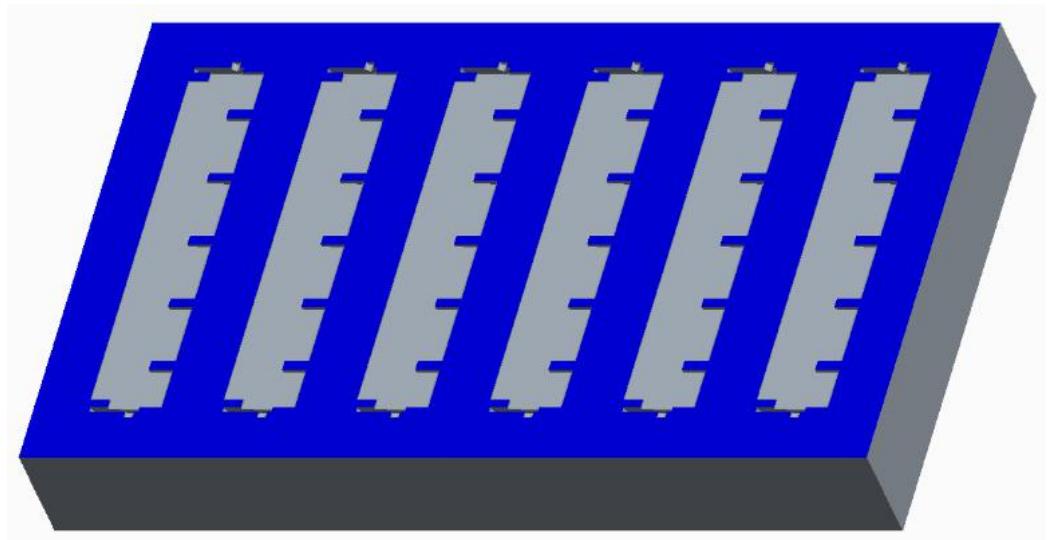
EXERCISE 1

Topics covered in this exercise are as follows

- ❖ Assembling the reference model using Layout dialog box
- ❖ Creating the pattern of reference part
- ❖ Creating parting surface for the patterned parts



Patterned Reference Part

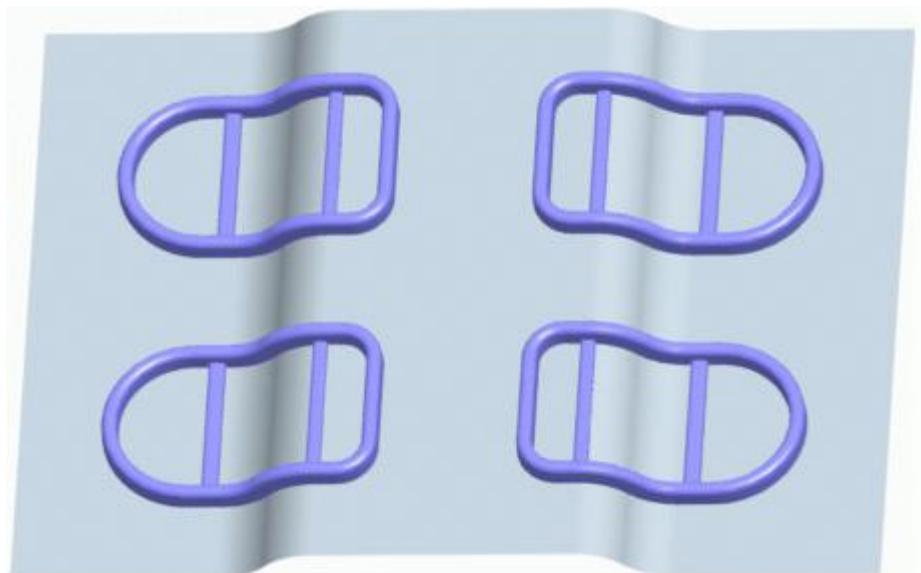


Cavity

EXERCISE 2

Topics covered in this exercise are as follows

- ❖ How to control the orientation of reference parts.

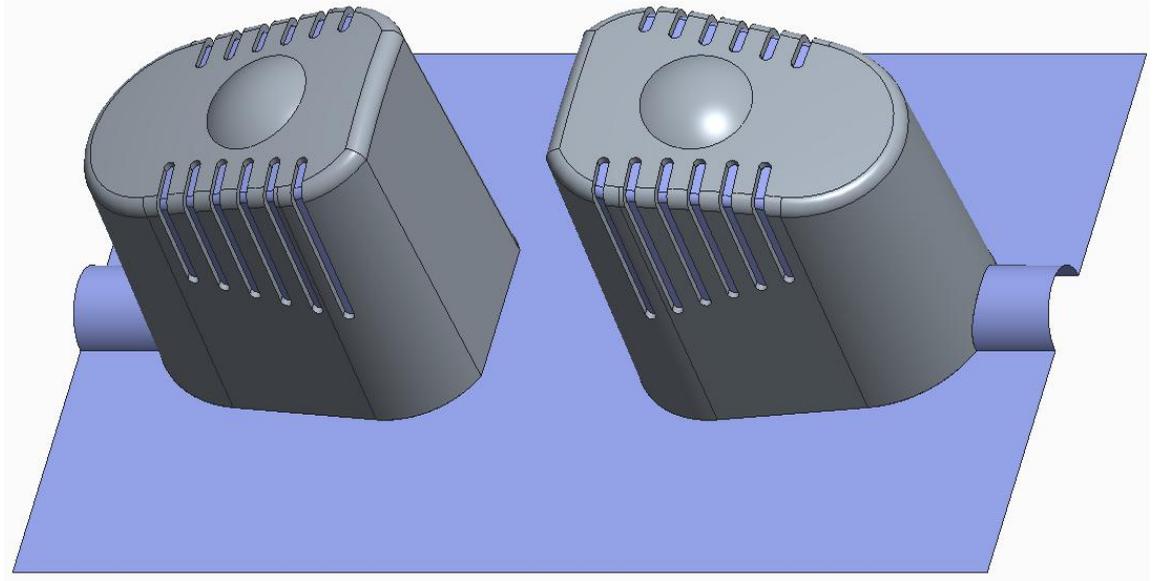


Patterned Part with Parting Surface

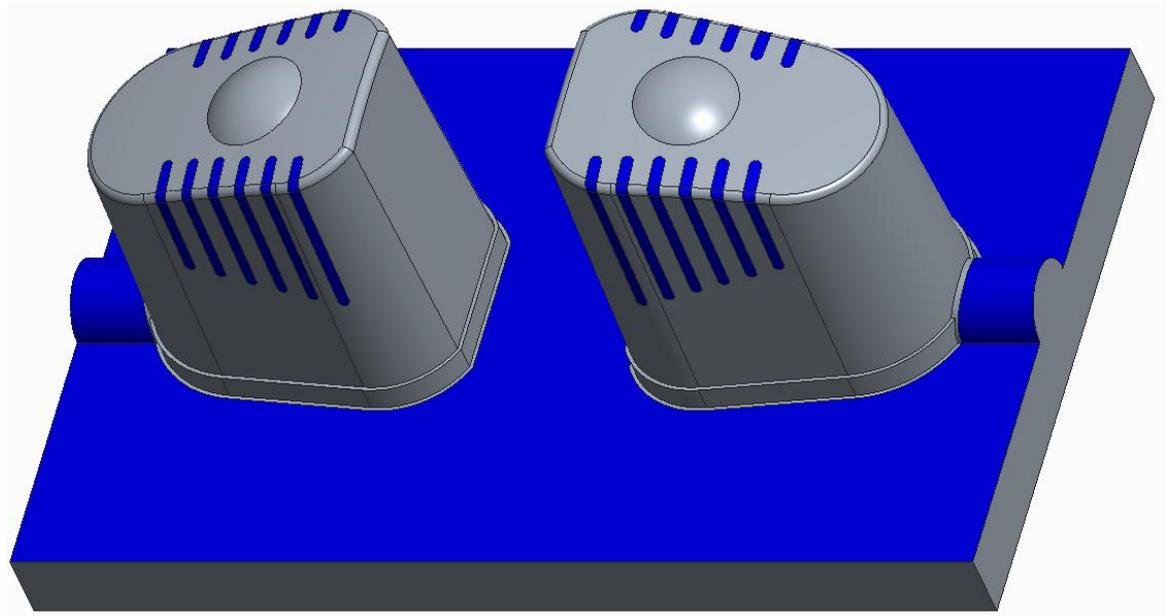
EXERCISE 3

Topics covered in this exercise are as follows

- ❖ How to create Automatic parting surface for multicavity mold.



Patterned Reference Part

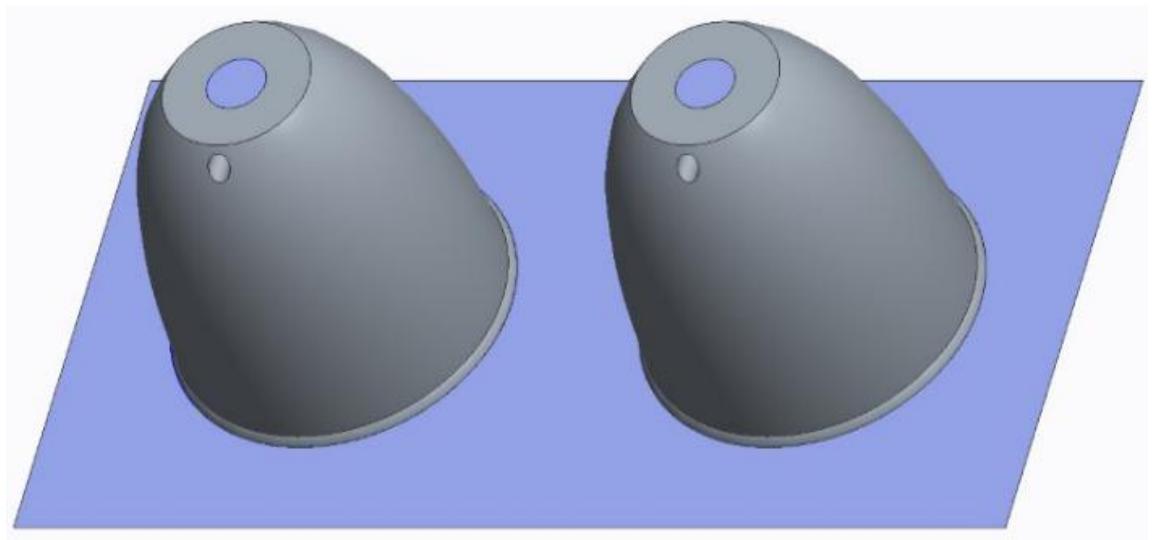


Core

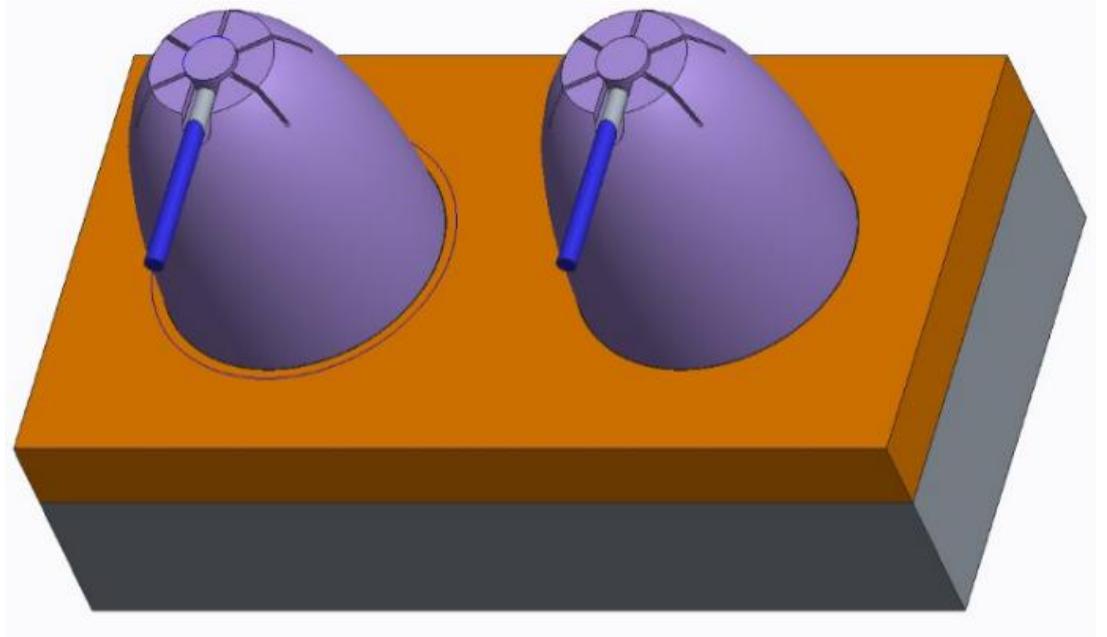
EXERCISE 4

Topics covered in this exercise are as follows

- ❖ How to pattern a volume and parting surface.



Patterned Reference Part

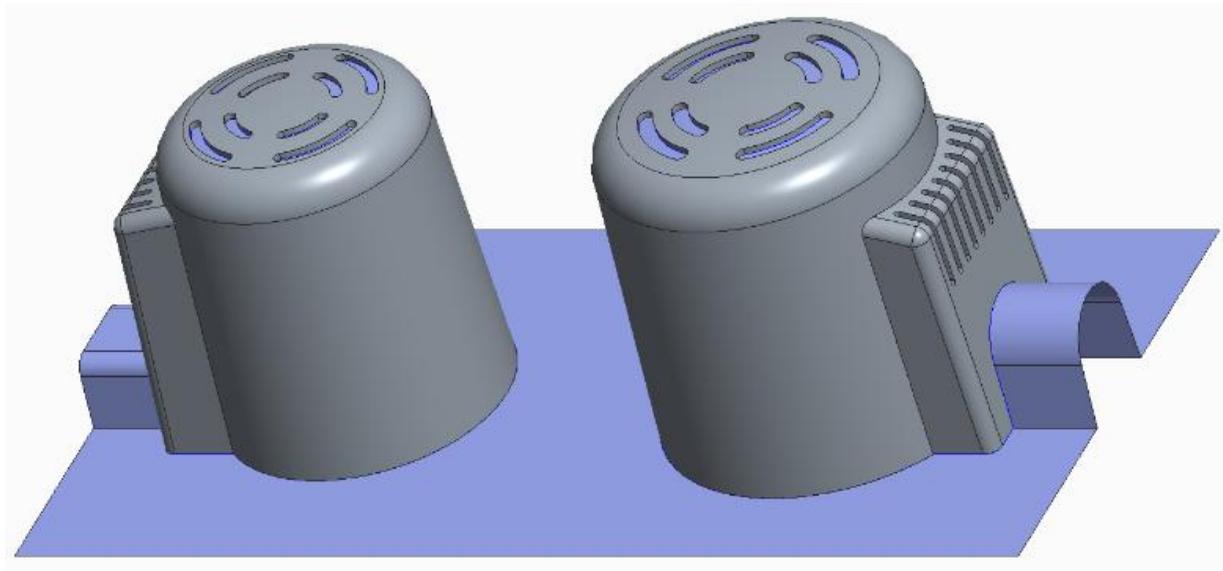


Moving Half : Back Plate, Stripper Plate, Core Inserts

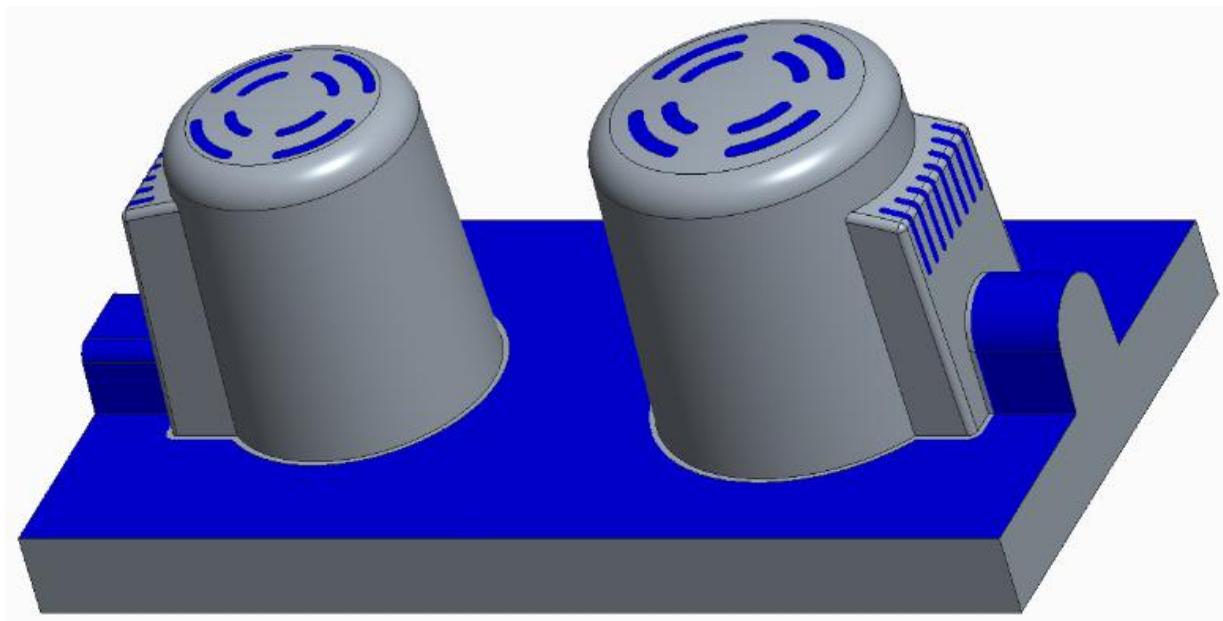
EXERCISE 5

Topics covered in this exercise are as follows

- How to create Automatic parting surface for a multi-cavity mold model with different reference parts



Reference Parts with Parting surface ((Both parts are different))



Core side

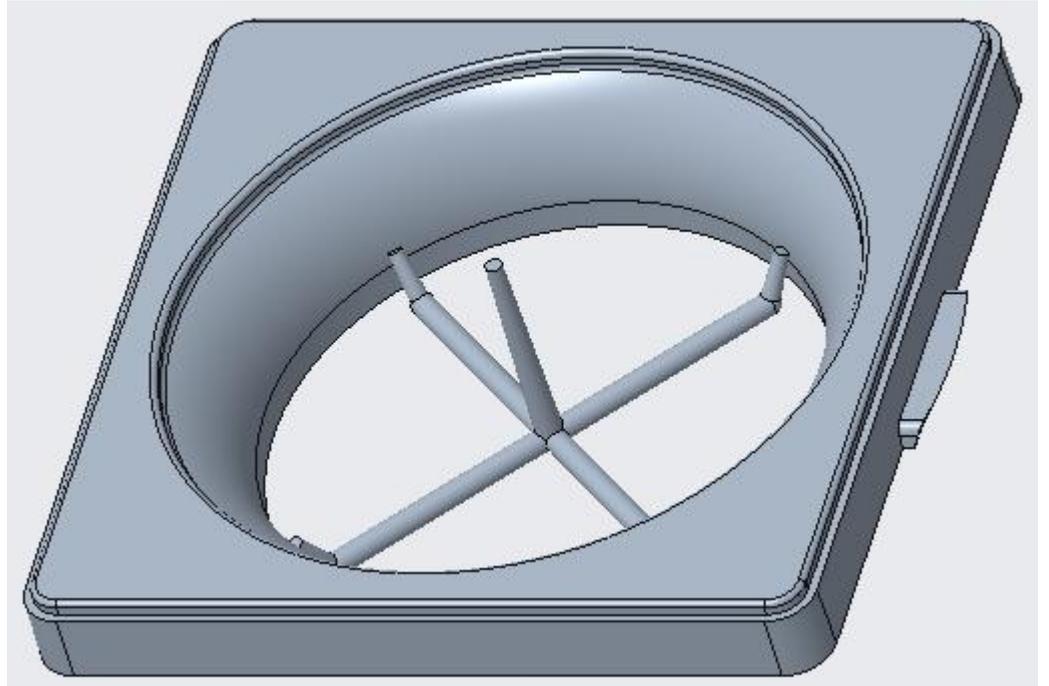
FEED SYSTEM AND MOLDING

The feed system for a mold provides the path for the molten material to flow from the nozzle of the machine to the machined impression. This flow-way is called the Feed System.

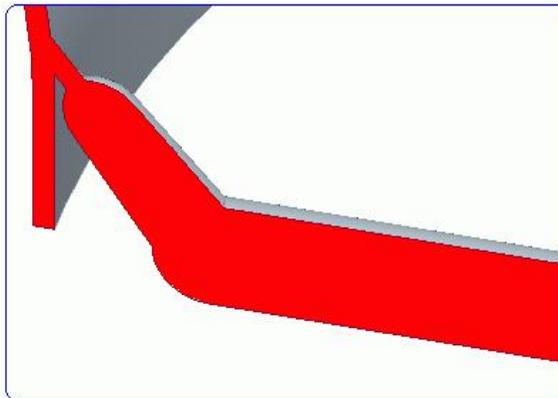
EXERCISE 1

Topics covered in this exercise are as follows

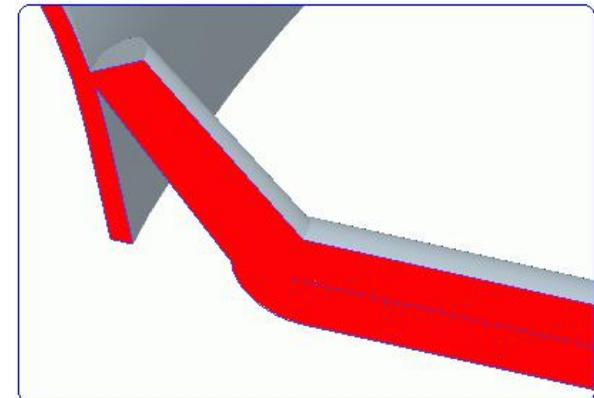
- ❖ Creating the runner system by defining a Runner feature
- ❖ Creating the gates by defining a Runner feature
- ❖ Creating the sprue by defining a revolved cut feature
- ❖ Creating the molding for the cavity assembly
- ❖ Creating the submarine gate



Molding Component



Pin-Pointed Submarine Gate

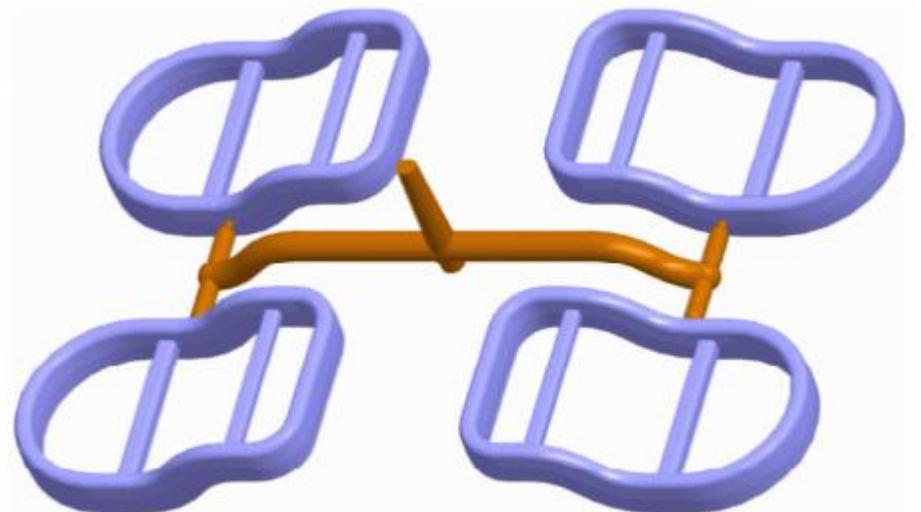


Truncated-Cone Submarine Gate

EXERCISE 2

Topics covered in this exercise are as follows

- ❖ Creating the flow path for non-planar runner
- ❖ Controlling the size of the branch runners
- ❖ Creating the runner and gates by defining Runner feature
- ❖ Creating the sprue and cold slug by defining a revolved feature
- ❖ Creating the molding for the mold assembly

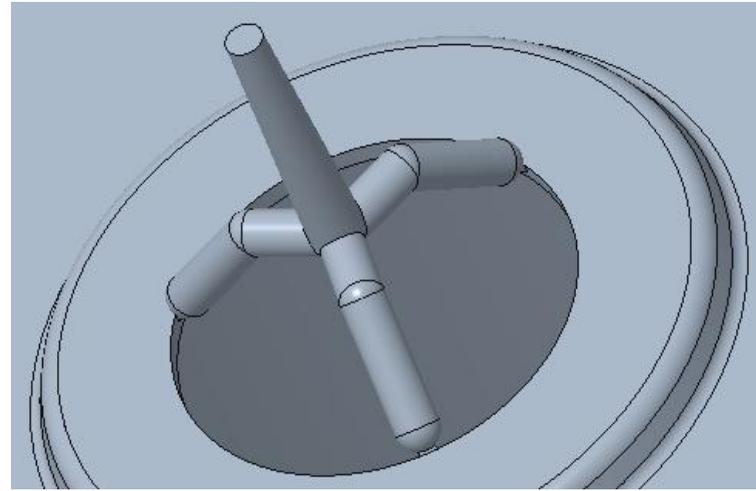


Multi-Cavity Molding with Sprue, Cold Slug, Runners and Gates

EXERCISE 3

Topics covered in this exercise are as follows

- ❖ Creating the runner system by defining a Runner feature
- ❖ Creating the gates by defining a Runner feature
- ❖ Creating the sprue by defining a revolved cut feature
- ❖ Creating the molding for the cavity assembly

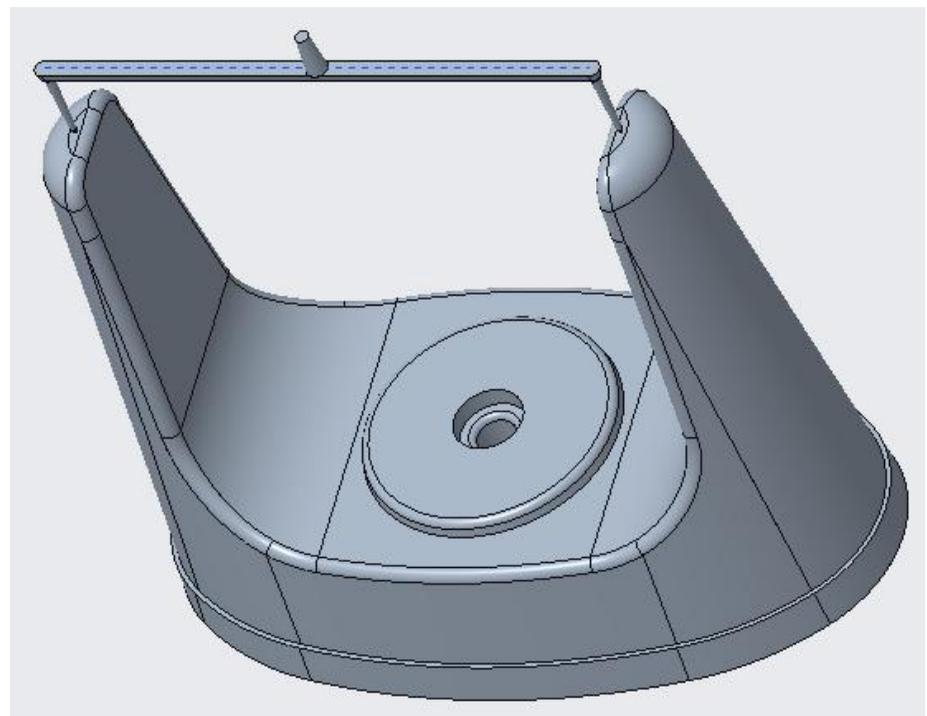


Feed System for a Long Slender Product

EXERCISE 4

Topics covered in this exercise are as follows

- ❖ Creating the Pin-point gates
- ❖ Creating the Round Trapezoid runner
- ❖ Creating the molding for the cavity assembly
- ❖ Calculating the weight of feed system



Pin-Point Gate and Round Trapezoid Runner for Three Plate Mold

WATER LINE AND EJECTOR PINS

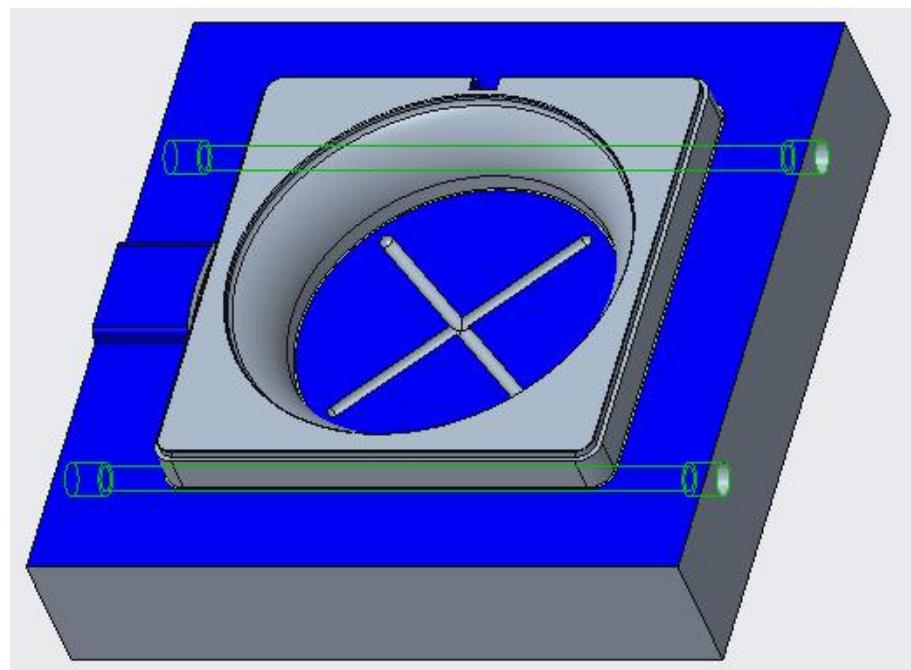
Waterline feature is used to create cooling channel in the mold components.

Ejector Pin Catalogue is used to assemble the ejector pins in the manufacturing assembly.

EXERCISE 1

Topics covered in this exercise are as follows

- ❖ Creating the Water Line feature
- ❖ Specifying End Condition for the channel.



Cooling Channels with Counter-bored Ends

MOLD ANALYSIS

Creo Tool Design provides a number of tools to ensure that mold cavity will perform satisfactorily during actual production. These tools verify that mold confirms to some minimum criteria set by the mold designer. These include

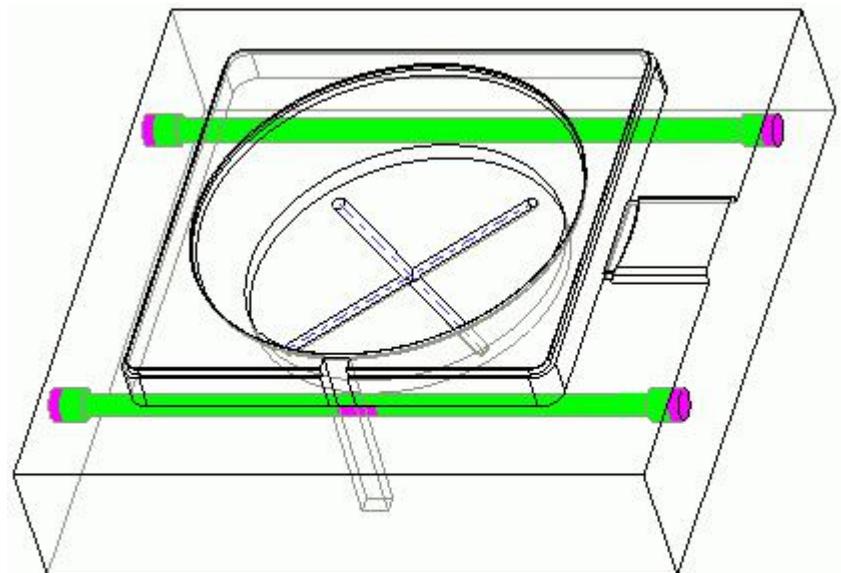
- ❖ Water Line clearance check
- ❖ Mold opening analysis
- ❖ Parting surface check
- ❖ Projected area calculation

EXERCISE 1

In this exercise we will check the clearance between the waterlines and the surrounding surfaces of selected component.

Topics covered in this exercise are as follows

- ❖ Checking the clearance for the given waterline

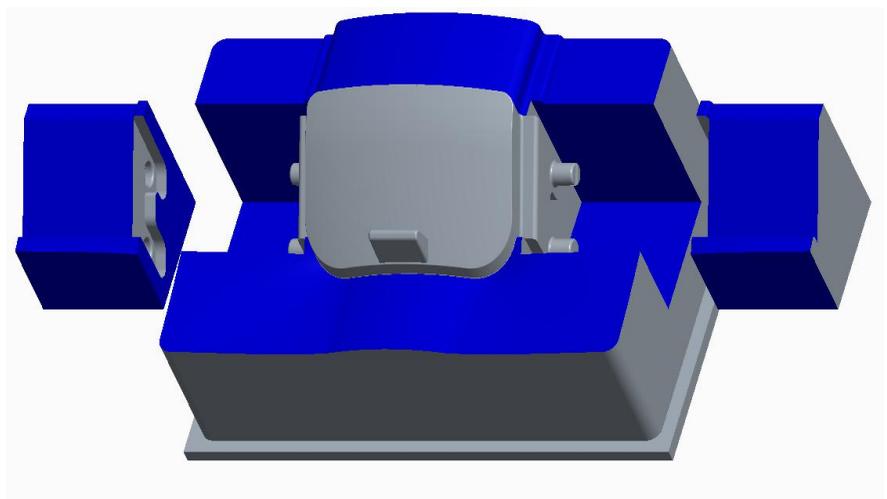


-  This colour represents the area closer than clearance
-  This colour represents the area farther than clearance

EXERCISE 2

The topics covered in this exercise are as follows

- ❖ Defining mold opening sequence
- ❖ Checking interference during mold opening simulation



Mold Opening Simulation

MOLD LAYOUT AND EMX

In this section we will discuss the Mold Layout functionality. We will also describe the benefits EMX (Expert Moldbase Extension) over Mold Layout.