

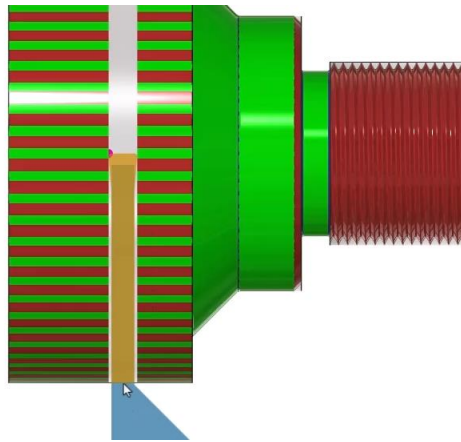
Step-by-step guide

Use toolpath simulation

Use Fusion's Simulate to learn valuable information about your digital operations to determine whether changes need to be made before physical manufacture.

Learning objectives:

- Use Simulate to validate toolpaths.



The completed exercise

1. Open the supplied *CAM Lathe Simulation.f3d* file or continue with your project from the previous module.

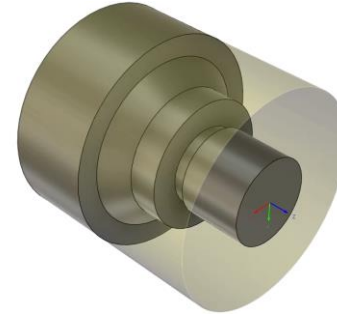


Figure 1. Open the supplied file

2. Now that all of the part's toolpaths are created, they need to be validated using Fusion's simulation. Select the entire setup in the Browser.

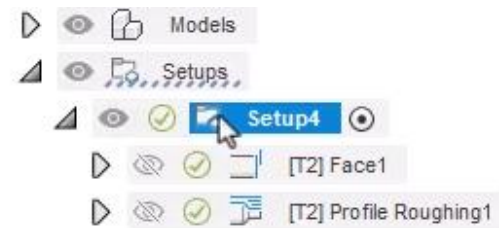


Figure 2. Select the setup

3. Open the Simulate tool by clicking Actions> Simulate.



Figure 3. Open the Simulate tool

4. The options inside the Tool section can customize how much of the tool and holder is visible during the simulation.

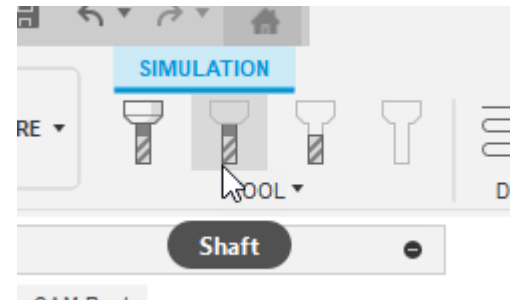


Figure 4. Customize the tool visibility

5. You can access the same options inside the Simulate dialog.

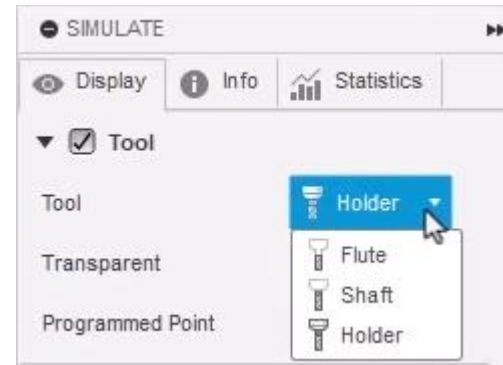


Figure 5. Explore the Simulate dialog

6. You can use the options in the dialog's Toolpath section to customize the toolpath's appearance during the simulation. You can also toggle these options in the Toolbar's Display section. Deactivate the toolpath's visibility by unchecking the Toolpath option

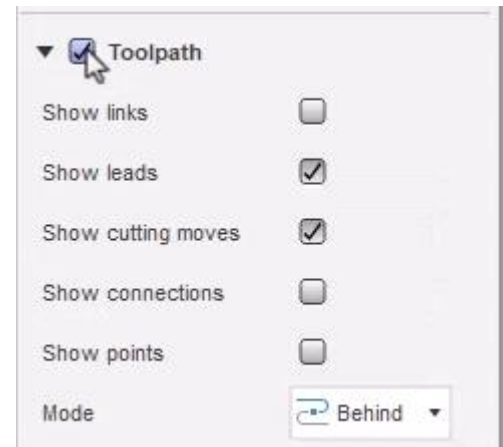


Figure 6. Continue to explore the Simulate dialog

7. Choose the Comparison option from the dialog's Colorization menu.

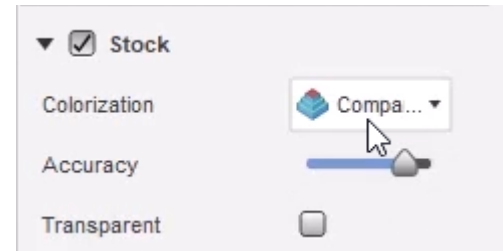


Figure 7. Change the colorization type

8. Notice that three different colors are applied to the model: red, green, and blue. The blue areas indicate material that needs to be removed, green represents areas that have been machined to spec, and red represents areas that have had too much material removed. Note that the red sections on the back of the part will disappear if you adjust the dialog's Accuracy slider. Continue to explore all of the Simulate dialog's options.

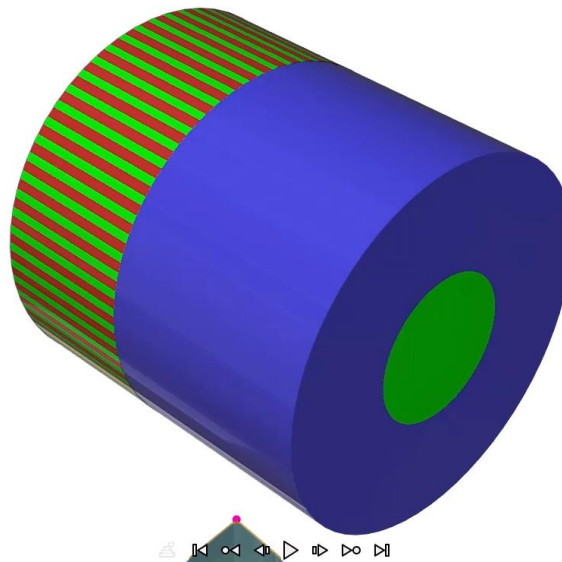


Figure 8. Inspect the model's colors

9. Press Play at the bottom of the screen and adjust the slider to determine the simulation's playback speed. Instead of pressing Play, you could also scrub through the animation by clicking and dragging your cursor in an open section of the canvas.

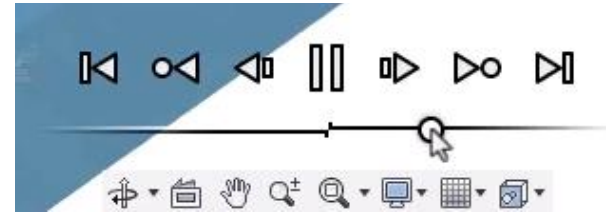


Figure 9. Play the simulation

10. A third way to play the simulation is to click and drag the timeline marker at the bottom of the screen. Each of the timeline's sections represent a new operation.



Figure 10. Inspect the simulation's timeline

11. Play the simulation and make sure each operation correctly removes the part's material.

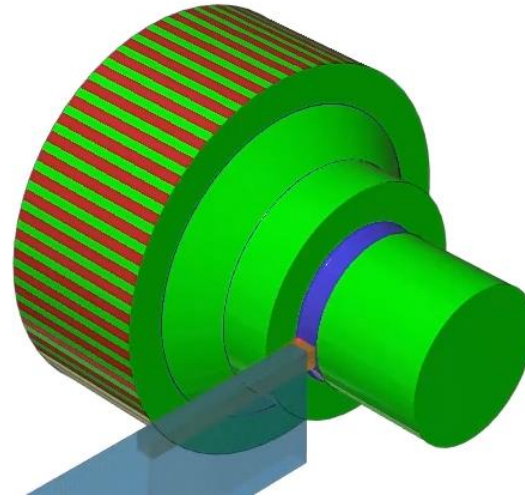


Figure 11. Play the simulation

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12. The chamfers are displayed in red because they were not included on the 3D model. Fusion assumes that too much material has been removed in this area because the machined geometry does not match the 3D model.

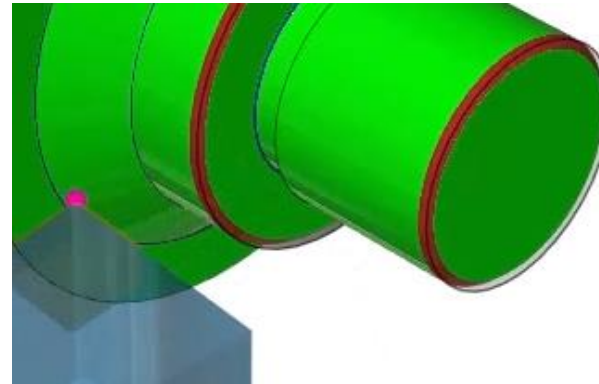


Figure 12. Note the red sections

13. Similarly, the threads were not included in the 3D model and will be displayed in red during the simulation.

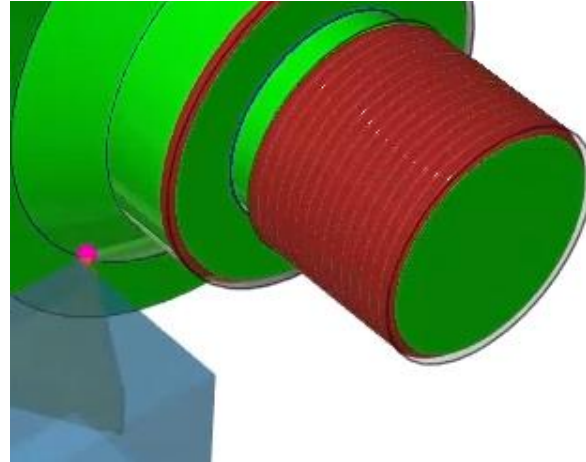


Figure 13. Continue to analyze the simulation

- 14.** During the simulation, verify that each tool is appropriate for the operation. During the Parting operation, notice that the tool is just barely long enough to remove; the tool's holder is in danger of colliding with the material.

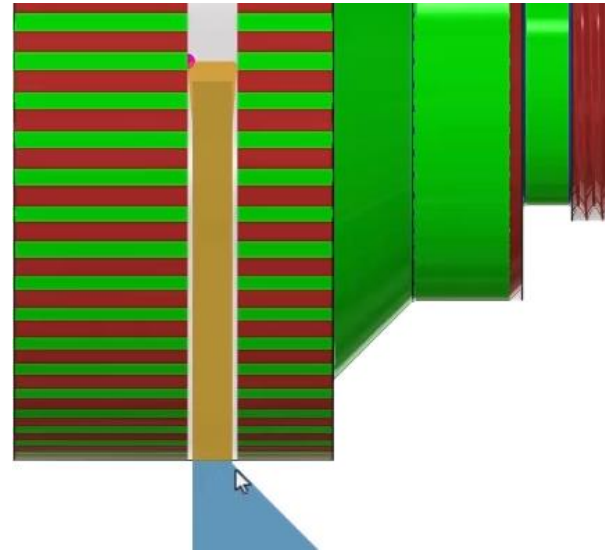


Figure 14. Verify each tool

- 15.** One way to help avoid collisions between the parting tool and the body is to modify the Part operation. Exit the simulation by clicking Exit Simulation> Exit Simulation.



Figure 15. Exit the simulation

16. Double-click the Part operation to edit it.



Figure 16. Modify the Part operation

17. Navigate to the Geometry tab and activate the Edge Break option. OK the dialog to accept the changes.

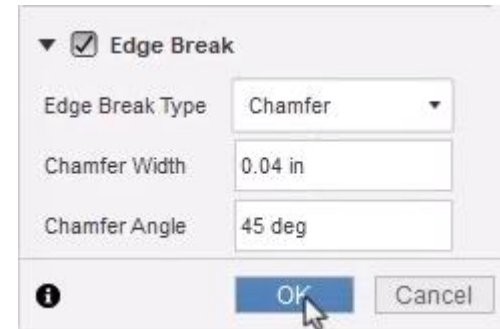


Figure 17. Add a chamfer

- 18.** Make sure that only the Part operation is selected in the Browser, then click Actions> Simulate. This will simulate only the Part operation. Play the simulation and notice that a small chamfer is added to the Part operation.

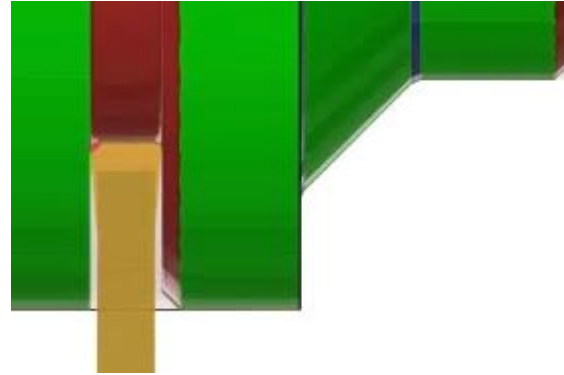


Figure 18. Simulate the Part operation

- 19.** Inspect the result and notice that the tool's holder is less likely to collide with the machined part. Exit the simulation after you finish analyzing the operation.

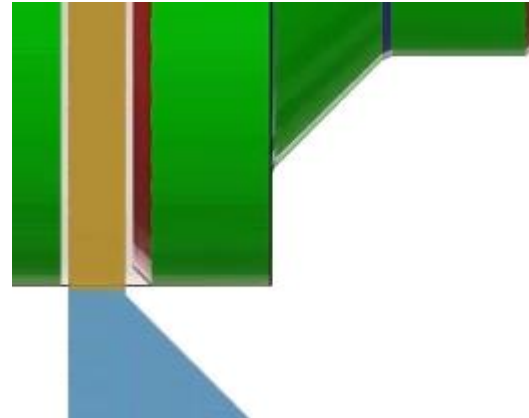


Figure 19. Inspect the result

20. Right-click the setup inside the Browser and choose Machining Time from the menu.

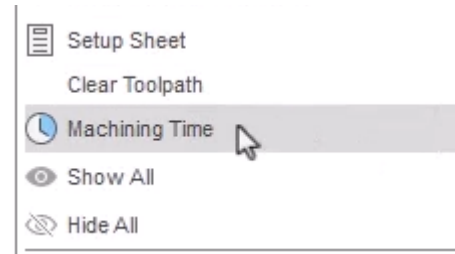
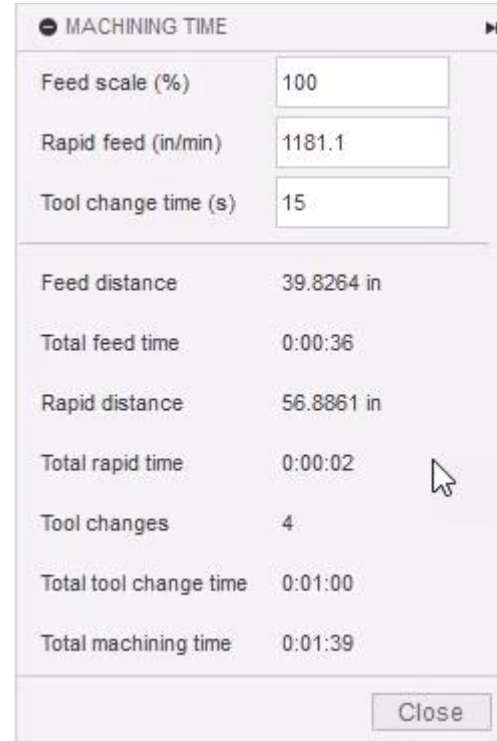


Figure 20. Explore the setup's machining time

21. You can learn valuable information about the setup by exploring the Machining Time dialog.



The MACHINING TIME dialog box displays the following information:

MACHINING TIME	
Feed scale (%)	100
Rapid feed (in/min)	1181.1
Tool change time (s)	15
<hr/>	
Feed distance	39.8264 in
Total feed time	0:00:36
Rapid distance	56.8861 in
Total rapid time	0:00:02
Tool changes	4
Total tool change time	0:01:00
Total machining time	0:01:39
<div>Close</div>	

Figure 21. Explore a setup's information

22. Some of this information can also be found inside the Simulate dialog. Navigate to the Info and Statistics tabs to explore the information. Save the design.

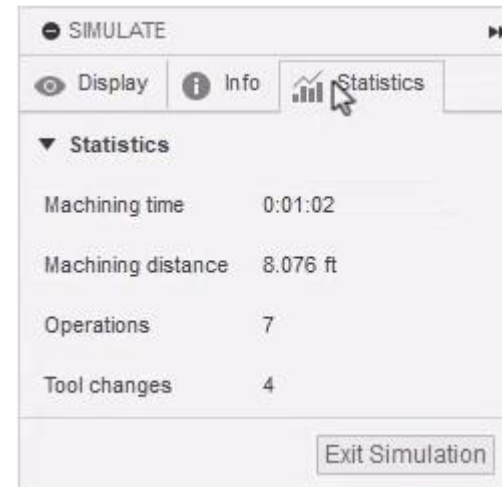


Figure 22. Note that the simulation also has statistics