

Simulation Modeling Sciences

CUBIT Fast-Start Tutorial 4. The Basic CUBIT Process



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Laboratories



2 Set the file filter type to STEP (*.stp *.step)











Define and preview a cut through the part

1 Click Mode-Geometry

Click Entity-Volume

3 Click Action-Webcut

- 4 Select Coordinate Plane from the menu
- 5 Select volume (or enter **all** in the field)
- 6 Choose Webcut With YZ Plane



Click *Preview* to display a preview of the plane

Cut the model into quarters to take advantage of symmetry

mu







8

Apply

 \times

8×

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○ xr

P

5

Command Pane

Entity

1

Action

0 X

Volume ID(s)

Offset Value

Merge

(j) **1**

Rotate Plane Imprint

Group Results

Include Neighbors

🔘 YZ

Coordinate Plane

all

0

⊖ zx

Preview

Mode - Geometro













Cut the model into quarters to take advantage of symmetry

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Delete 3 of the 4 volumes

Change from Action-Webcut to Action-Delete

Pick three of the four volumes from the graphics window

(13)

(14)

Execute the delete command by pressing *Apply*







Simplified model ready for decomposition



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Cut the model into sweepable volumes



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Select Cylinder Radius

Define a Cylindrical Webcut

Click Entity-Volume

Click Action-Webcut

from dropdown menu

4 Select volume (all)

- 5 Enter Radius 1.5
- 6 Select Axis as *Vertex Pair*

Select the two vertices as shown to define the cylinder axis





Cut the model into sweepable volumes

Cylinder	Radius				•	C
Volume ID(s)	all					(7
Radius						
Value		() F	rom Existin	ig Arc		
Radius 1.5						
Axis						(
🔵 X Axis		\bigcirc	/ector			
🔵 Y Axis		0	/ertex Pair			
🔵 Z Axis		<u> </u>	Surface Nor	mal		
Vertex 1 ID	133					
Vertex 2 ID	132					
Center X, Y, Z						
Group Resu	lts					
(i) 9		Preview		Apply		
			8		\mathbf{k}	9

Preview and Apply the Cylinder Webcut

8 Click *Preview* to see a preview of the cutting cylinder



Click Apply to cut the

volume



Webcut Preview





Entity - Volume







Define a cutting plane from a planar surface



Click Entity-Volume

3

Click Action-Webcut

- Select Plane from Surface from the drop down menu
- (13)Select the volume to cut (all or 1)
 - Select the surface as shown to define the cutting plane

Plane From Surface Volume ID(s) 101 Plane From Surface ID Group Results

Preview

Cut the model into





Apply

Decompose sweepable volumes mu Geometry







Cut the model into sweepable volumes



Preview and Apply the planar webcut



Click Preview to see a preview of the cutting plane

Click Apply to cut the (16)volume









Volumes are now individually sweepable

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4 Imprint & Merge

Connect volumes
 together to ensure a
 continuous FEA mesh
 will be generated





Action - Imprint and Merge

Mode - Geometry





Imprint and Merge the volumes

- 1 Click Entity-Volume
- Click Action-Imprint and Merge



4 Select volumes

Click Apply

5











Action - Intervals







Preview and set the

Click Mode-Mesh

Click Entity-Volumes

Click Action-Intervals

Click Automatic Sizing

Drag the slider until the

desired resolution is set

from dropdown menu

Select volumes all

(see preview in

graphics window)

mesh size

5

(6)

Set Schemes & Intervals

5

Define the meshing schemes and the mesh size on the geometry that will be used

Action - Intervals 贫 1→ 100 **P** Automatic Sizing Select Volumes all Auto Factor Propagate Preview Apply Size Check For Overlapping Surfaces Apply Size Before Meshing (i) 🤨 Mesh

mı



Preview of nodes on the curves



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Define the meshing schemes and the mesh size on the geometry that will be used

Set the Meshing scheme to Automatically Calculate



Click Action-Mesh

Click Automatically Calculate from dropdown menu



Select the volumes (*all*)



Automatically Calculate 👻				
Select Volumes				
all				
	Apply Scheme			
Check For Overlapping Surfaces	10			
Apply Scheme Before Meshing	·			
Scheme:	Mesh			





Working Directory: C:/Users/Randy/Desktop/tutorial-images











Check to see if the quality of your elements are reasonable for analysis

Display color-coded elements based on the *Shape* quality metric

Click Mode-Mesh

4

5

- Click Entity-Volumes
- Click Action-Quality
 - Select Volumes (all)
- Select the *Shape* quality metric from the dropdown menu
- 6 Check the Display Graphical Summary check box

7

Check the *Draw Mesh Elements* check box Click *Apply*







Blocks	 Grouping of Elements with Common Properties Normally define elements with same Material Element can be in only one block Common element type (i.e. hex8, tet10, etc)
E Sidesets	 Grouping of Quads on Hexes (3D), Edges on Quads (2D) Normally describe force over an area (ie. Pressure loading) Side can be in any number of sidesets
Nodesets	 Grouping of Nodes Normally describe force at a point (ie. Point source loading, constraint) Node can be in any number of nodesets







Designate where materials and boundary conditions will be applied on the model

Define a Material Block with ID=100

Click Mode – Analysis Groups and Materials

Click Entity-Blocks

Click Action - Create

Enter Block ID 100

3

Select Volume

6 Select the volumes to add to the block (*all*)



5

Click *Apply* to create the new block 100







Designate where materials and boundary conditions will be applied on the model

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Define the element type for Block 100 as HEX8

- D Click Action Element Type
- 2 Enter Block ID 100
- 3 Select Volumes
- 4 Select Hex8
- 5 Click Apply







Designate where materials and boundary conditions will be applied on the model

Create a Sideset representing a distributed load

- 1 Click Entity-Sidesets
- 2 Choose Action Create Sideset
- 3 Enter a Sideset ID of 1
- Select Surface
- 5 Pick the surfaces as shown where the distributed load should be applied

6 Click Apply







Create an FEA Mesh File to be used in an analysis

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Export a Genesis file containing mesh, blocks and sidesets

- Click Operation-Export Mesh
- Choose Genesis from the dropdown menu
- Click Browse. Enter the file name "qtr piston.g" in a directory of your choosing
- Select Export All to export all block ids

