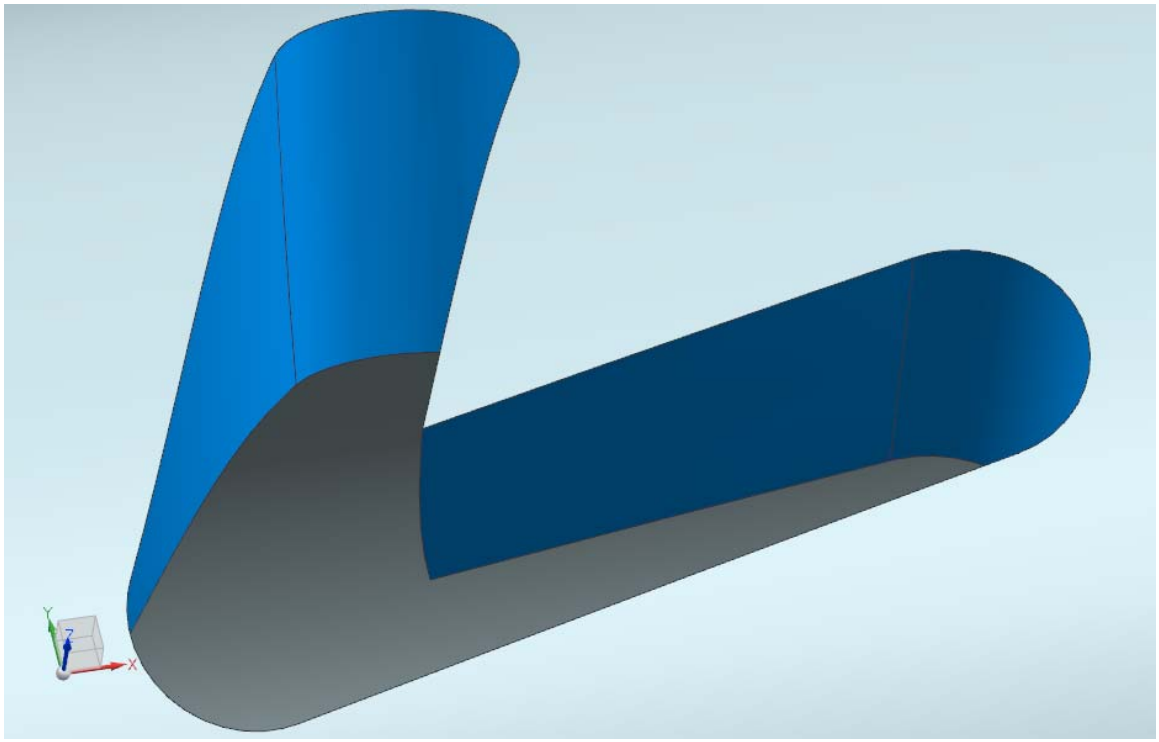
Imitating a machining operation in NX modeling

Sometimes there is a need to model the result from a machining operation. You have certain dimensions and functions defined by your design specification. The appearance of the exact shape in-between is not important and is more guided by what is achievable with a chosen production method. The following example demonstrates such methodology.

Overview

The chosen production method in this case is milling. A groove is milled in a rotationally symmetric part to be milled in production. We start with a section of pipe. The mill cuts a groove while moving along the center axis of the pipe and at the same time the pipe first rotates 10 degrees counter-clockwise and then 30 degrees clockwise while simultaneously moving in the other direction.



Overview of the methodology

- You have an initial body you want to “mill” a groove in.
- Define end mill positions and build a solid body of the end mill´s anticipated movement volume.
- Subtract the end mill tool movement from the initial body.

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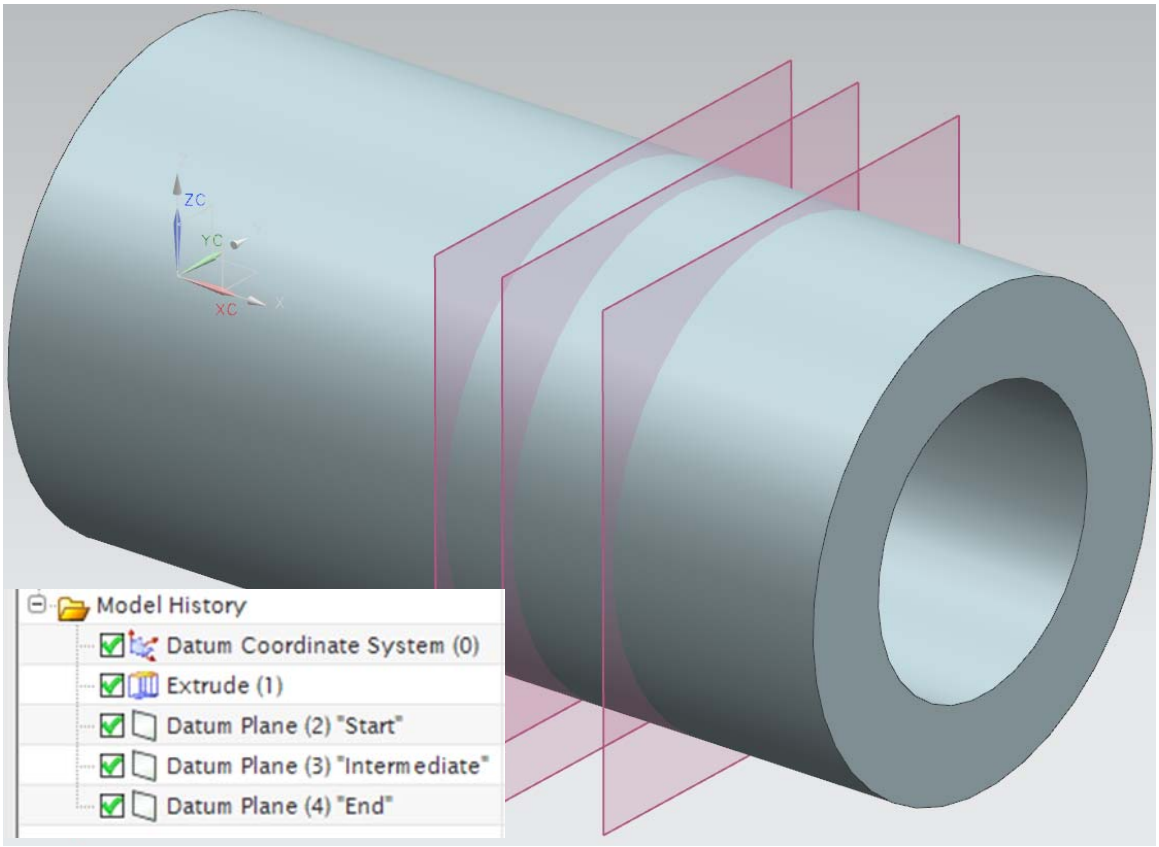
Detailed steps

- The end mill has 3 defined positions. Create datum planes representing each of those positions; ***Insert => Datum/Point => Datum Plane.***



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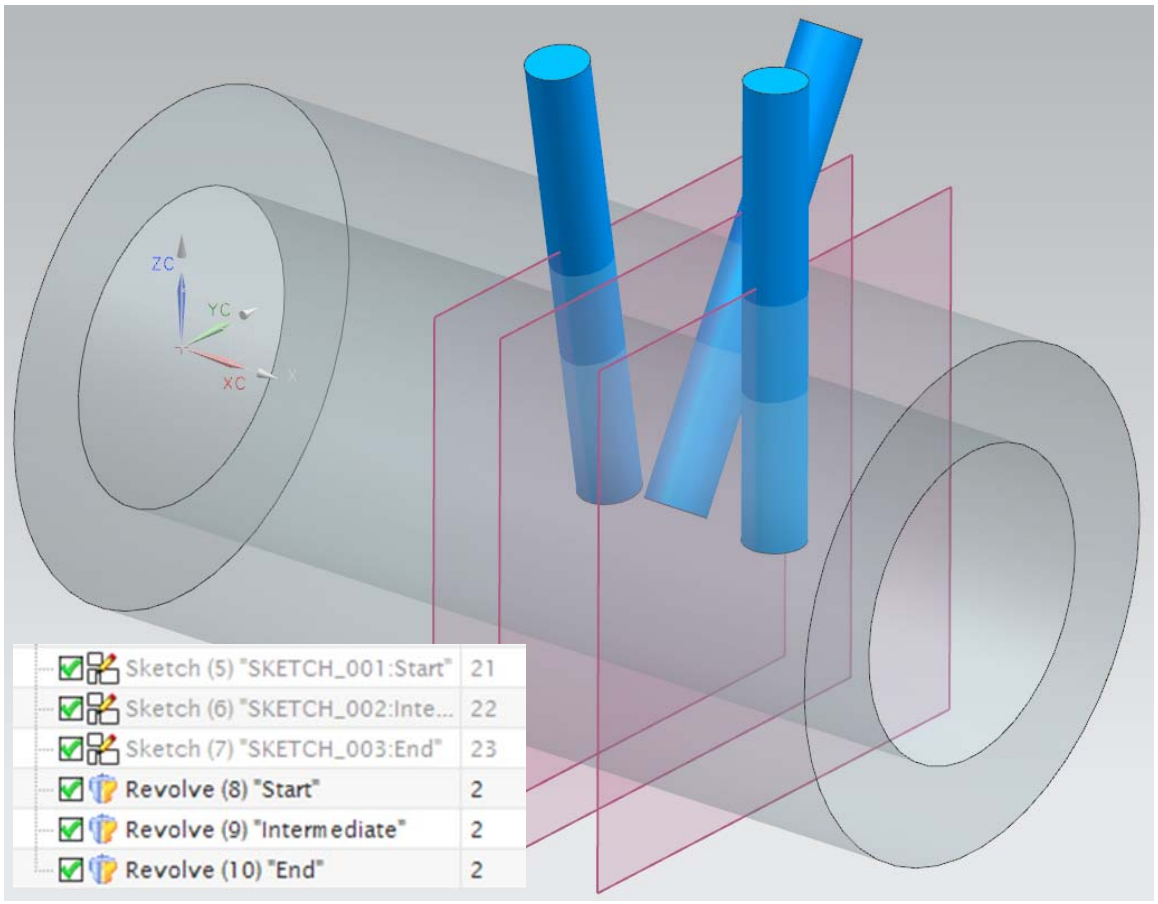
- Create a revolved sketch representing the end mill in each position. The end mill is vertical (Z-axis) in start position. ***Insert => Sketch*** and ***Insert => Design Feature => Revolve***.



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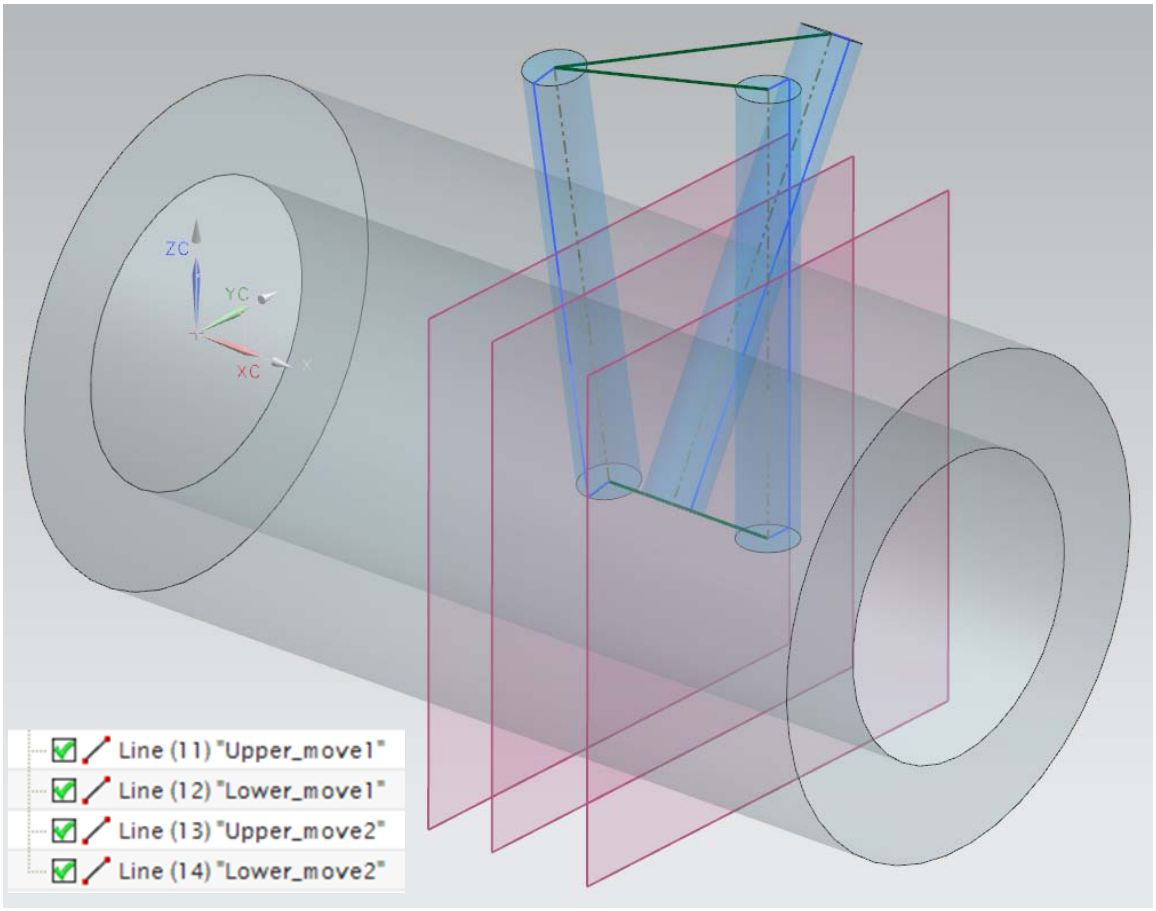
- Create curves representing the end mill movement between the ends and intermediate position. In this case the movement can be described with straight lines (dark green), using associative line function; ***Insert => Curve => Line***.



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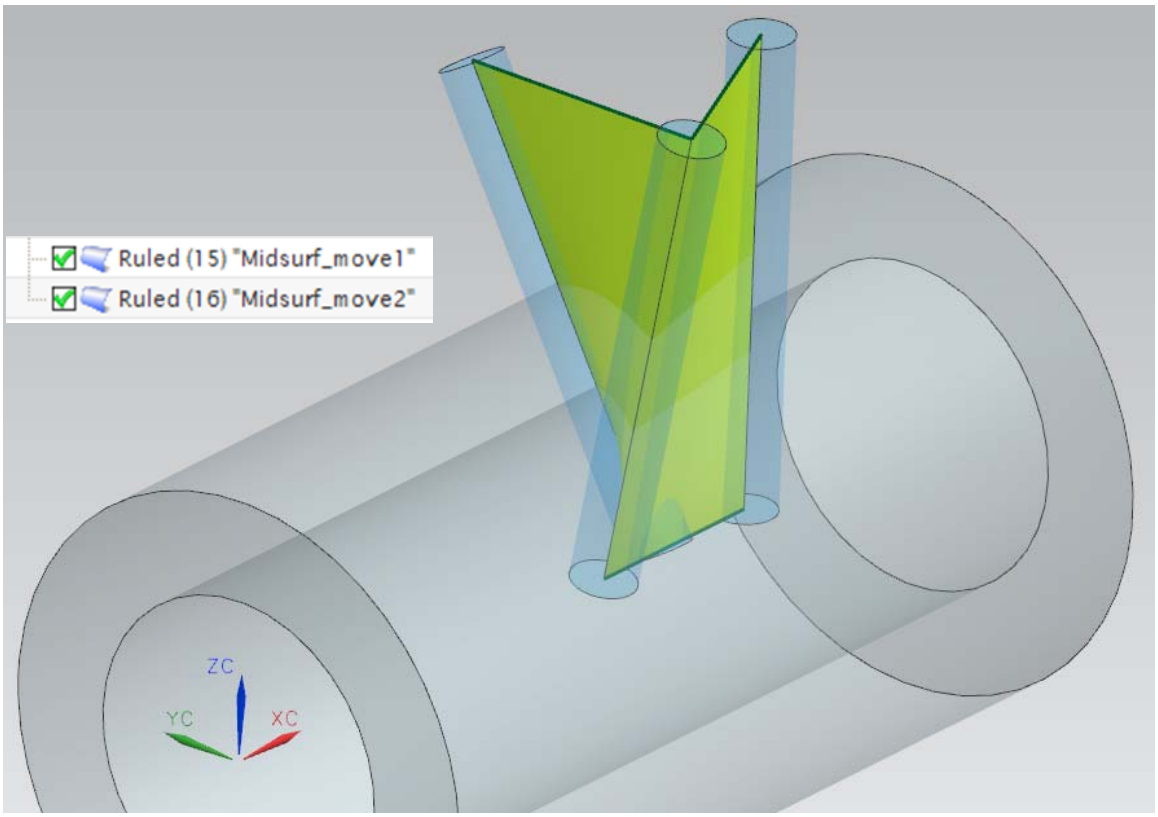
- Create the end mill movement *mid surface* using the previously created curves as sections. The *Ruled* surface feature will do the job; ***Insert => Mesh Surface => Ruled***.

  When selecting ruled surface sections, the closest control point along the selected line determines the vector direction. Use the *reverse direction* button to correct any incorrect directions (use *Preview* to review the result).



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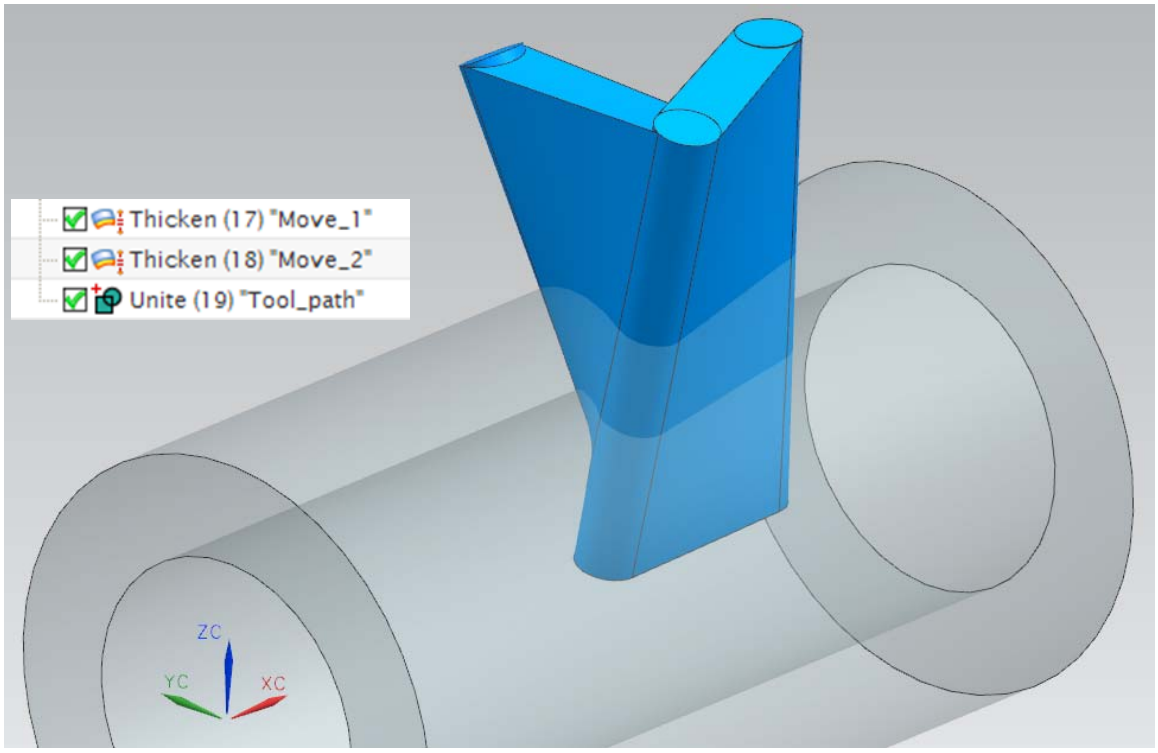
- With the mid-surfaces as input, use *Thicken Sheet* to create the body of the end mill movement; ***Insert => Offset/Scale => Thicken***.
  Then unite the two thicken sheet bodies together with the three end mill positions to form the entire "tool path"; ***Insert => Combine => Unite***.

  As the mill tool body overshoots in both ends, the end face shapes are of no importance.



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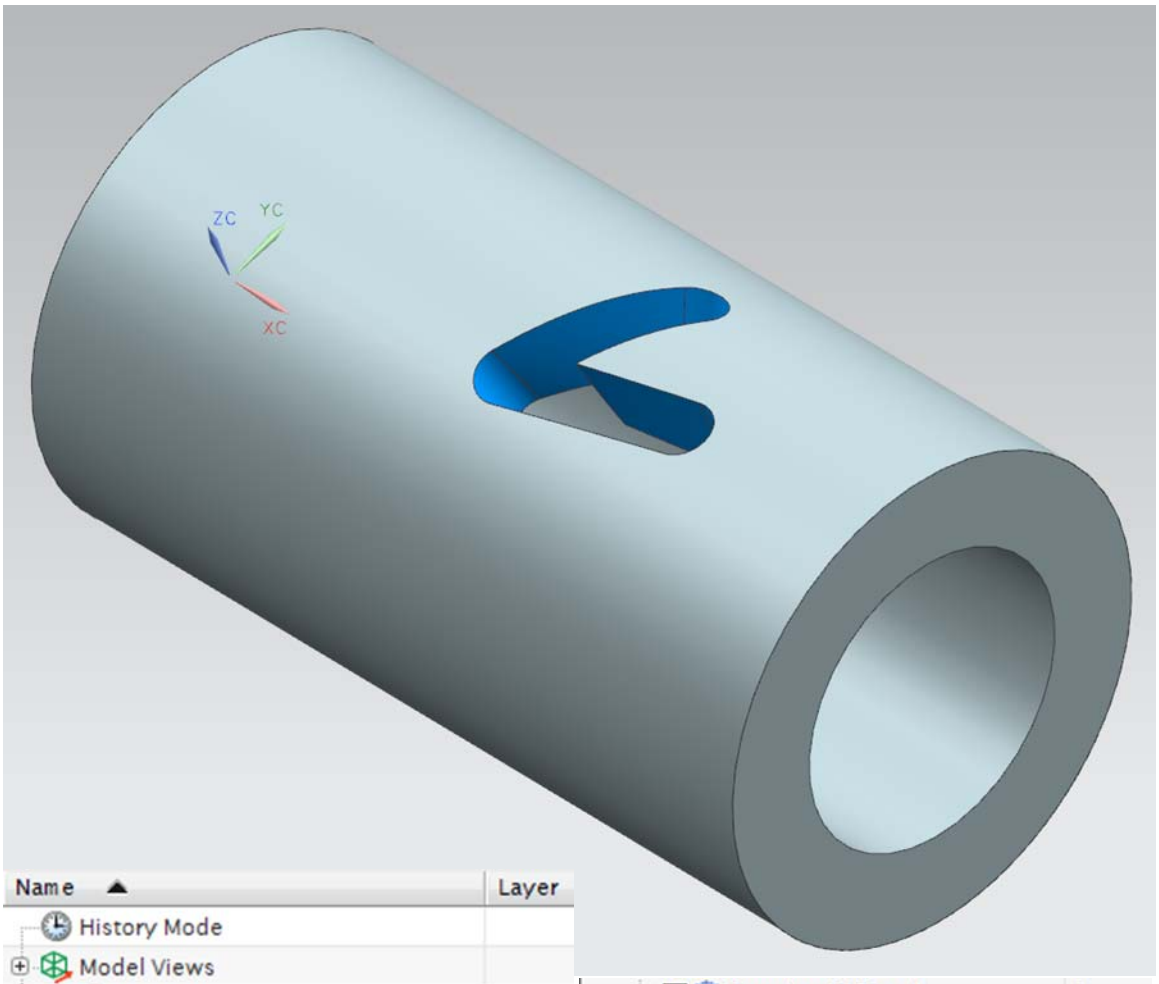
- Finally subtract the “tool path” from the pipe and you have the result; ***Insert => Combine => Subtract***.



Name	Layer
History Mode	
Model Views	
Cameras	
User Expressions	
Model History	
Datum Coordinate System (0)	61
Extrude (1)	1
Datum Plane (2) "Start"	62
Datum Plane (3) "Intermediate"	62
Datum Plane (4) "End"	62
Sketch (5) "SKETCH_001:Start"	21
Sketch (6) "SKETCH_002:Inte...	22
Sketch (7) "SKETCH_003:End"	23
Revolve (8) "Start"	1
Revolve (9) "Intermediate"	2
Revolve (10) "End"	2
Line (11) "Upper_move1"	41
Line (12) "Lower_move1"	41
Line (13) "Upper_move2"	41
Line (14) "Lower_move2"	41
Ruled (15) "Midsurf_move1"	11
Ruled (16) "Midsurf_move2"	11
Thicken (17) "Move_1"	2
Thicken (18) "Move_2"	2
Unite (19) "Tool_path"	1
Subtract (20)	1

Ulf Rosberg

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