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Wcam2K

CAD-CAM

Practical examples and suggestions

(English Version)

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1 GENERAL INFORMATION

1.1 Structure of the manual

The present manual includes eight sections:

1. GENERAL INFORMATION
2. CONFIGURATION WCAM2K SOFTWARE
3. USE OF THE DISK
4. BRIDGE SAW
5. LATHE
6. MILLING MACHINE
7. FIVE AXIS MACHINE

1.2 Introduction

This program has to be used in Windows© and is for to realize a simple interface between the user and the C.N.C machine.

The learning is made easy for users who already knows his working environment; the initial training can vary from a day to a week.

The installation is a not invasive one, to eliminate every trace of the program from the hard-disk is enough to delete the main directory with all its contents.

Once the program has been started, the main menu appears the top of the screen, whereas on the left side there is a secondary menu divided in several buttons for drawing, modifying and magnetic connection; the information display is placed under the main menu and the drawing area.

The main menu includes the managing functions of the program and those of frequent use while drawing; the secondary menu is made with a vertical series of shortcut buttons.

A help window is accessible from the program with a summary of the main functions.

The realization of a machining can be divided into three stages: the realization of the drawing (CAD = Computer Aided Design), the loading of the piece with the survey of its position on the machine (this subject goes beyond from the purposes of this manual, but some suggestions will be given when necessary) and the realization of the working file (CAM = Computer Aided Manufacturing).

The positioning of the piece can be made first, but best results are attained with the suggested solution. The principal reason for this choice is the problem of the anchorage of the material to be worked on the table of the machine with regard to the movements of the tools in the working area.

2 Configuration WCam2K Software

2.1 Choice of the language

In MAIN MENU:

Select **SYSTEM** → **GENERAL PARAMETERS** → **SUBPARAMETER**

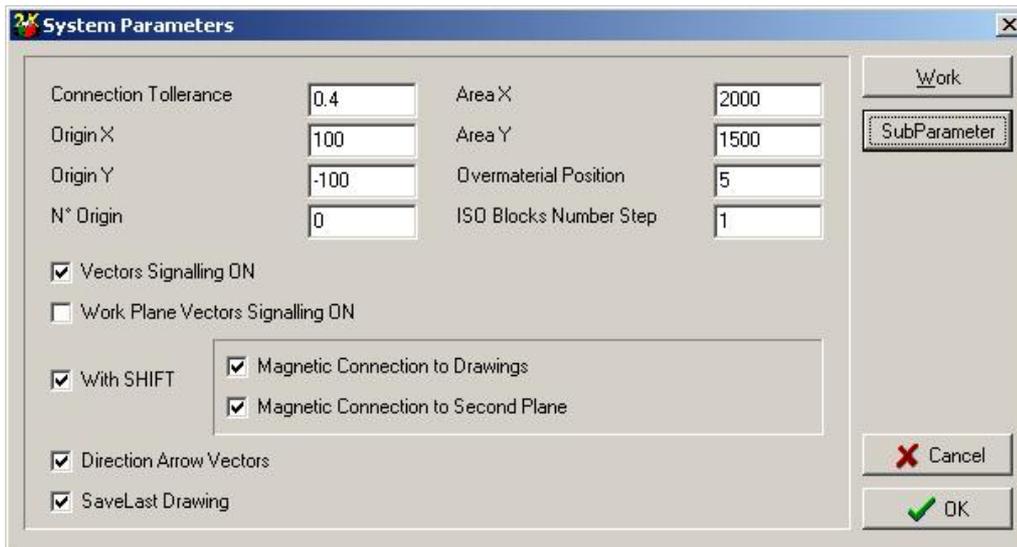
Select the desire language and press OK



2.2 Configuration for the type of machine

2.2.1 General Parameters

For the correct pattern of the program from the window of the MAIN MENU



All the parameters to be inserted are here listed here below, without priority

Connection Tolerance: when the segments connection procedure is activated, which is made automatically by the program in some stages of the calculation of the tool route, two consecutive vectors will be joined in a polyline, if the distance between the final point of the previous vector and the starting point of the successive vector satisfies this minimum value

Origin X, Y: possibility to modify the position of the zero point in the drawing area. When these values will be different from zero and within the area, the origin will be highlighted by the special symbol

N° Origin: in some NC it enables to insert the number of origin that you want to use to position the piece on the machine table

Area X, Y: dimension of the drawing area expressed in millimeter

Position: distance over the working table for the rapid movement of the machine. This value is used when moving from a starting point to another of the same machining

ISO Step: increase in the numbering of the program lines in the ISO file. If you insert a value higher than 1, you can intervene on the instructions of the program by inserting new code lines before using it

The choice made by pressing the keys are listed as follows:

Vector Signaling: it is used to visualize every notable point of the drawing, a square shows a starting point while a triangle shows a following point.

Simulation Refresh: visualization besides the normal drawing of all following movements from the final previous point to the next initial point of the drawing. It enables to make visible the simulation of the tool movement each time the drawing area requires to be designed again; it is optional because this simulation needs long times to be visualized

Press SHIFT: it activates the magnetic connection to the drawing not permanently, but only while pressing the SHIFT key (CAPITAL LETTER)

Reference Magnetic Connection: possibility of connection to the lines and points of reference

Drawing Magnetic Connection: possibility of connection to the drawing items

Background Magnetic Connection: possibility of connection to the drawing items of the second level. Actually there are two drawing's levels, the principal and the second one

Direction Vector Arrows: visualization of the versor that points out the route direction on the drawing from the starting point

2.2.3 Sub-Parameters



Resolution: it defines the minimum degree of error and approximation to consider during the calculations

Decimals: number of decimals that are visualized on the display and reported in the ISO file for the movement of the machine (max 16)

Vector Minimal length: minimum length of the possible movements of the machine

ISO Extension: extension of the ISO file in operation on the present NC (for ex.. .GIO, .PIM)

Arrow Dimension: dimension of the arrows for the dimensioning in millimeter

Cursor Dimension: dimension of the square cursor which is visible in the area of the drawing in pixels

Average Distance Rate: as for the previous parameter, it is the tolerance coefficient used to estimate if a series of vectors belongs to the same arc on the basis of their length

Characters Height on Screen: measure in millimeter of the dimensioning character's height

Grid Step: increase of the grill for the positioning at fixed intervals

Compensation Chordal Step: length used by the program for the movement on the curves type B-Spline, that is of the particular curves determined by a series of following points, approximate so that to get a continuous layout without edges. The characters of Windows® type TTF is generally built with them. This value is used in general for the incremental movements that are not simple arcs or lines. Smaller it is the value and more precision is gotten, normally for incision the value to be inserted is 0,5mm while for normal workmanships 1 mm. The center utensil passes for the knots of the run utensil

Minimal Chordal Step: is the step of the variation along the axle for the job of the writings. It potentially has to be a value $[0,5 \div 1 \text{ mm}]$, smaller than the step chordal compensation

Maximal Chordal Step: is the step of the variation along the axle for the work that at the most the program allows to perform

Automatic saving timer: In every 60 seconds the program automatically saves the works against the power supply problems or etc...If the user is not an experienced one time can be reduced

Kind of Machine: Selection of the type of machine on which to found the calculations served as the software

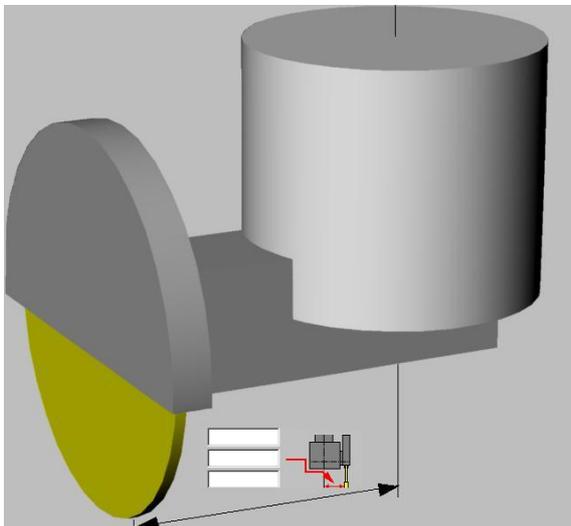
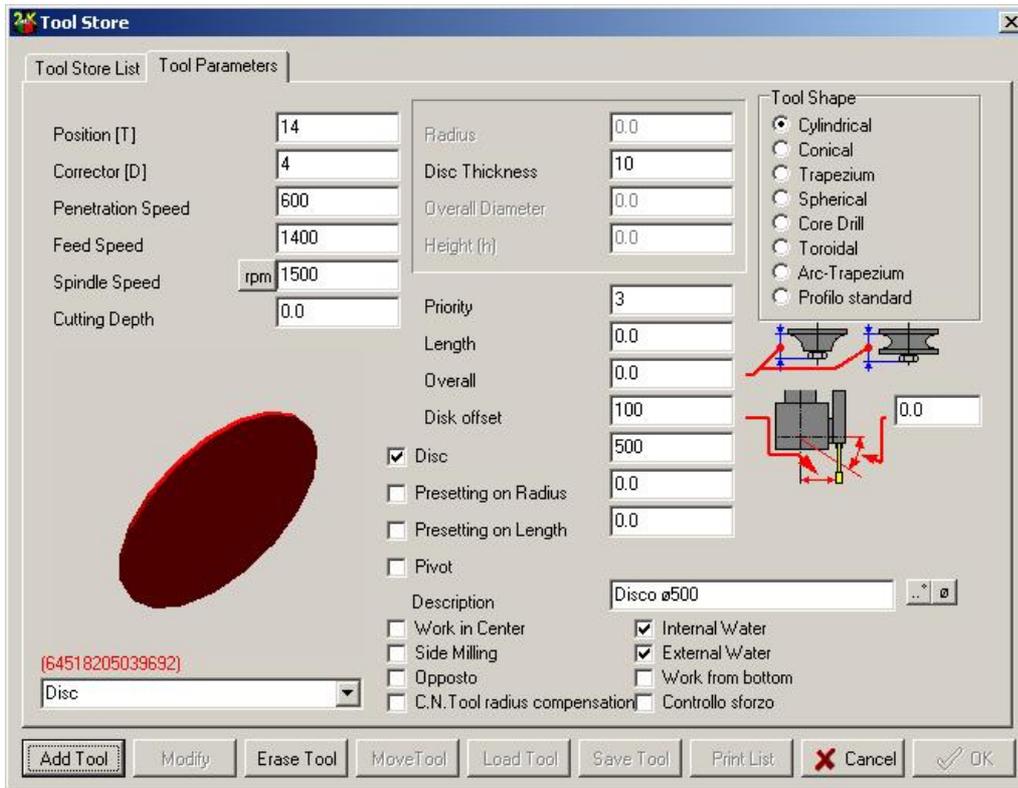
3 USEAGE OF THE DISK

Wcam2K in relationship to a postprocessor that use the disk it is able to realize the following work:

- Simple cuts to disk with automatic positioning of the table in the direction of cut. Every cut can be lengthened or to shorten according to the necessity and the automatic respect of the edge is possible. It allows the management of cuts to step
- Optimization of the run of the tool to obtain the speed process of the work
- The software allows to bring in the background some sketch the image in staircase 1:1 acquired by digital room for the positioning of the cuts
- Work of thickness to double section (frontal and side section different) with the disk that works on the plain X-Z
- As stings to the preceding point but with the disk capsized in horizontal
- Work of thickness to double section (frontal and side section different) with the disk that works on the plain Y-Z, said of Shoulder
- Tilted cuts
- Crosswise to PIVOT, with the normal disk to the surface
- Use of the table as vertical lathe in continuous rotation and interpolated for the realization of surfaces with profile in rotation in comparison to the axle of the table
- Execution profiles to generating of cut and of crosswise
- Roughing and finish of surfaces type bas-relief
- Roughing and finish of basin
- Use of parametric outlines for simple figures
- Option nesting to minimize the discard of material

In this section examples of job will be proposed with utensil disk. In the case of vertical disk, the configuration in tool store it is the following:

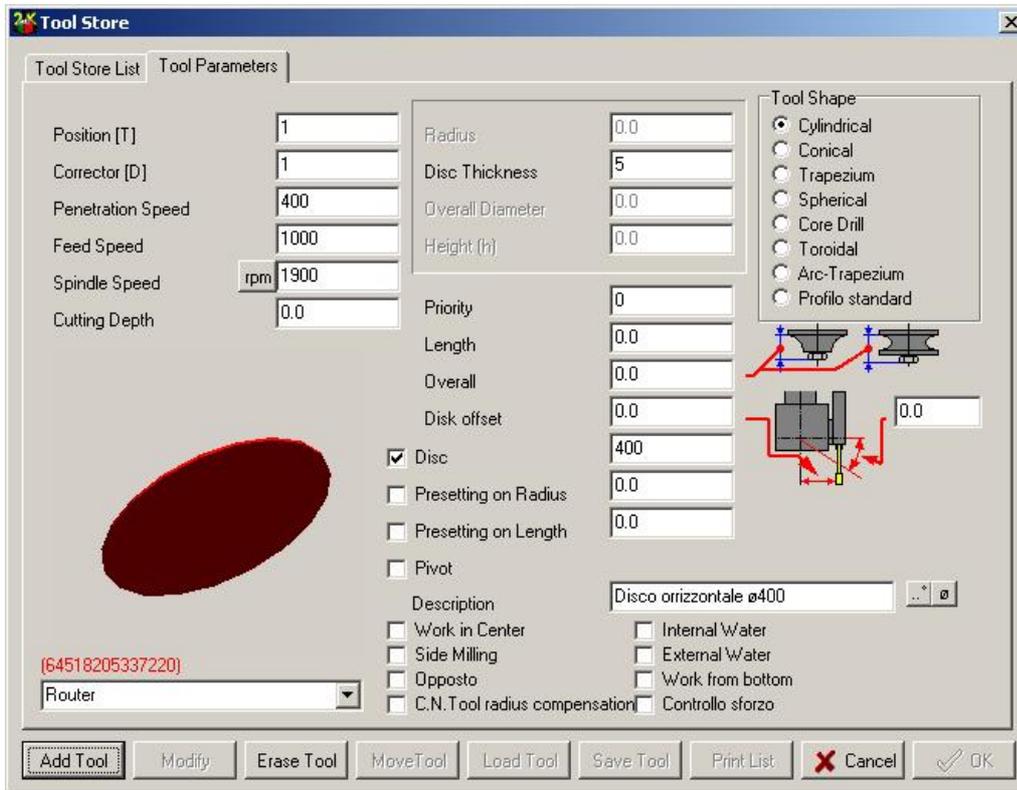
3.1 Vertical disk



In the image to the left the distance is represented by to measure for the disk offset. Such measure must be inserted in the configuration of the disk

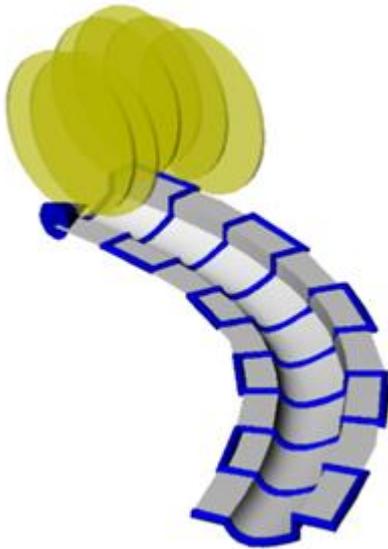
In case of horizontal disk, the configuration in tool store it is the following:

3.2 Horizontal disk

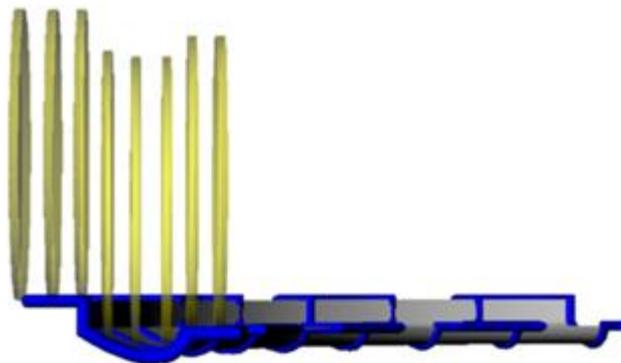


3.3 Crosswise movements

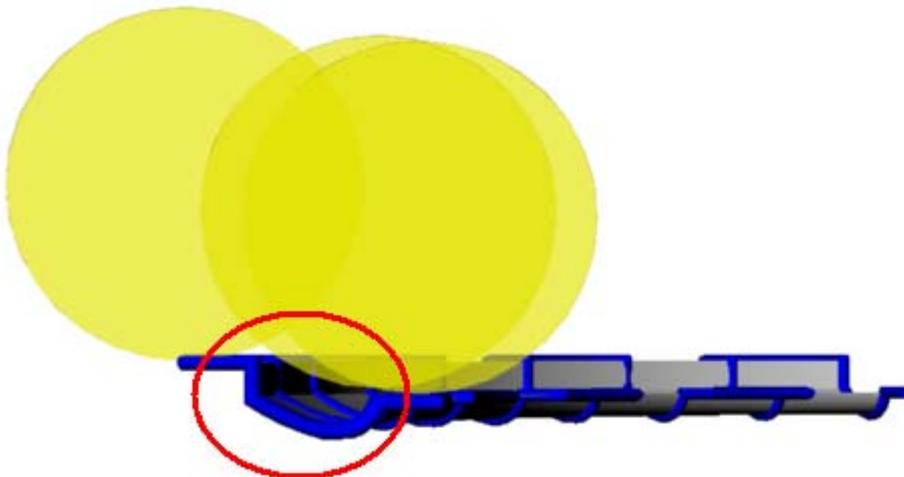
Of shoulder or crosswise, normally for the finishes, the orientation of the utensil is Horizontal in comparison to the section so that to reproduce more faithfully possible present edges on the same one



The choice of the position Horizontal in comparison to the section has been dictated by the impossibility of other solutions to be able to complete the job



The image below underlines the zone that would not be removed with an orientation of the disk in the direction of the section



3.4 Tool Compensation

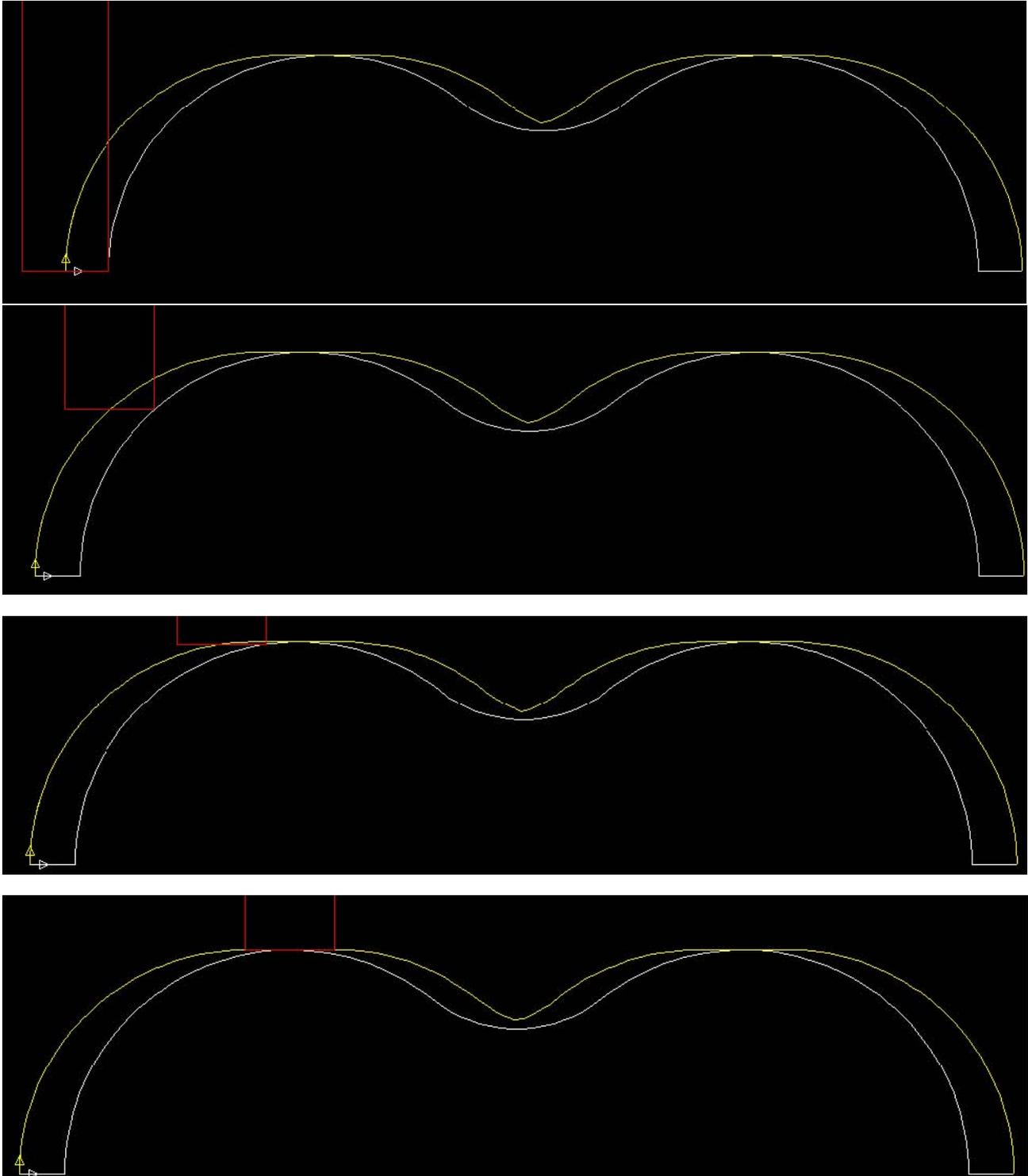
It verifies compensation of the utensil on the generatrix

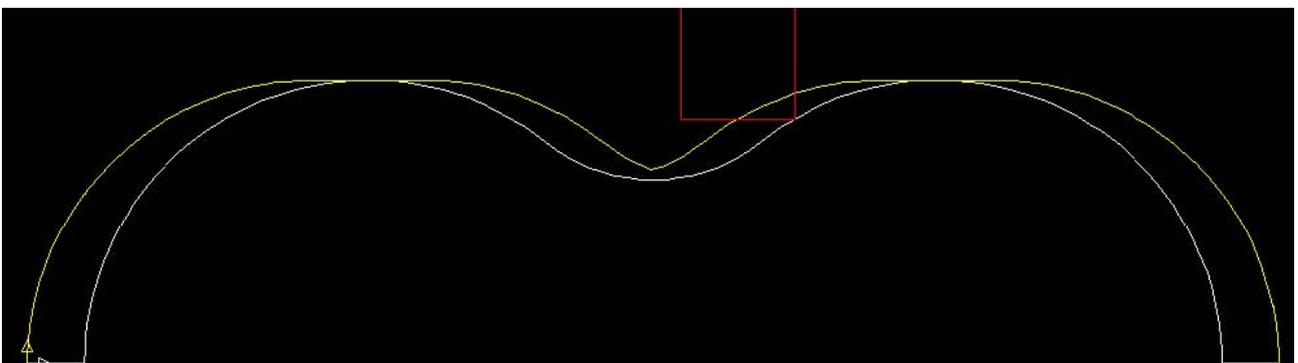
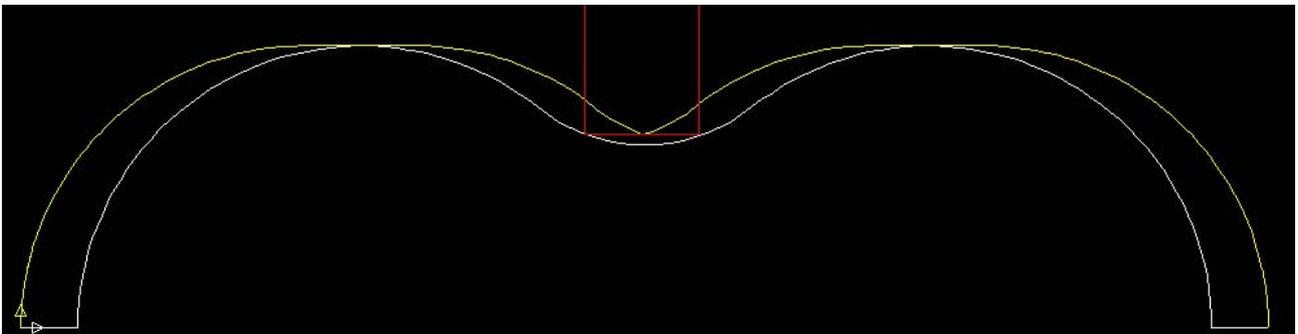
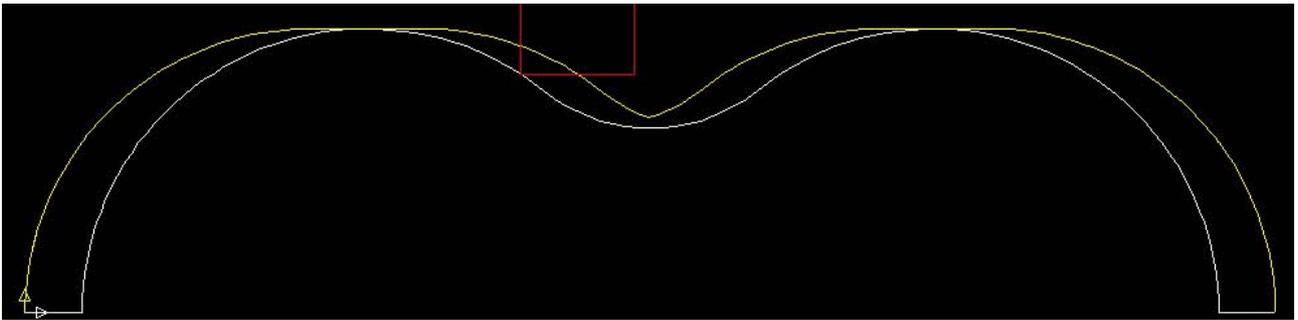
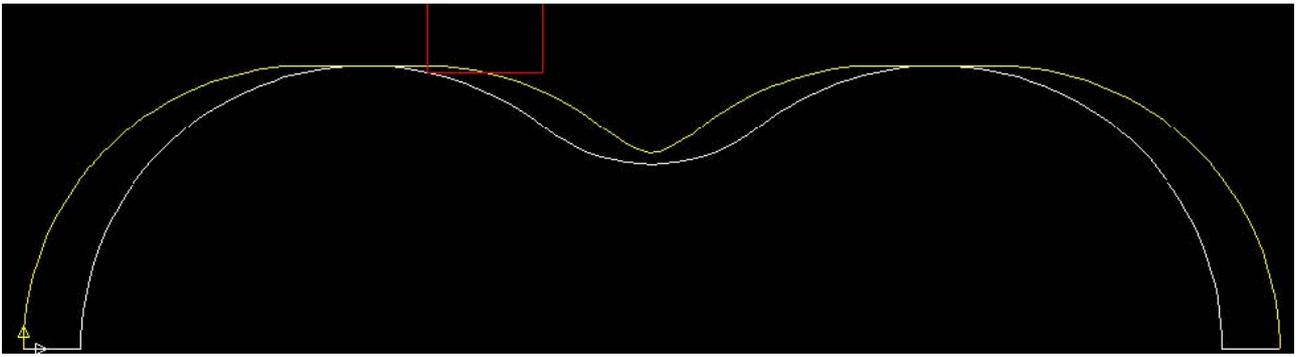
Work produced by WCam2K with compensation of the form of the tool activates:

The Red sketch is the section of the disk

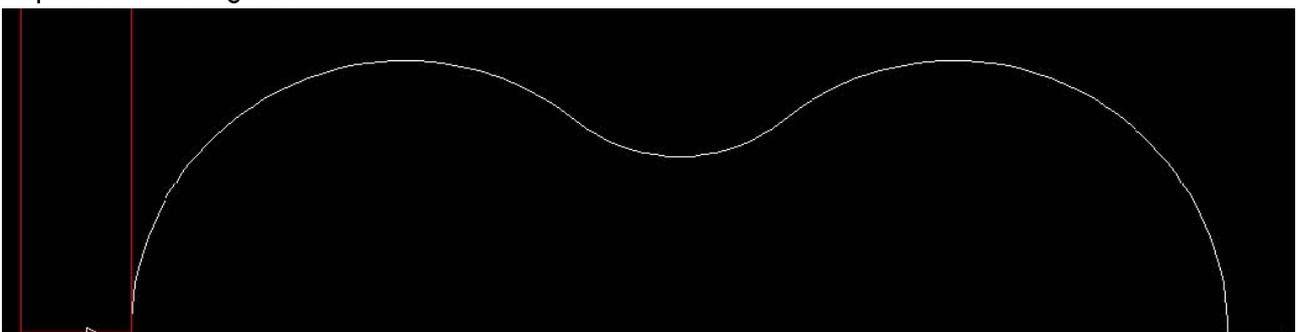
The White sketch is the profile to get

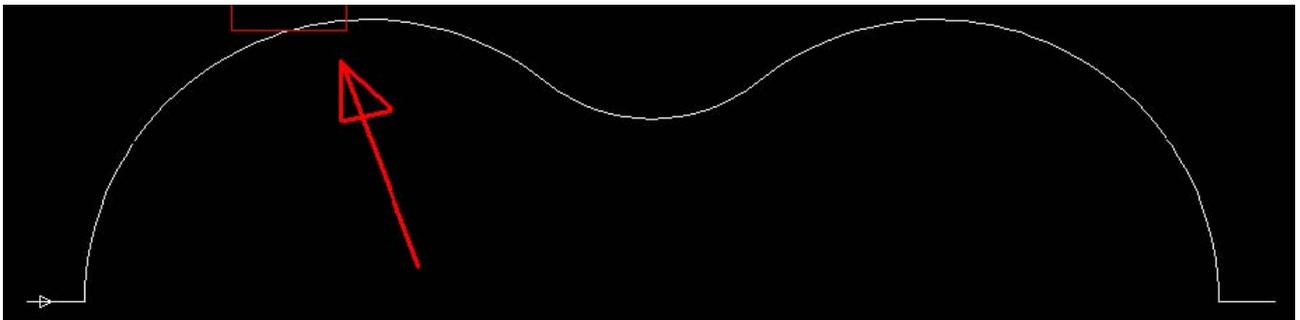
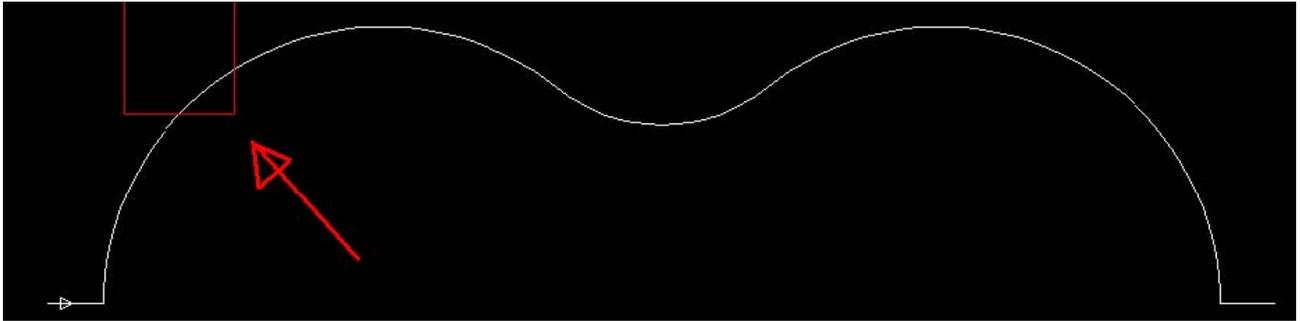
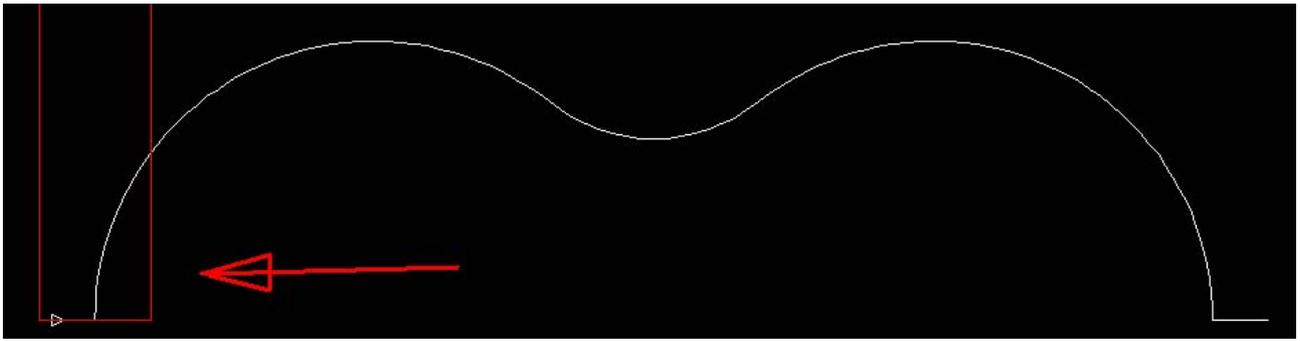
The Yellow sketch is the movement of the center utensil



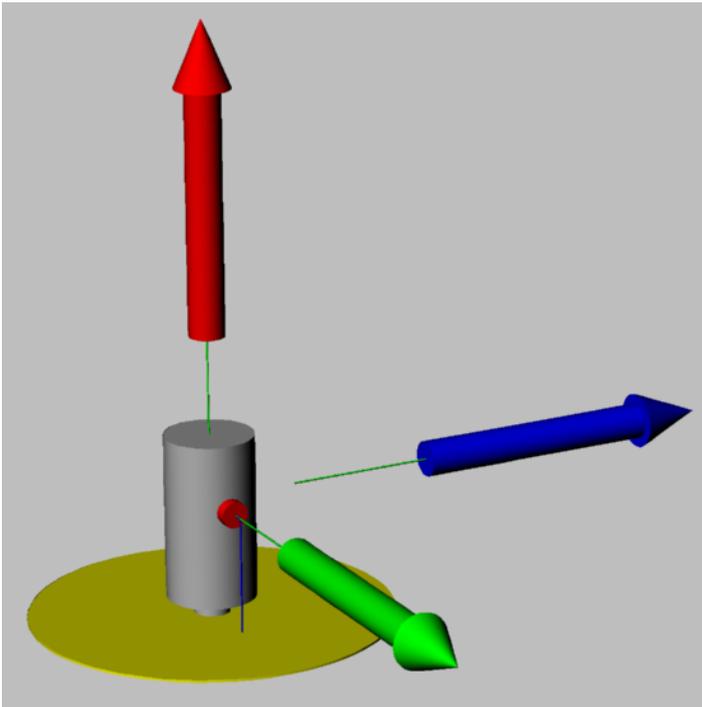


Work produced by WCam2K without compensation of the form of the tool activates:
 Clearly in this case the movement of the center utensil corresponds to that some profile but to cause of the thickness of the tool the work will go to deform the profile to get as him note from the sequence of the figures





3.6 Scheme management disk 5 axes



3D Reference position

Dimensions of the utensil used in position of measurement or reference, therefore with the disk positioned horizontal (as after all it does him for all the other utensils). The only difference between the disk and the other utensils is that normally the other utensils are of smaller diameter in comparison to their length, while the disk normally has the greatest diameter of the length

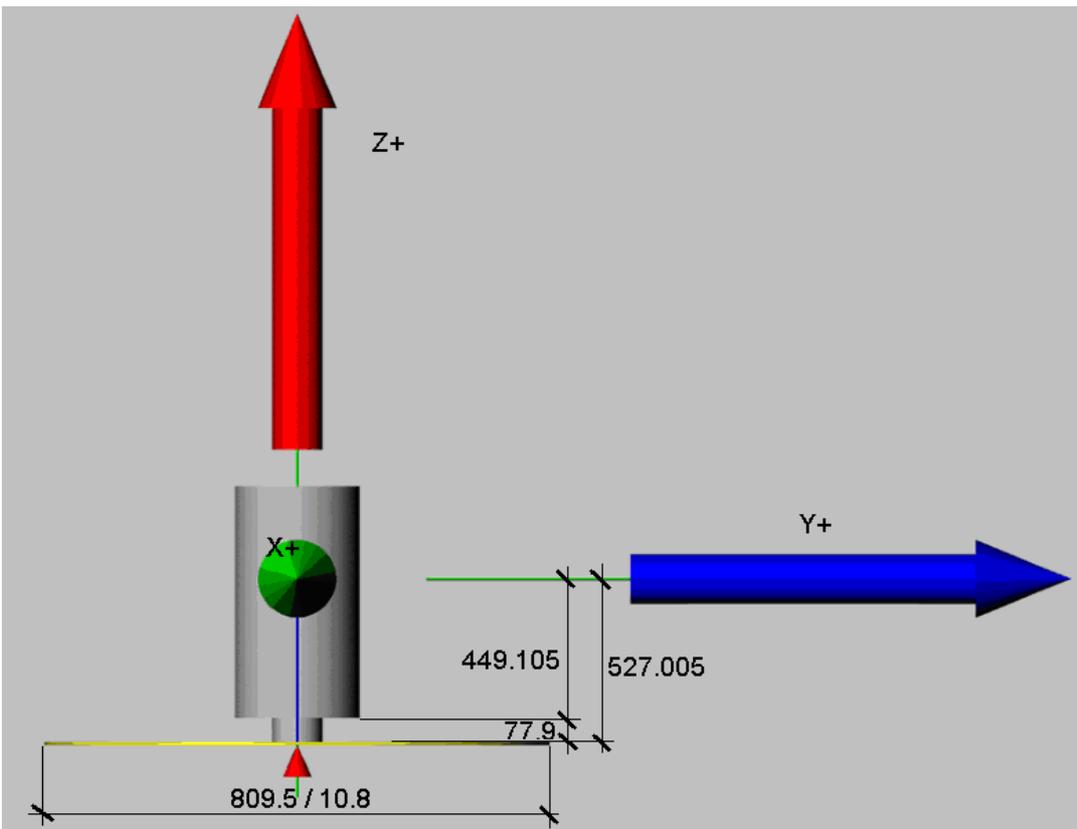


Figure below: position to 45° side sight Figure below: position vertical disk in sight 3D

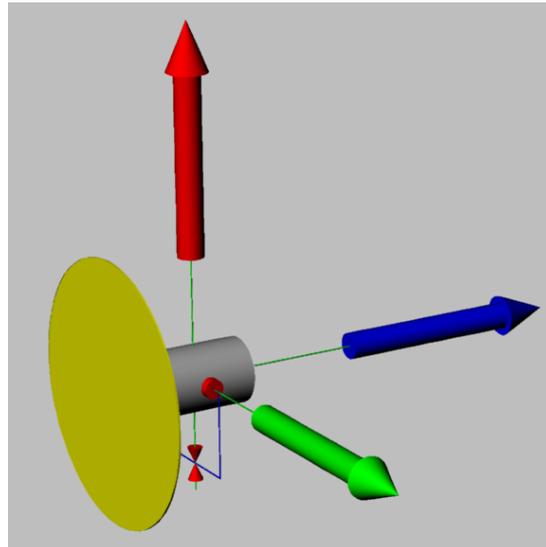
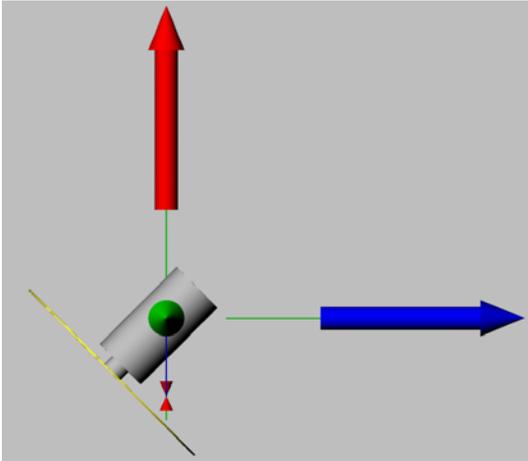
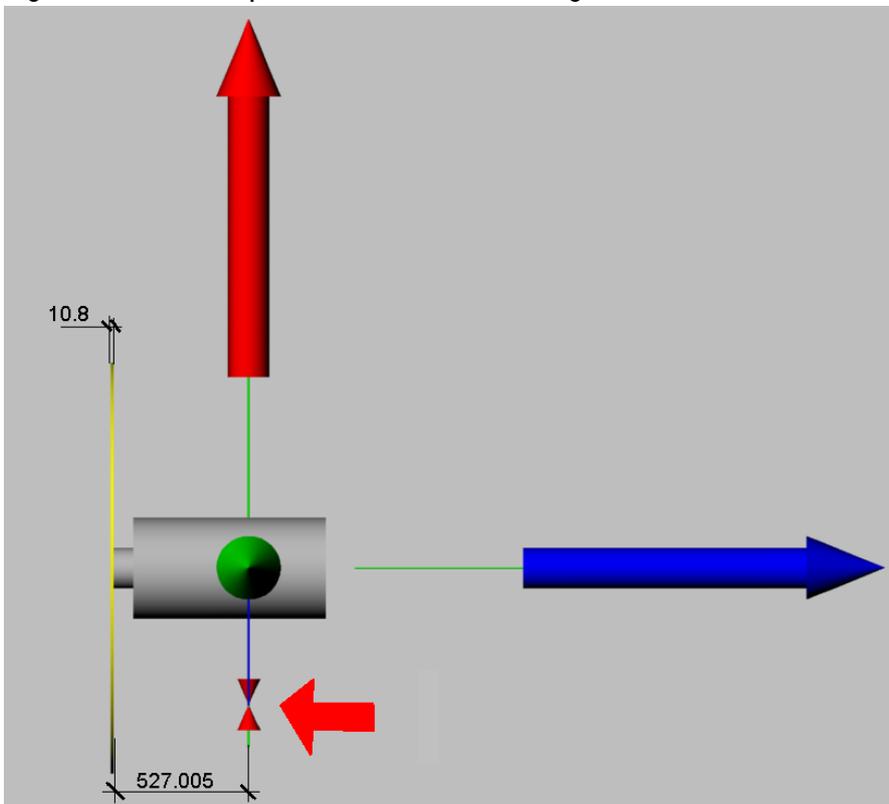


Figure under: disk position vertical in side sight with measure



The red arrow points out the point (underlined by a further red reference) of where it remains positioned the machine after having performed the rotation of the disk

The program therefore knows the geometry of the machine (measures tool and mandrel) and it moves the point of red reference in all the operations both with the vertical tool (as for the machine to 3 axes) that with the tilted tool

For example If it performs a deep horizontal cut 100mm on the plan of the machine that departs from 0,0 and it finishes to 500,0 with the considered tool as example it is gotten a program:

```
%
N1 {VER 6.0.2.228 - C:\BPIWCAM\Dat\abc - WKMACH=0 - 13/11/2003 - 7:44:38 CSL5}
N2 <OTT=R100>
N3 R2=0.0 { MATERIAL THICKNESS}
N4 D0
N5 G0G90
N6 G0G53Z0
N7 M81 {Unlock A}
N8 M83 {Unlock C}
N9 {DIS527.005=449.105+77.9}
N10 G17
N11 R3=5 {QUOTA SICUREZZA RAPIDI}
N12 <IFF <OTT>:N14;N14;N13>
N13 <IFF <R102>:N36;N36;N14>
N14 {Disco UTENSILE CODICE 2}
N15 T2M6
N16 <IFF <OTT>:N17;N17;N18>
N17 R99=10
N18 L<ORIGINI>
N19 M67
N20 G64 {Fast positioning and fast feed}
N21 M82 {Lock A}
N22 G0X0.0Y532.405C90
N23 M81 {Unlock A}
N24 A-90
N25 M82 {Lock A}
N26 M84 {Lock C}
N27 G0G43Z=-133.055+R3
N28 S900
N29 M3
N30 G1Z-233.055F5000
N31 X500Y532.405
N32 G0Z=-133.055+R3
N33 M5
N34 M81 {Unlock A}
N35 M83 {Unlock C}
N36 <LCK:ON>
N37 <IFF <OTT>:N39;N39;N38>
N38 <RET>
N39 M32
N40 M30
```

You see that the position in X,Y of the first positioning is: N22 G0X0.0Y532.405C90

The position in X goes to Zero because the wheel is programmed of 90 degrees the plain YZ and therefore some move doesn't intervene in direction X of the point of reference

The position Y becomes 532.405 that it is the distance in comparison to the point of reference owed to the rotation of the disk (527.005 see figure) more halves the thickness of the disk ($10.8 / 2 = 5.4$) therefore: $527.005 + 5.4 = 532.405$

The position in Z of cut is N30 G1Z-233.055F5000

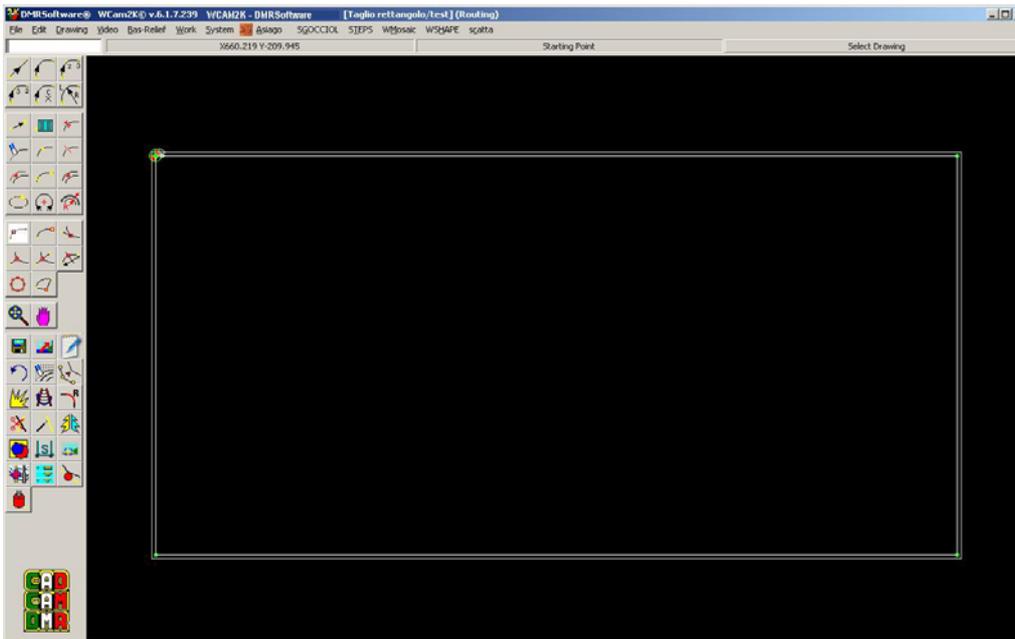
The measure gotten by the calculations is given by the distance in Z of the point of reference from the center of the tooth of the disk therefore rotating the disk I go to lift the center disk of 527.005 (overall) + 10.8 (thickness) = 537.805, however rotating the disk its diameter is positioned in vertical and therefore the center of the tooth is found more in low of the ray of the disk $809.5/2 = 404.75$. I get the difference of Z given by $537.805 - 404.75 = 133.055$ in direction Z+, therefore to bring the center of the tooth to 100mm of depth the position of Z will be $-133.055 - 100 = -233.055$

4 Example

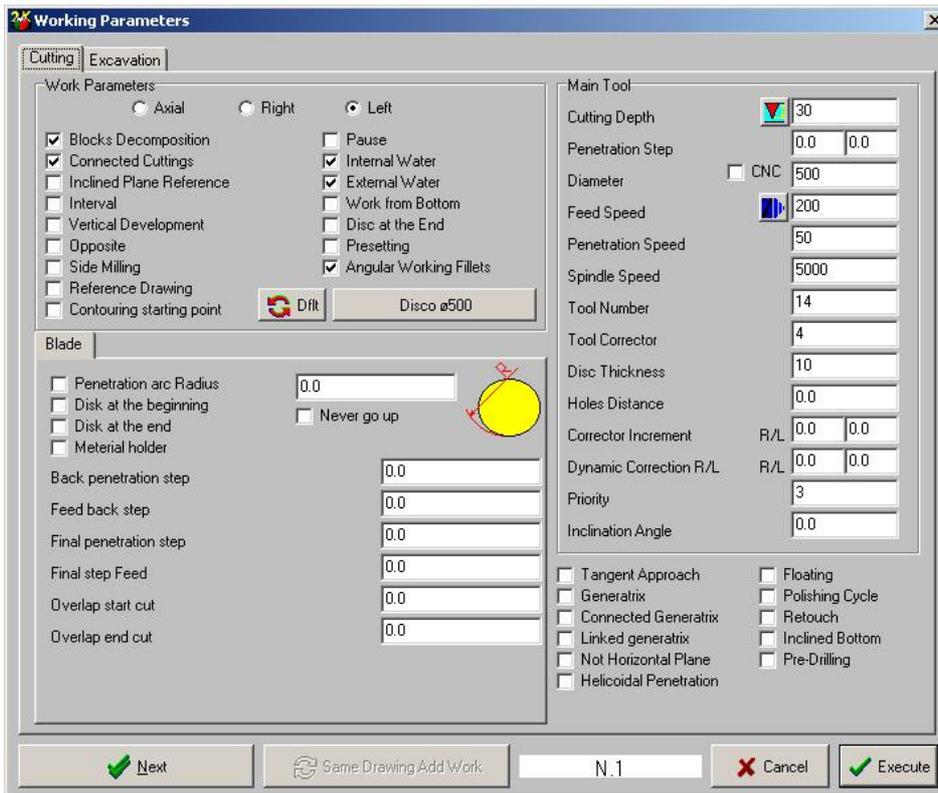
4.1 Cut of a rectangle

Cut of a rectangle of dimensions 1000 x 500 from a plate of enough dimensions with thickness 30mm. To draw the rectangle:

- 1) From the menu **DRAWING**, select **RECTANGLE**
- 2) From keyboard insert 0,0 and press Enter to introduce to the left aloft the position of the vertex
- 3) From keyboard 1000,-500 and press Enter to complete the rectangle

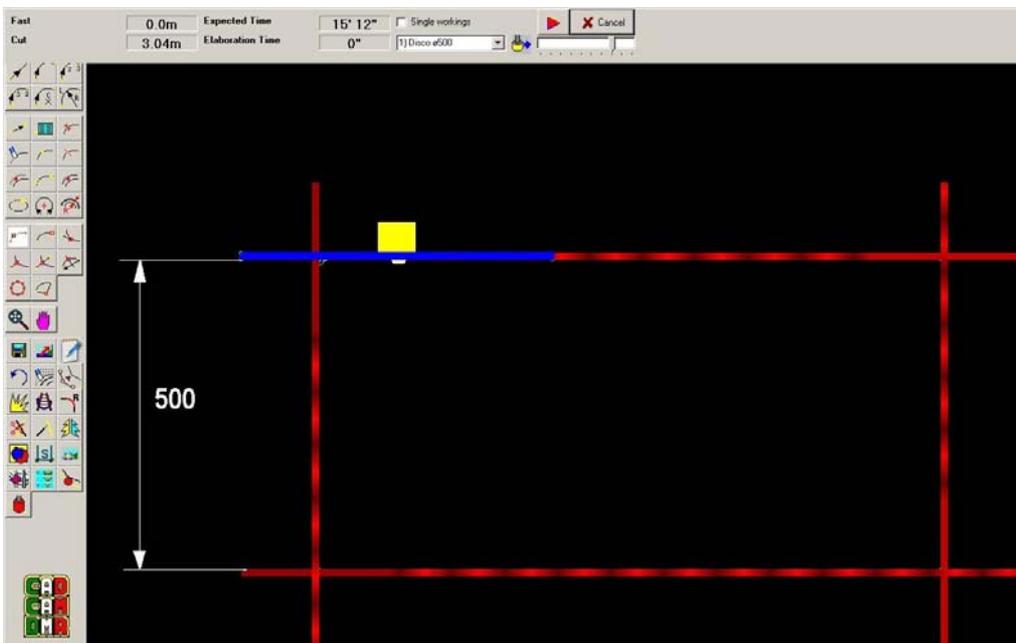


- 4) From the menu **WORK**, select **WORKING** → **CREATE** select the rectangle, for inserting the data work
- 5) P the button to realize the zoom of the area of rectangle
- 6) You note that an arrow exists above to the layout that points out the toward of route of the rectangle
- 7) Selects the rectangle moving the cursor of the mouse above the rectangle and pressing the left key, the rectangle changes color, therefore it is confirmed with the right key
- 8) Select in the tool store the proper tool for the work. With the mouse it brings him above the indication looked for in list, he presses the left button of the mouse and therefore the pulsating OK. In this way the selected tool is trained for the work in question. In this case it is worthwhile to consider a cut. Chose a blade of \varnothing 500 and thickness 10 mm
- 9) Select the position that has to assume the tool in comparison to the layout, keeping in mind the sense of route given by the arrow; in this case the arrow points out that the rectangle develops clockwise him, therefore to get the rectangle I have to point out in the left
- 10) Introduces a value of 30mm in the **CUTTING DEPTH** of cut to point out how much it is had to lower the tool in comparison to the surface of the material so that to perform the job.



- To select and to insert:
- Right
 - Block Decomposition
 - Connected Cuttings
 - Tool
 - Cutting Depth=30
 - Angular Working Fillets

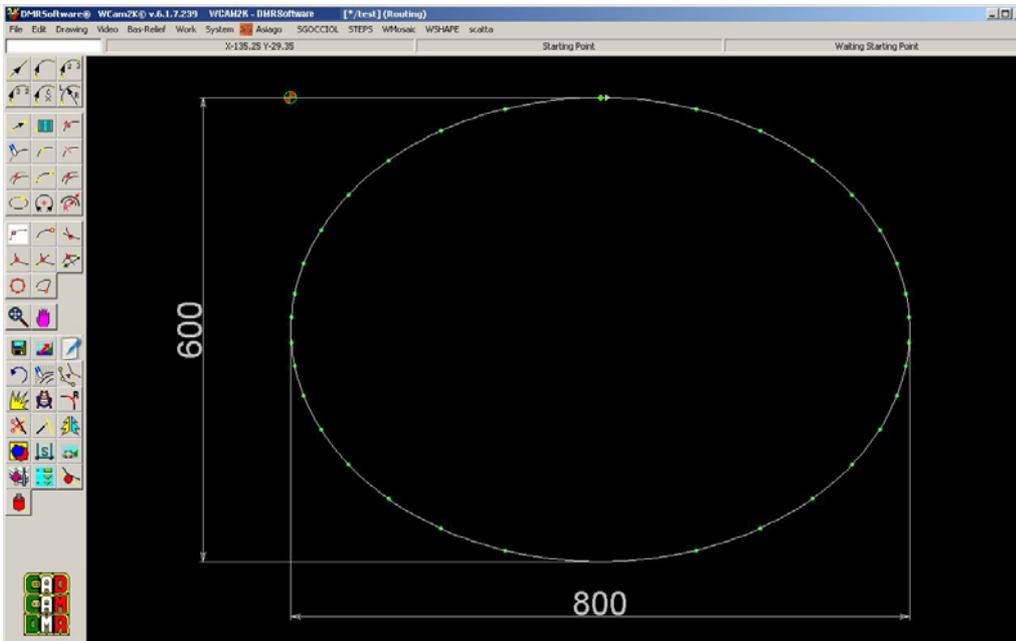
12) Press OK. To video the run utensil appears. You note that having selected to the left some direction of the arrow, the trace appears compensated of the thickness of the disk. The simulation 2D make to see besides the encumbrance of the disk on the material



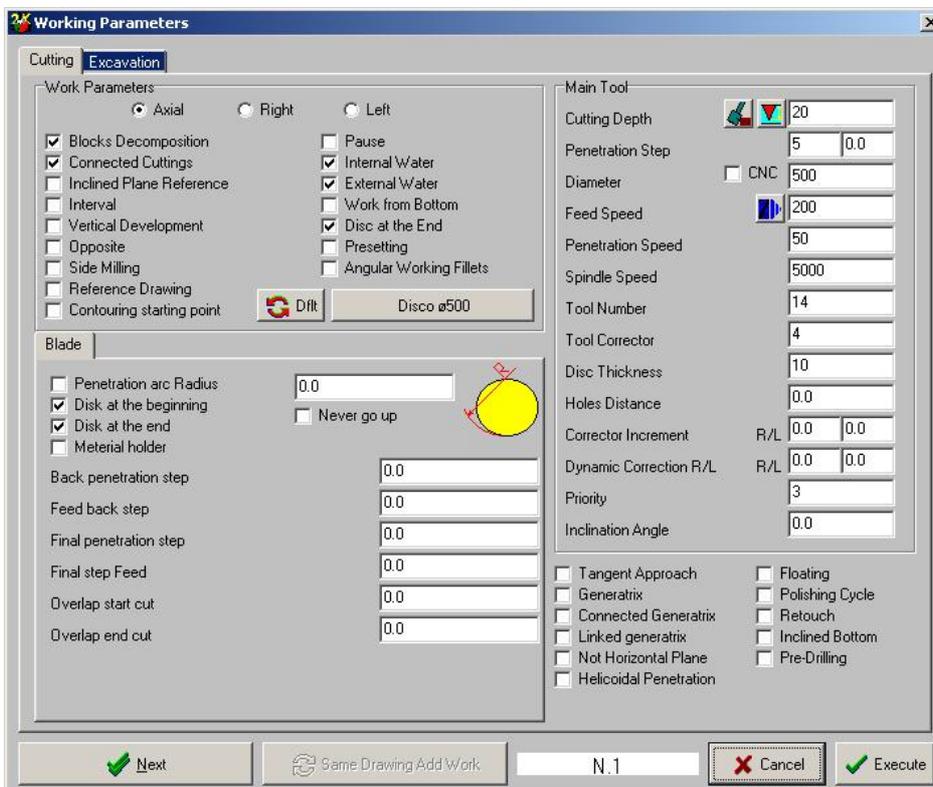
11) **ANGULAR WORKING FILLETS** is selected for lifting the head of the machine to every angle and to allow the rotation or of the table or of the head above the material

4.2 Excavation

Make a excavation of an elliptic basin with disk. We draw an ellipse 800X600. We draw some references to have the correct dimensions, it is possible to use the automatic command from the menu **DRAWING** → **ELLIPSE**



From the menu **WORK**, select **WORKING** → **CREATE** select the rectangle, for inserting the data work

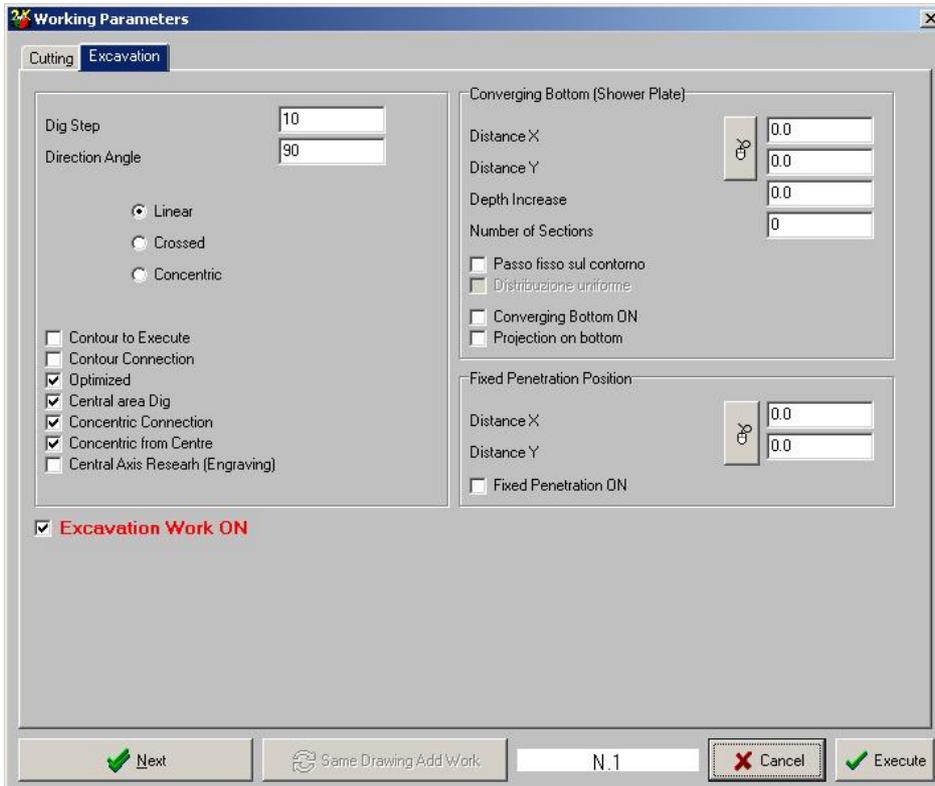


To select and to insert:

- Axial
- Block Decomposition
- Connected Cuttings
- Tool
- Cutting Depth=20 (Final depth)
- Penetration Step (5)
- Disc at the End
- Disc at the Beginning
- Disc at the End

Select **DISK AT THE END** to finish the cut to the correct measure

Insert the **CUTTING DEPTH** and the **PENETRATION STEP** to penetrate in the materials to levels of the inserted measure

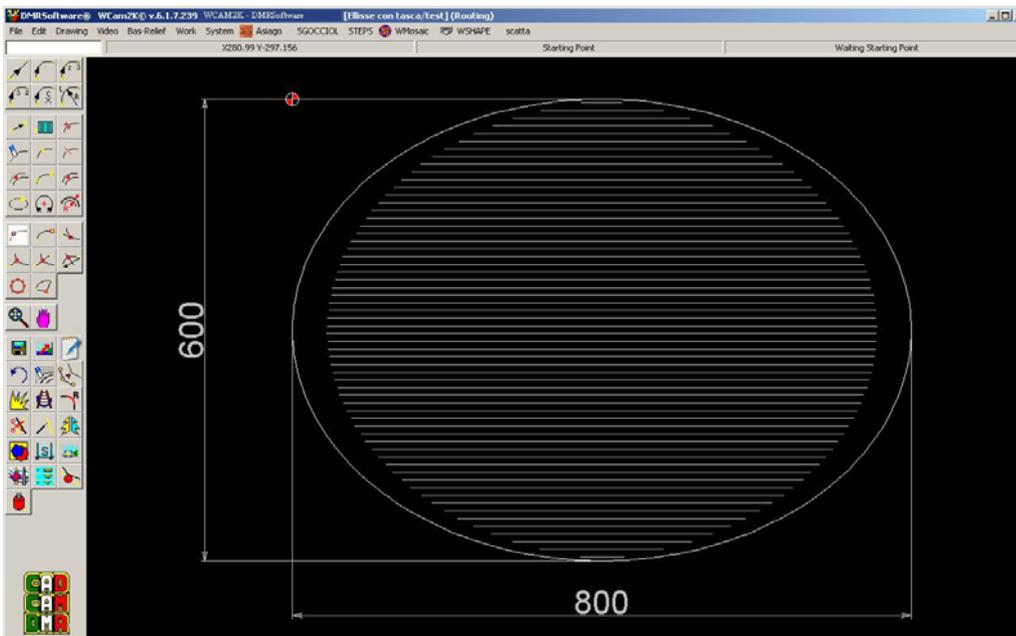


To select and to insert:

- Dig step
- Direction Angle (90°)
- Linear
- Optimized
- Central Area Dig
- Concentric Connection
- Concentric from Center

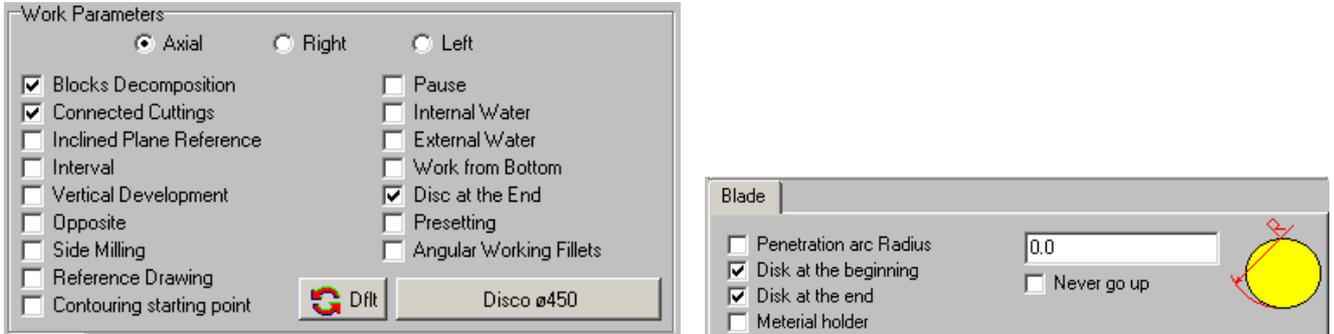
- Excavation Work ON

From the menu **WORK**, select **WORKING** → **SAFE**



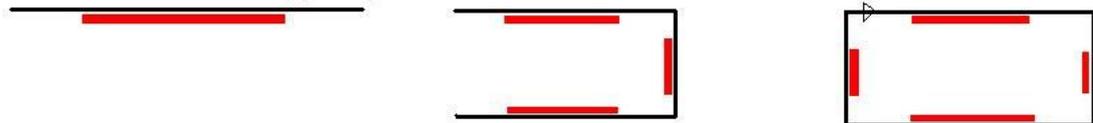
4.3 Disk at the end

In general **DISC AT THE END** interrupts the cut in correspondence of the inside angles

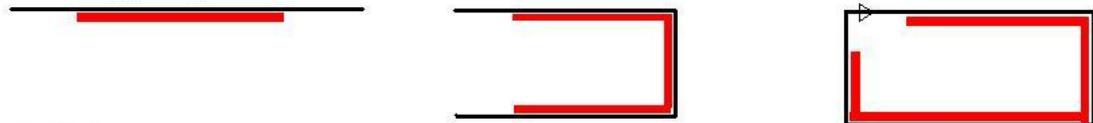


DISC AT BEGINNING interrupts the cut in correspondence of the point of departure of the run, **DISC AT THE END** interrupts the cut in correspondence of the end point of the run. The option **DISC AT THE END** follows the scheme attached that I have brought in an image that brings I believe all the conditions

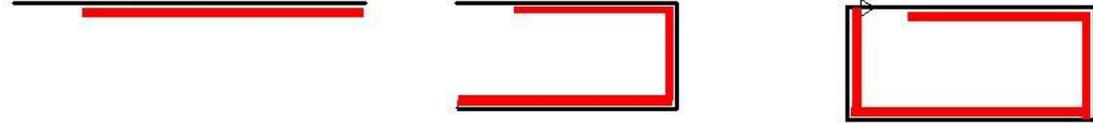
Disc at the End + Disc at beginning + Disc at the end



Disc at beginning + Disc at the end



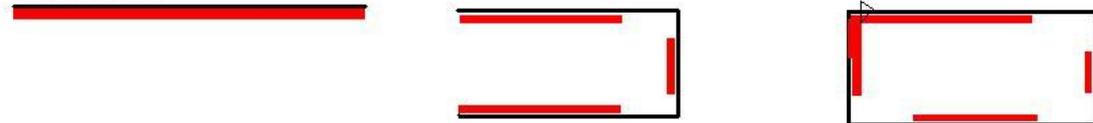
Disc at beginning



Disc at the end



Disc at the End



Disc at the End + Disc at beginning

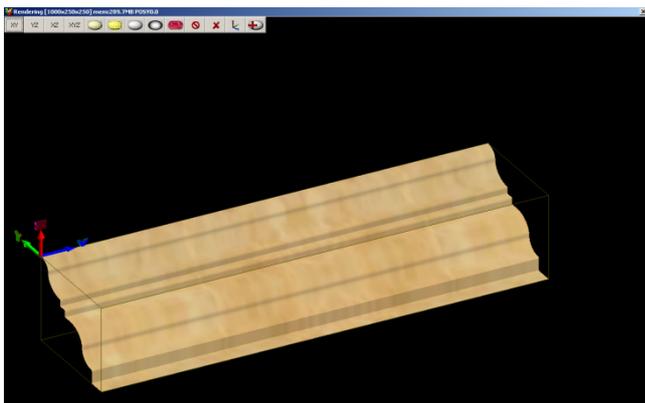
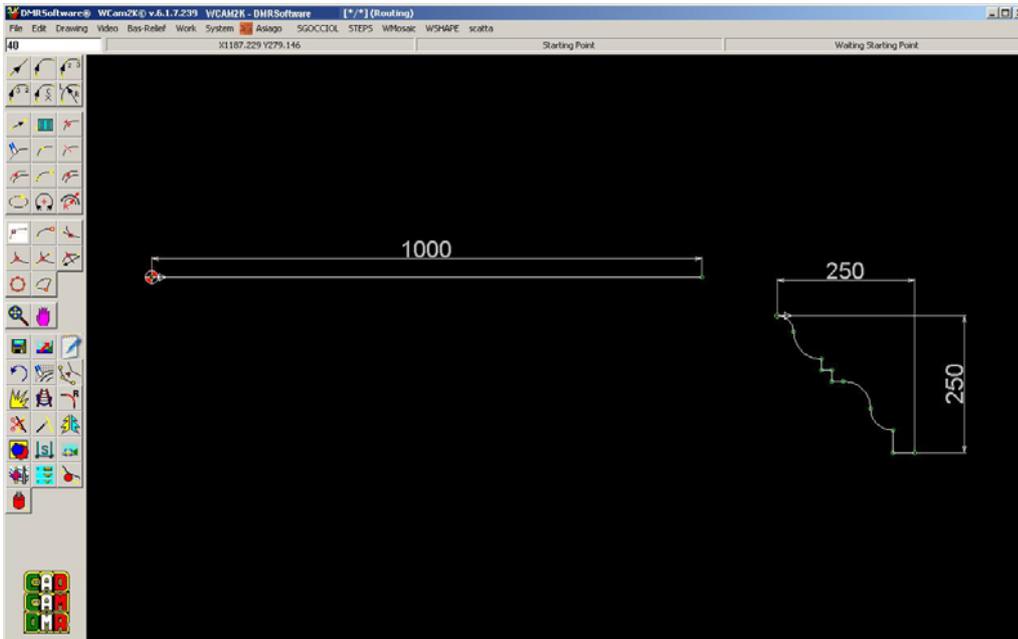


Disc at the End + Disc at the end

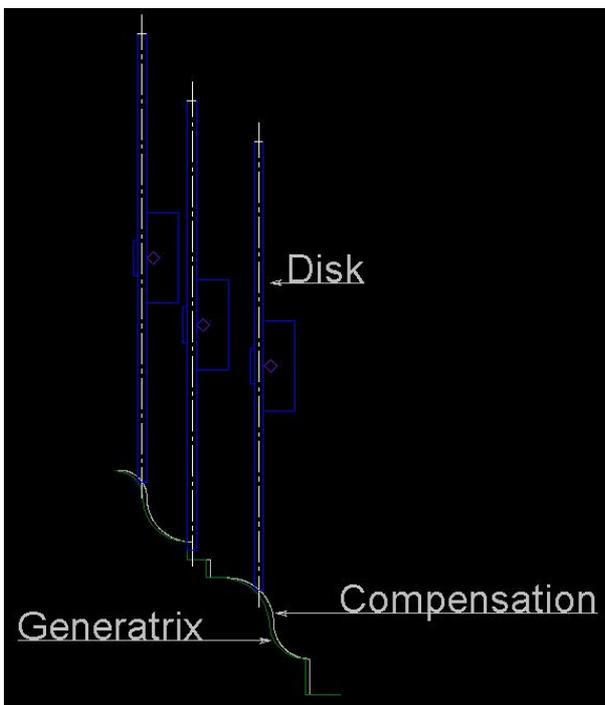


4.4 Use of the Generatrix

We use the disk in vertical position to create a profile with generatrix. We work with linear movement first for rough the material with steps in vertical and then ending the piece with movement crosswise



Rendering of the model:



In the image the disk in different positions is represented for explaining the compensation of the thickness of the disk along the run of job. The run is to the right that and he is always calculated in compensation to halves the thickness, on the axle of the disk

From the menu **WORK**, select **WORKING** → **CREATE** select the line, for inserting the data work



To select and to insert:

- Axial
- Block Decomposition
- Connected Cuttings
- Tool
- Penetration Step (20mm)

Generatrix

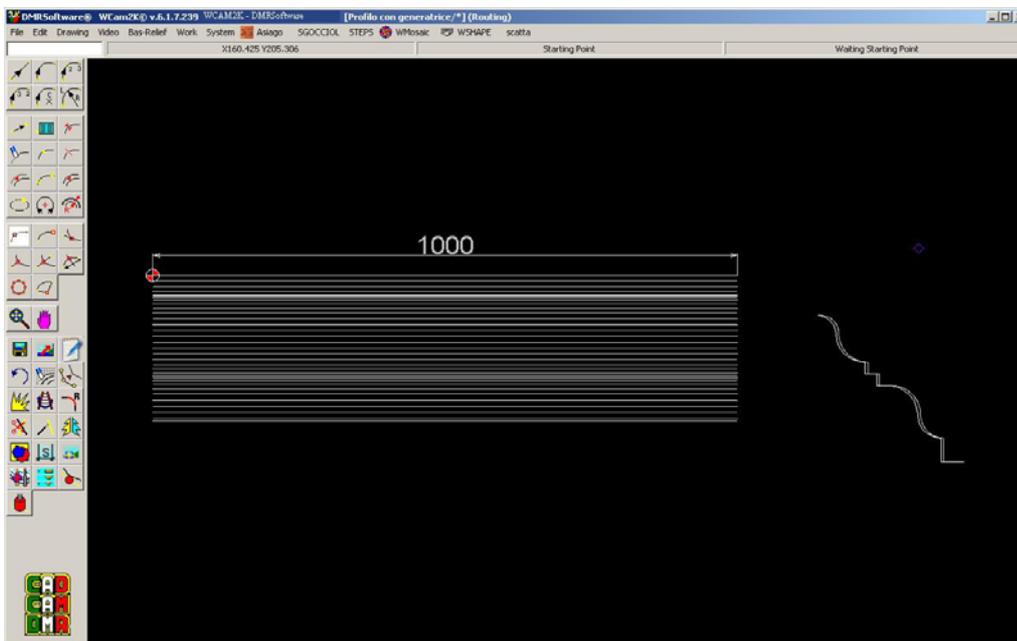
- Opposite Direction
- Generatrix Step (10)
- Tool Compensation

Tool Movement

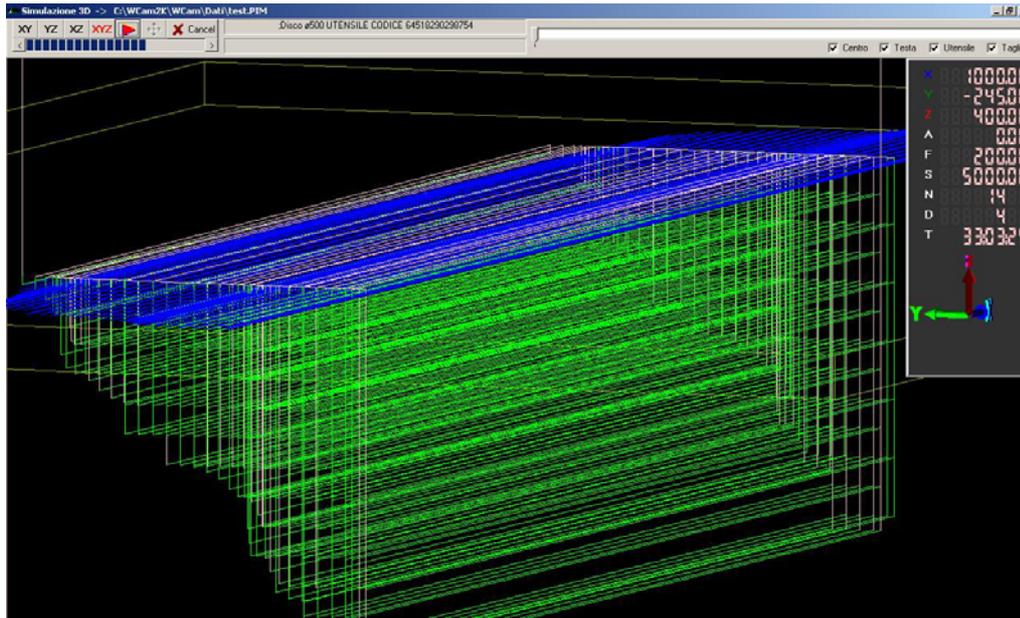
- Linear

Select **GENERATRIX** and insert the parameters

For the roughing we insert a step of lowering in Z in **PENETRATION STEP**

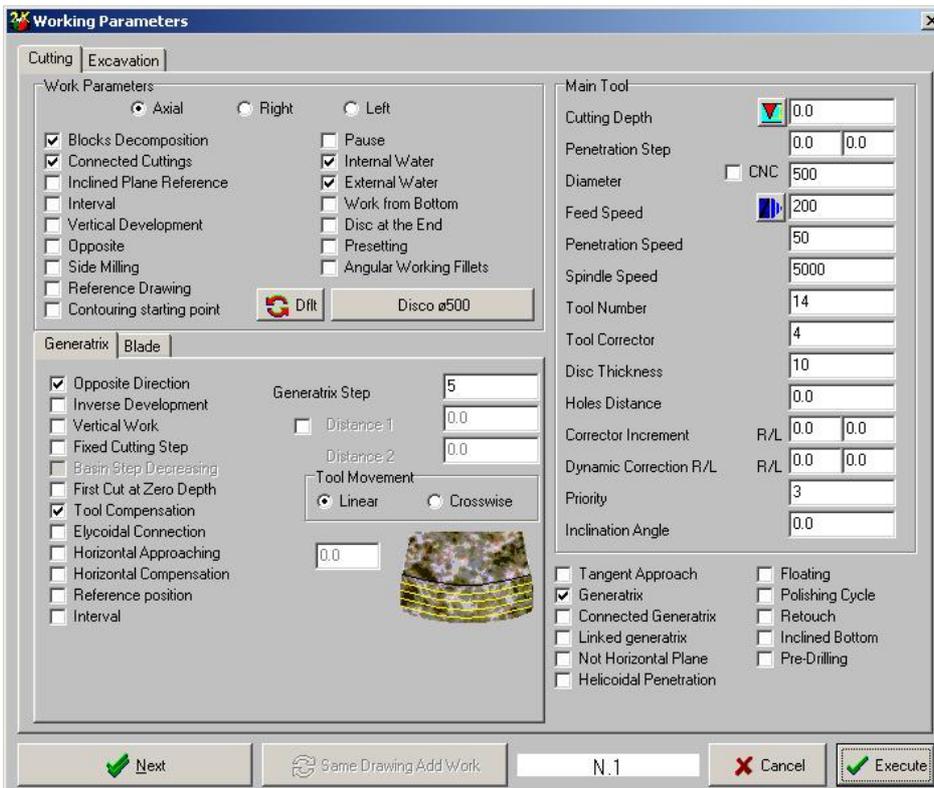


3D simulation:



From the menu **WORK**, select **WORKING** → **CREATE**

For the finishing:



To select and to insert:

- Axial
- Block Decomposition
- Connected Cuttings
- Tool

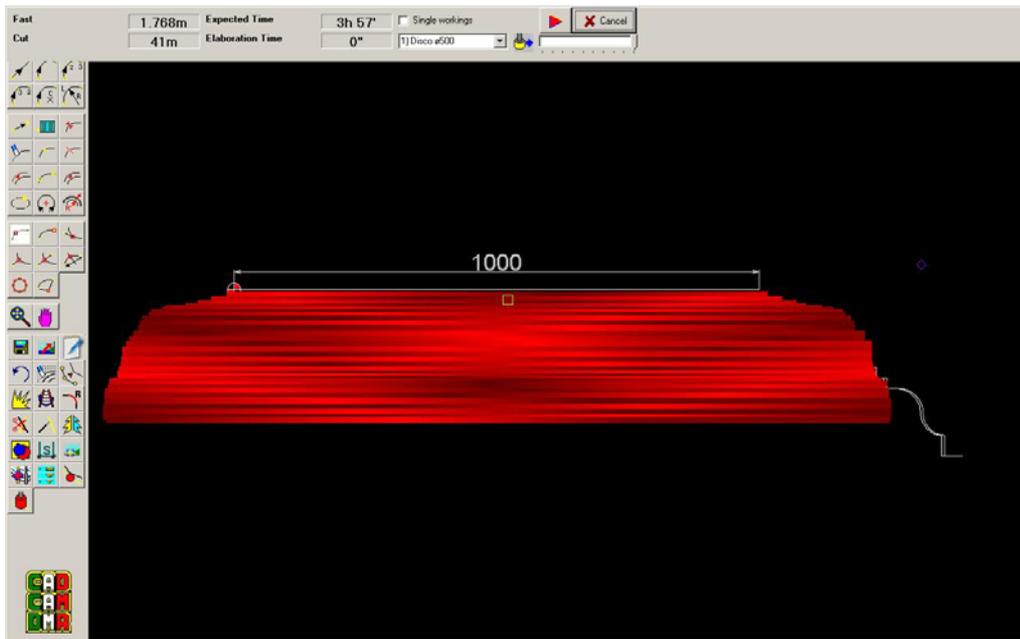
Generatrix

- Opposite Direction
- Generatrix Step (5)
- Compensation

Tool Movement

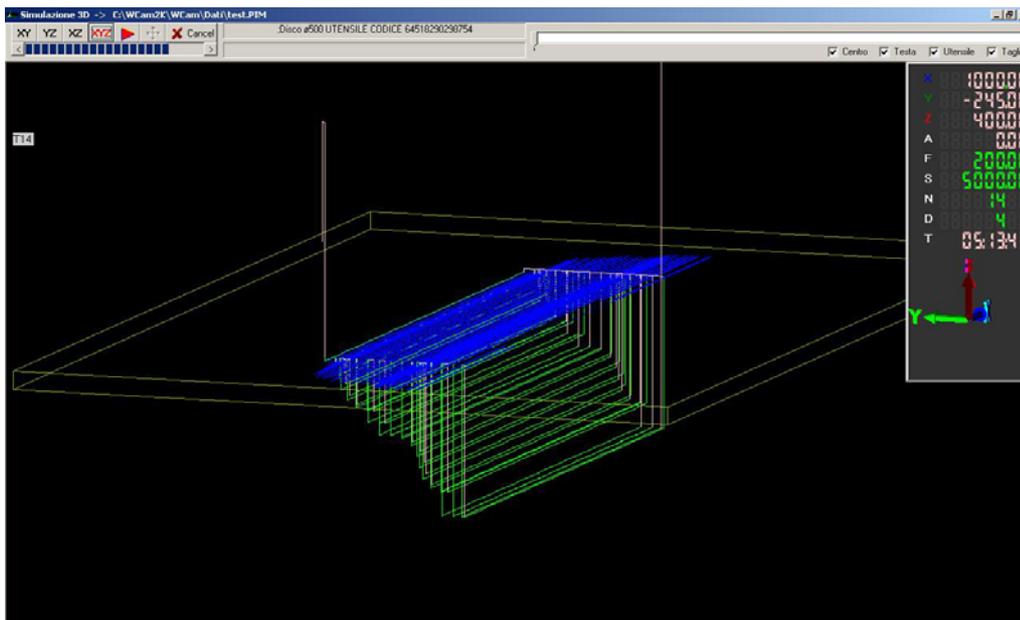
- Linear

2D simulation:



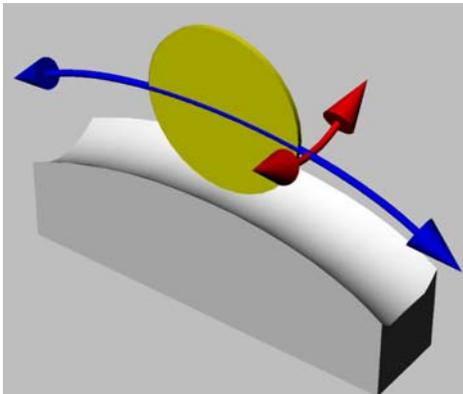
From the menu **WORK**, select **WORKING** → **SAFE**

3D simulation:



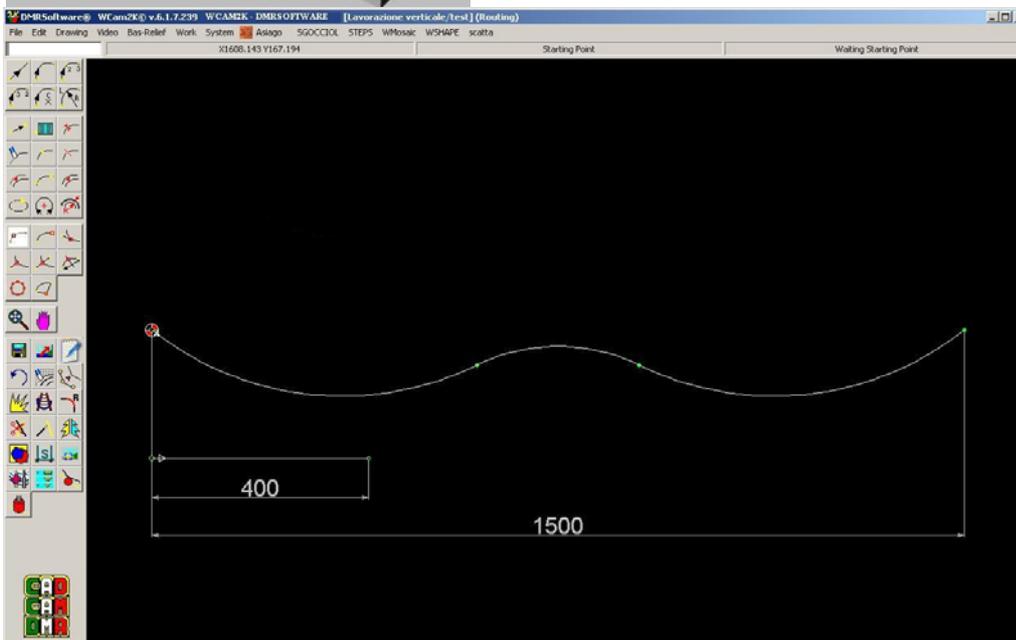
4.5 Vertical Work

We work using the vertical disk interpolating along a profile the axes X and Z. The horizontal line (generatrix long axes Y) is the width along which to connect the profile

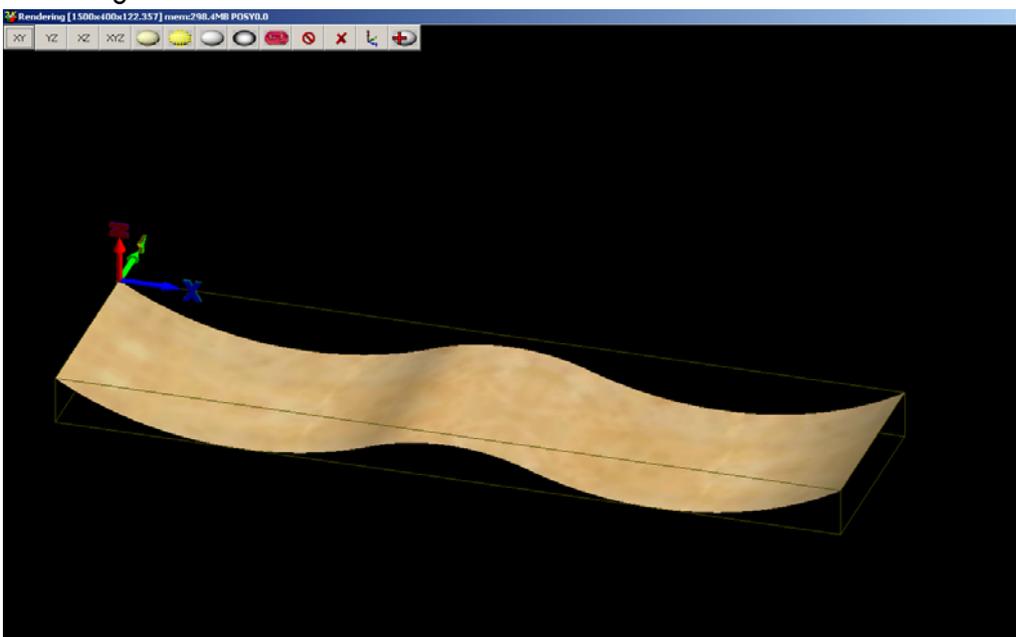


We suppose to realize a tub with this form. At the most we penetrate in the material with steps of 20 mm, moving the tool long the axle Y of the thickness of the disk

From the menu **WORK**, select **WORKING** → **CREATE** select the profile, for inserting the data work



Rendering of the model:





Select the profile and press left button

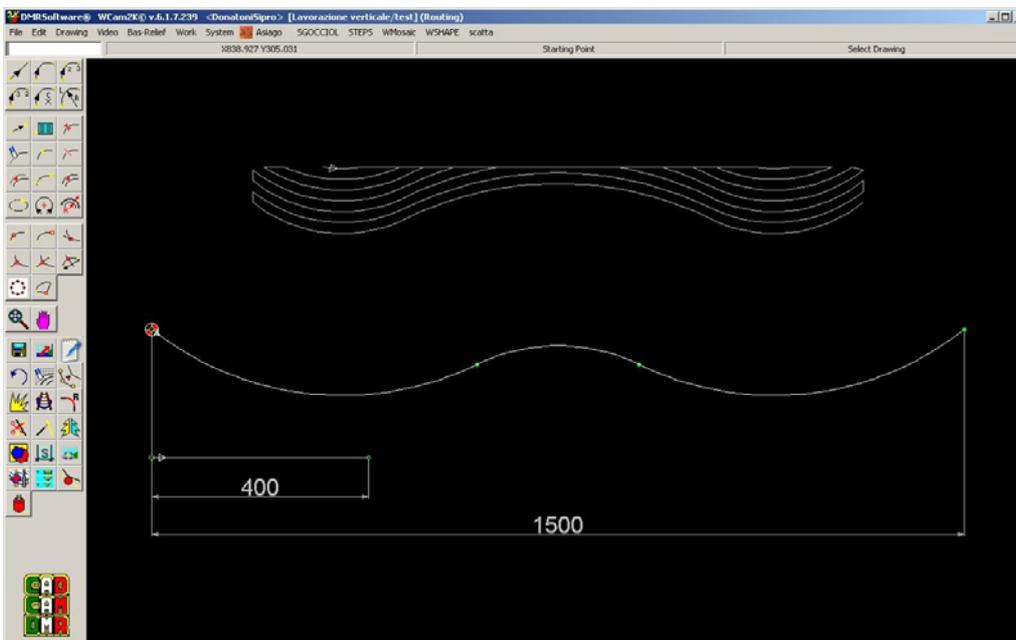
To select and to insert:
 Axial
 Block Decomposition
 Connected Cuttings
 Tool
 Penetration Step (20mm)

Generatrix
 Opposite
 Direction
 Vertical Work
 Generatrix Step (10)
 Compensation

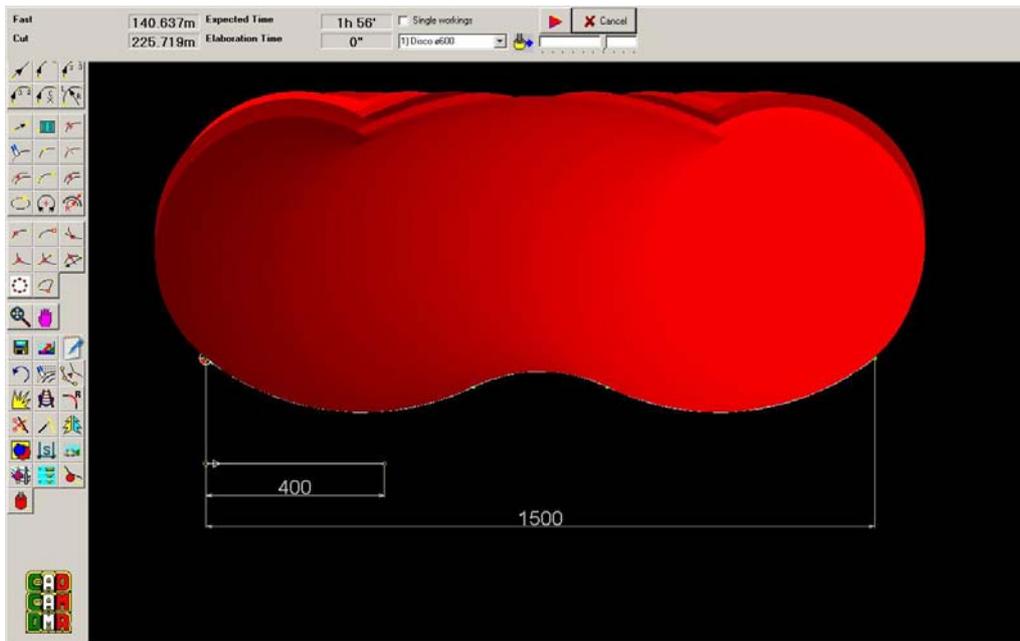
Tool Movement
 Linear

Attention to insert the step along the axle Z, **PENETRATION STEP**, and that along the axle Y **GENERATRIX Y**

When the parameters of work are confirmed it appears to video the movement of the tool

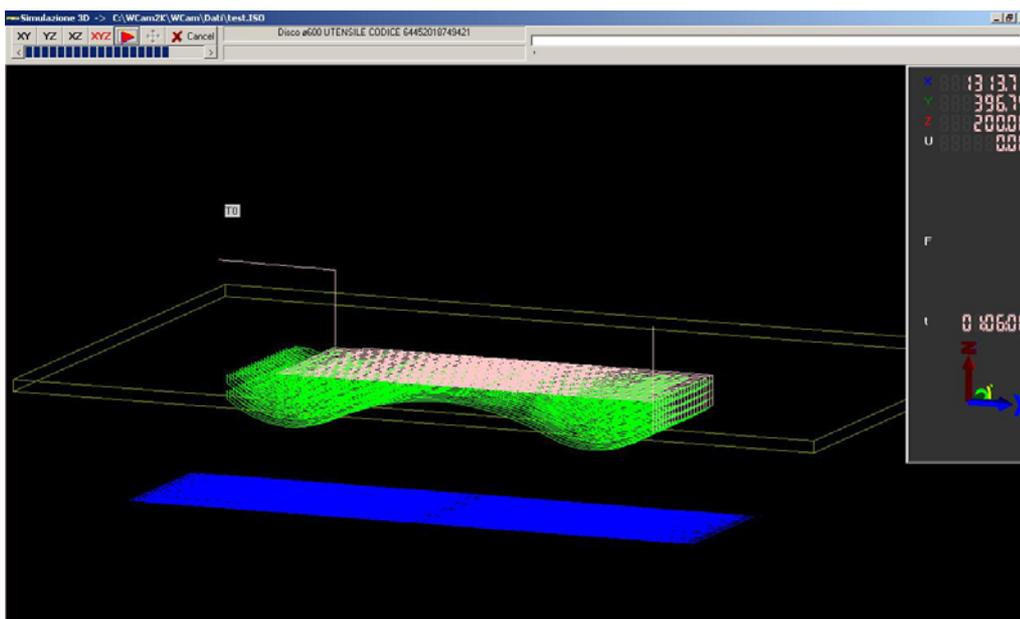


Simulating in 2D the encumbrance of the tool is seen



From the menu **WORK**, select **WORKING** → **SAFE**

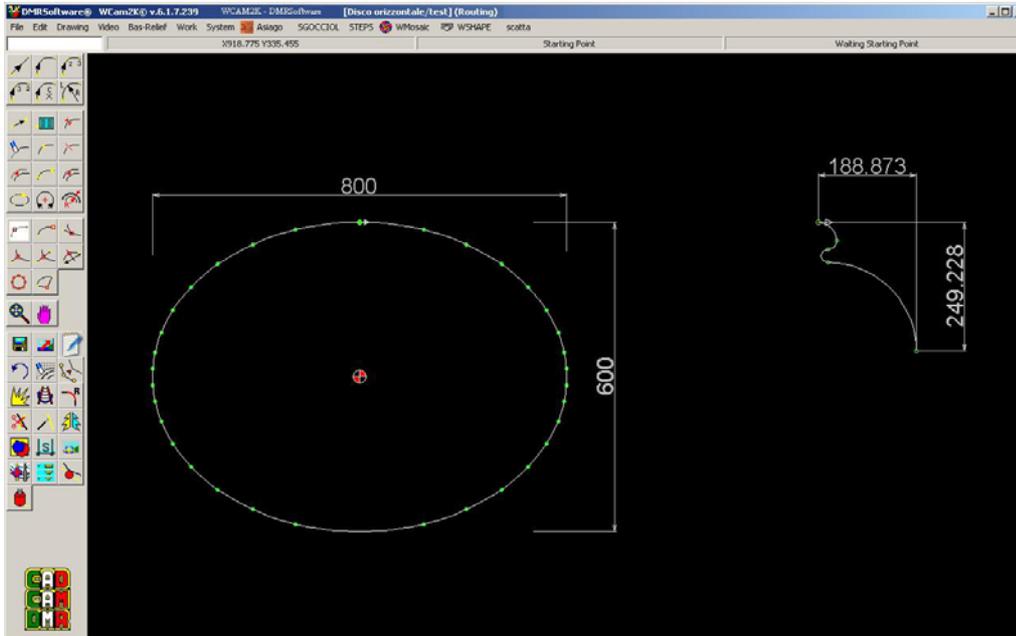
From the simulation 3D are seen all the movements of the tool:



4.6 Horizontal Disc

Compensation of the generatrix

Work with horizontal disk to compensate generatrix with inside profile. Imagine to have a piece of rectangular material of dimensions 800X600. I want to work with the horizontal disk penetrating in the material to steps in horizontal and in vertical. Subsequently I end the piece working in crosswise

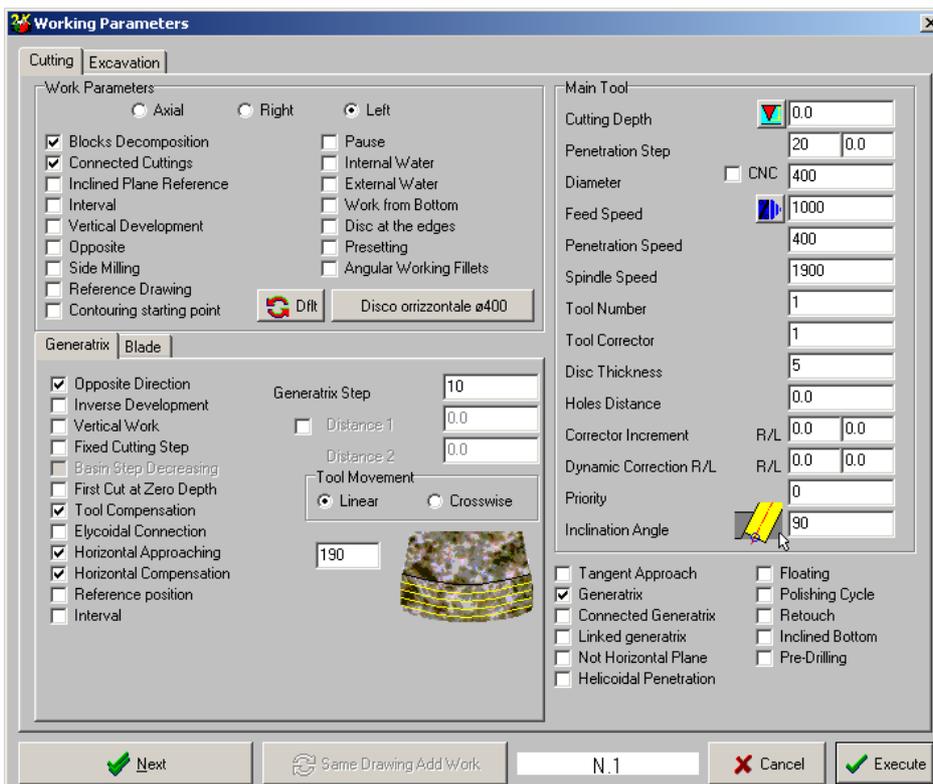


It is important to select the horizontal disk shaped as to the point 3. To select HORIZONTAL APPROCHING and HORIZONTAL COMPENSATION to compensate the thickness of the disk along the horizontal direction.

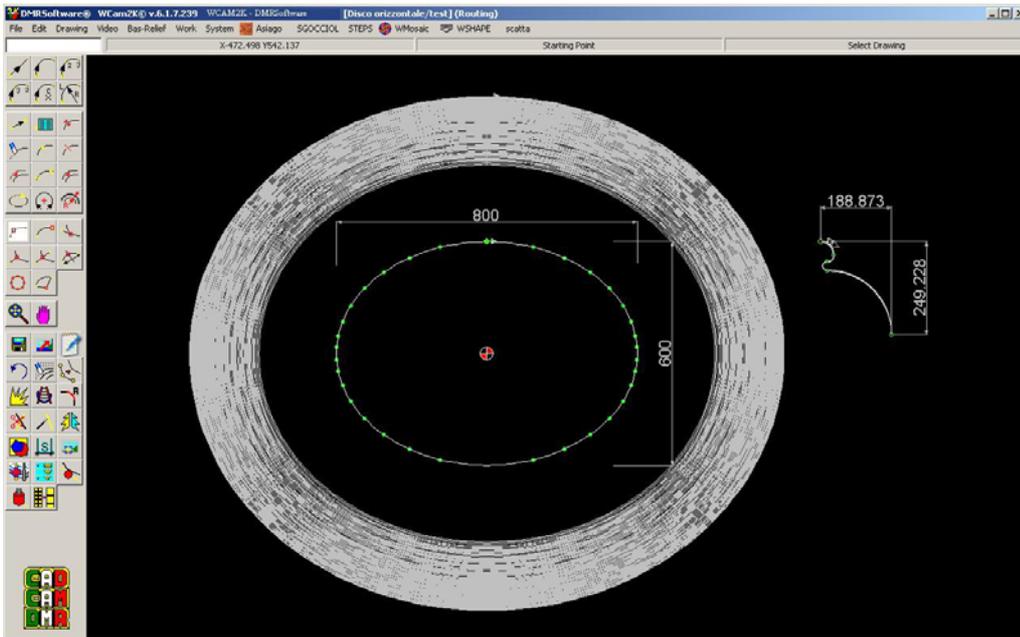
To select the inclination (90°) and the distance from which to depart (out of the piece = 190) and the step with which to penetrate to every turn (20) determine some possibilities of the tool

Select the profile and press left button

To select and to insert:

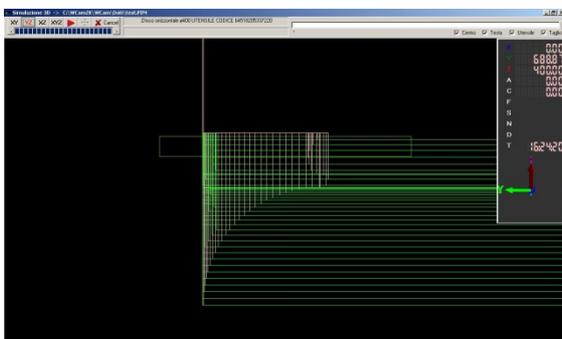
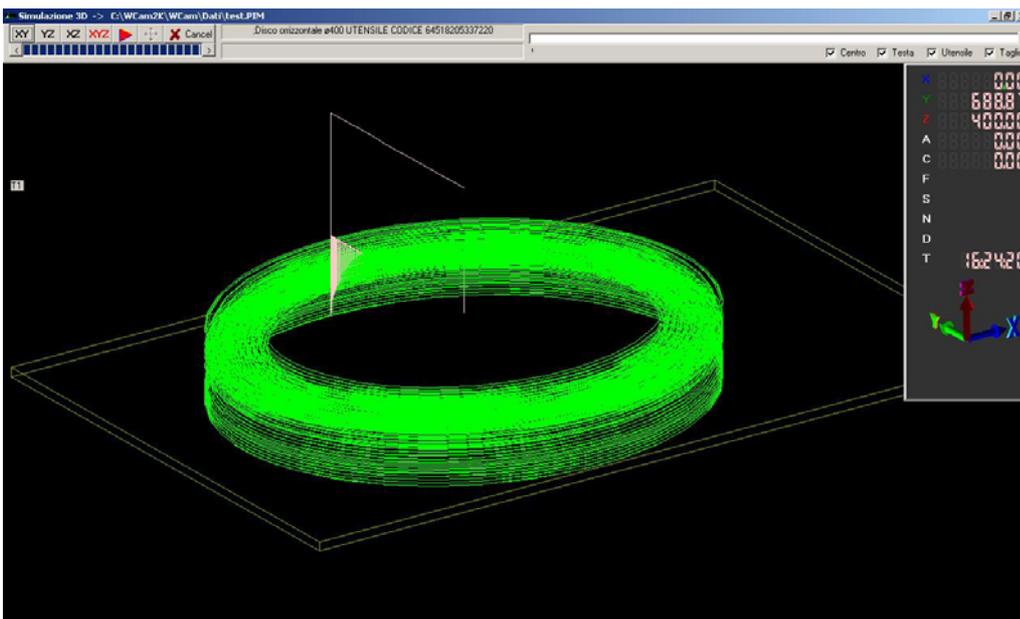


- Left
- Block Decomposition
- Connected Cuttings
- Tool
- Penetration Step (20mm)
- Generatrix**
- Opposite Direction
- Tool Compensation
- Generatrix Step (10)
- Horizontal Approaching
- Horizontal Compensation (100)
- Tool Movement**
- Linear
- Inclination Angle(90°)



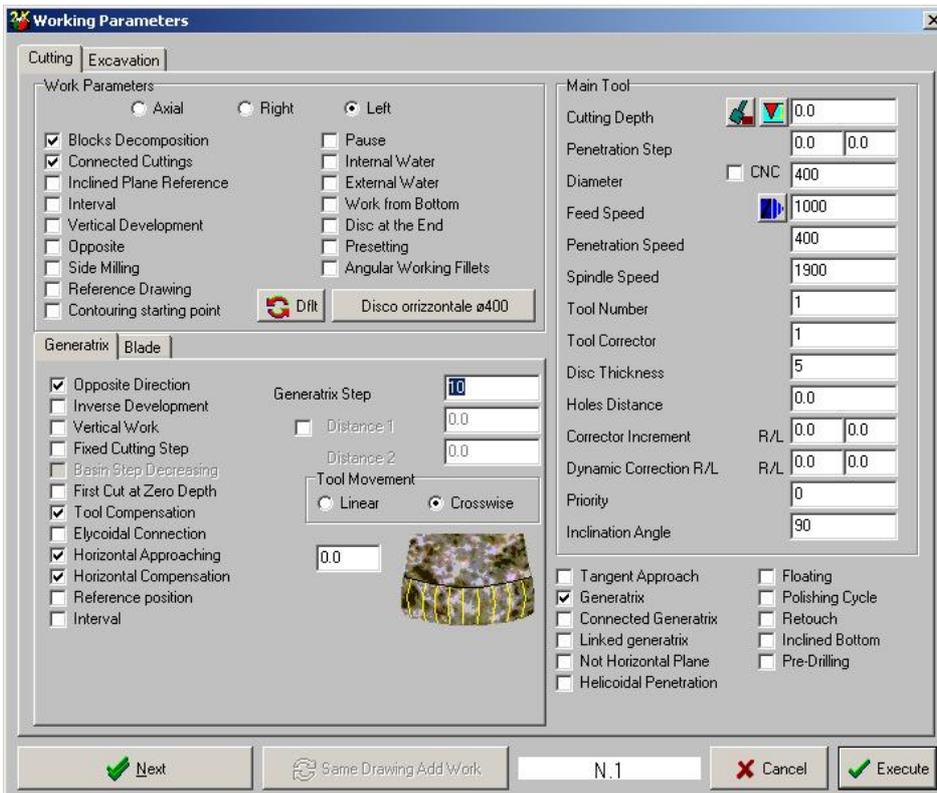
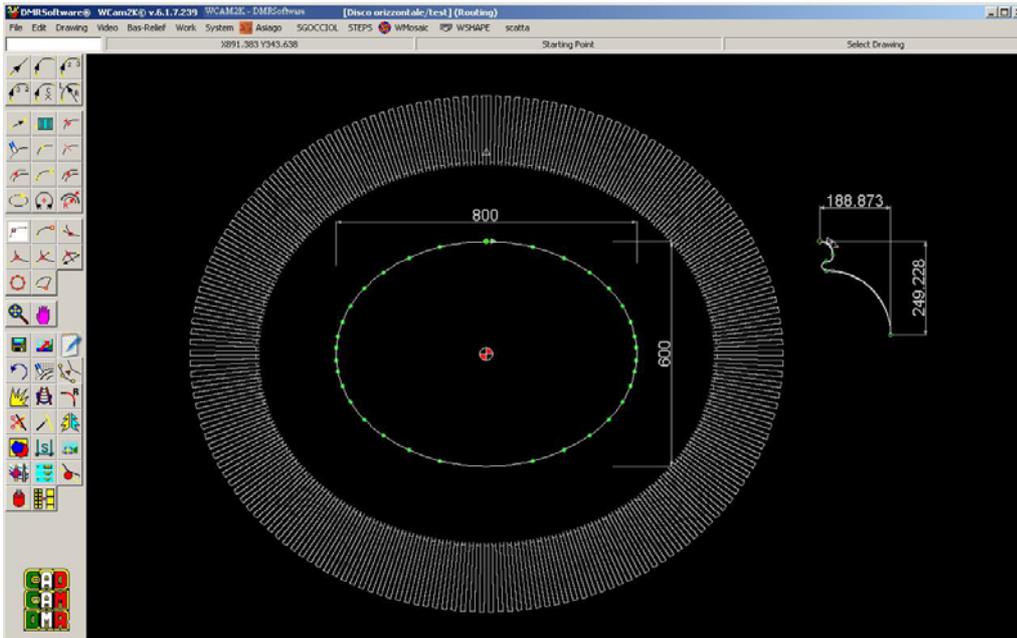
From the menu **WORK**, select **WORKING**→**SAFE**

3D Simulation:



In the image of the widened simulation the steps of the disk are seen for the generation of the profile and the movements by the outside to correctly remove the raw material

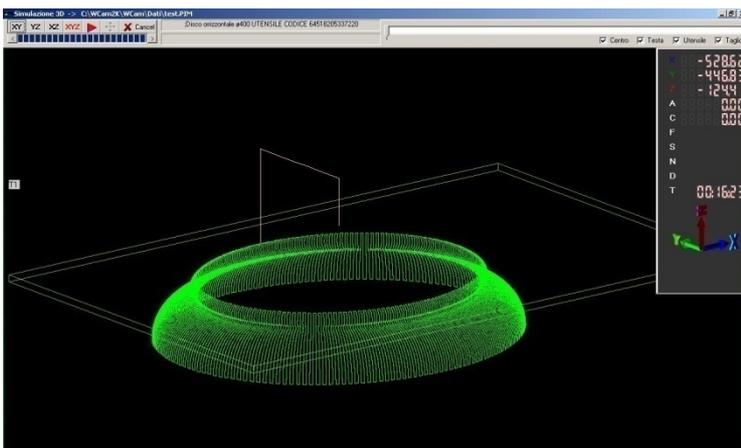
To finish the work, crosswise movement of the disk must be configured:



To select and to insert:
 Left
 Block Decomposition
 Connected Cuttings
 Tool

Generatrix
 Opposite
 Direction
 Generatrix Step (10)
 Tool Compensation
 Horizontal Approching
 Horizontal
 Compensation

Tool Movement
 CrossWise
 Inclination Angle
 (90°)

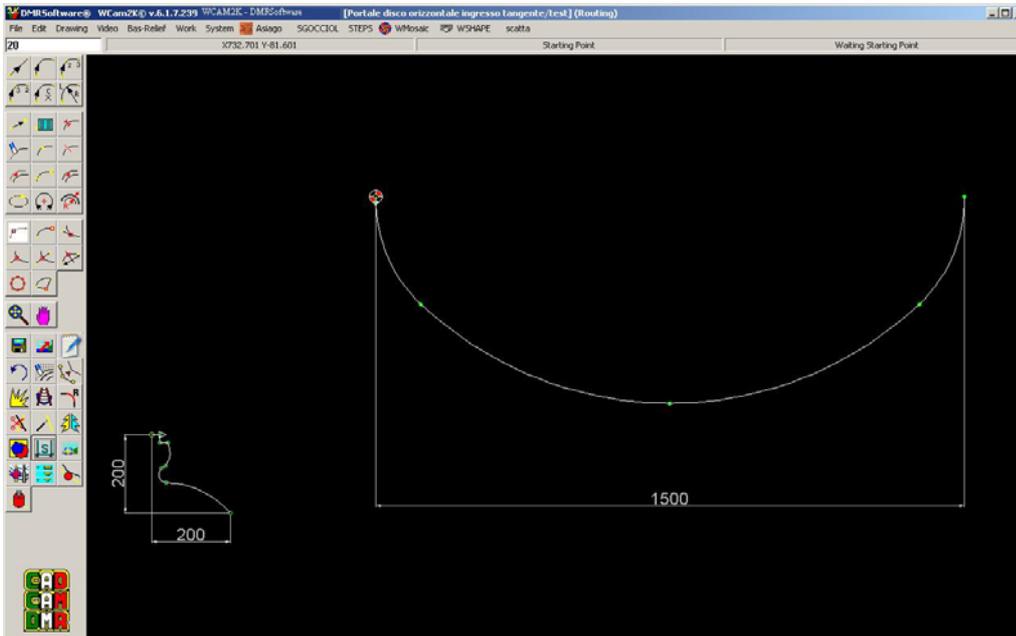


From the menu **WORK**, select **WORKING** → **SAFE**

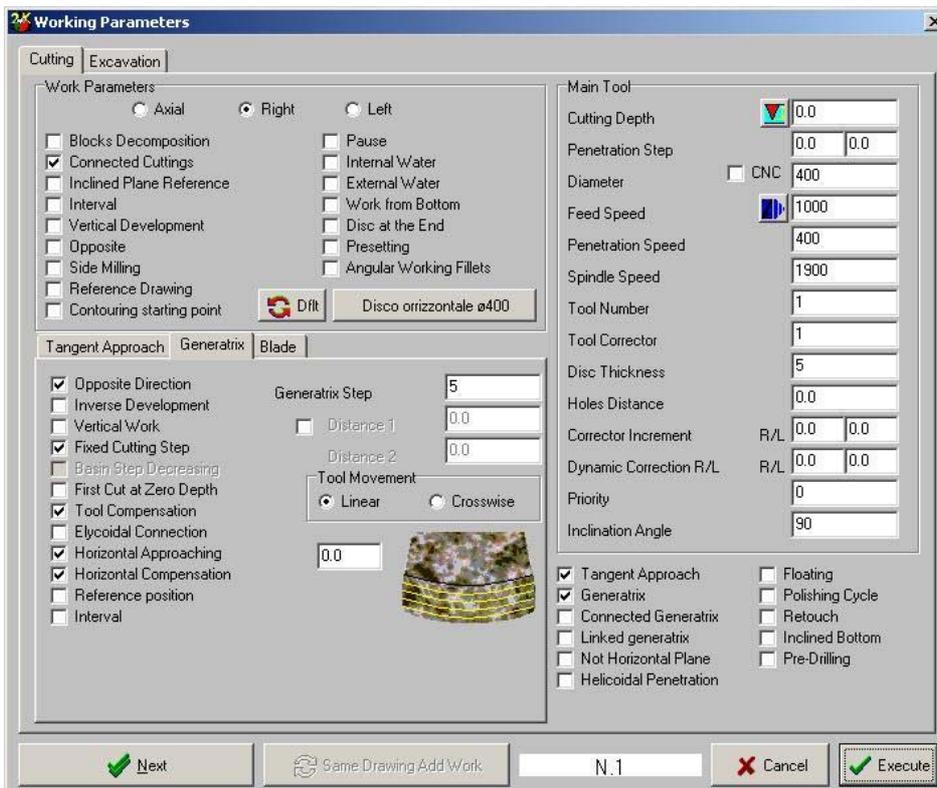
3D simulation:

4.7 Shaping with horizontal Disc

Work with horizontal disk to compensate generatrix and use the **FIXED CUTTING STEP** and **TANGENT APPROACH** for start the work out of the material



We want to enter in the material from the outside therefore we select the **TANGENT APPROACH** and we want to work in Z with fixed steps we select **FIXED CUTTING STEP**



To select and to insert:

- Right
- Connected Cuttings
- Tool

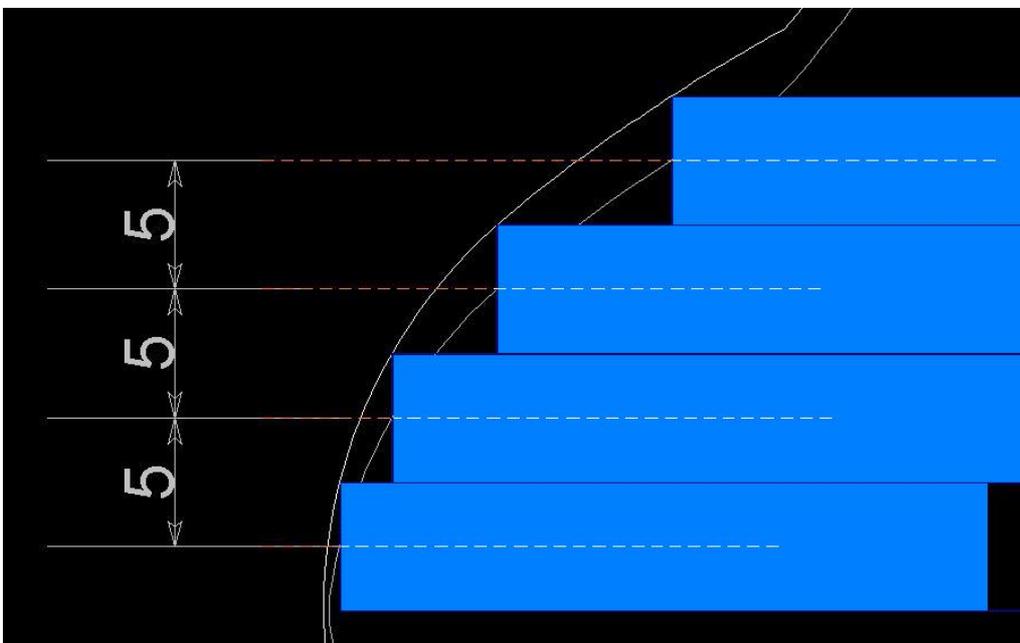
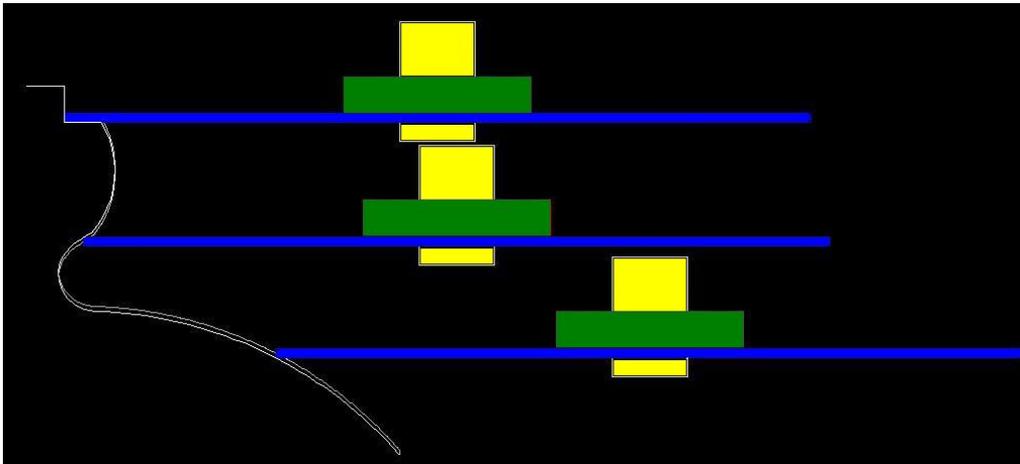
Generatrix

- Opposite
- Direction
- Generatrix Step (5)
- Fixed Cuttings Step
- Tool Compensation
- Horizontal Approaching
- Horizontal Compensation

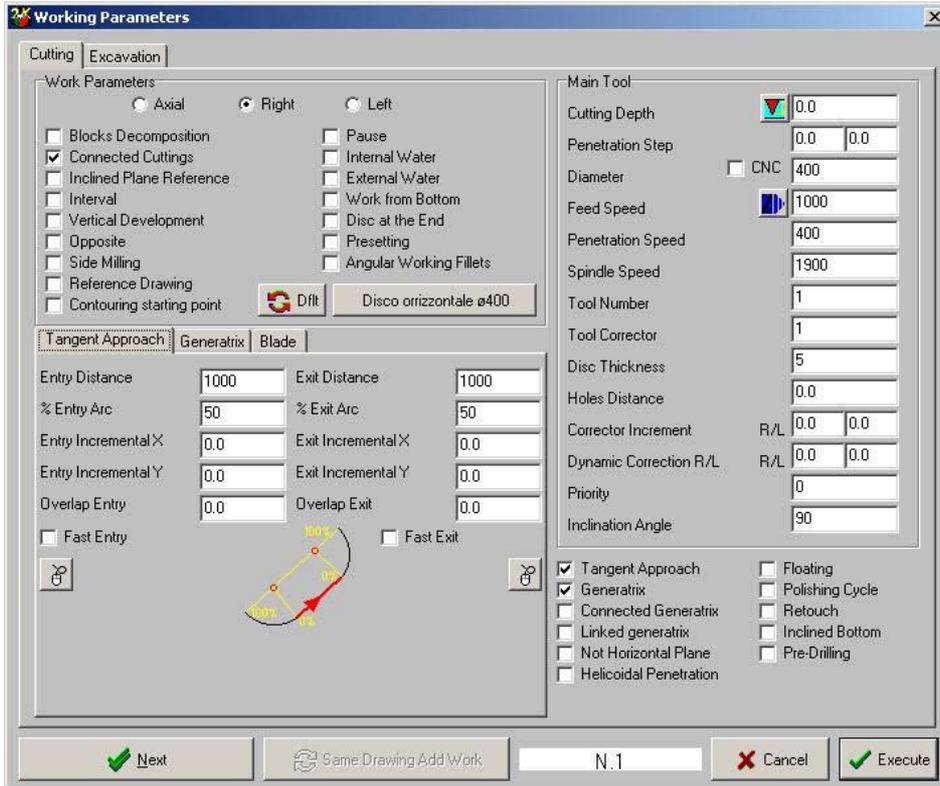
Tool Movement

- Linear
- Inclination Angle
- (90°)
- Tangent Approach

The **FIXED CUTTING STEP** allows to work with always the same steps in Z of the value that must be insert in the **GENERATRIX STEP**. The following two figures represents the generatrix with the compensation of the tool. The movements of the disk in Z are compensated on the thickness of the blade and it is represented the disk in three consequent steps



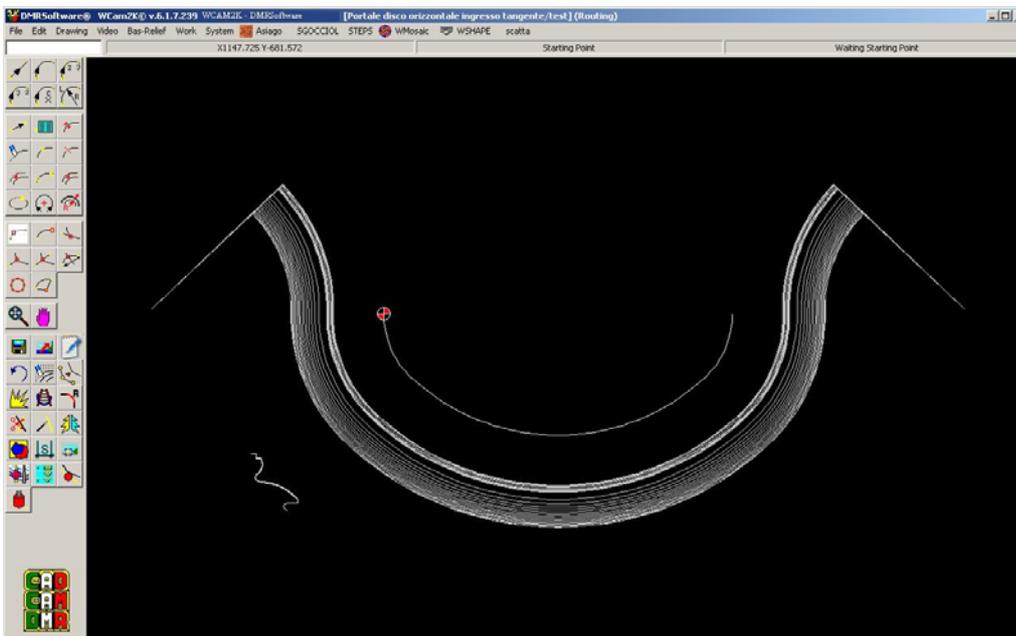
To select **TANGENT APPROACH**. The diameter of the disk is 500mm therefore imposed of the correct values for this example

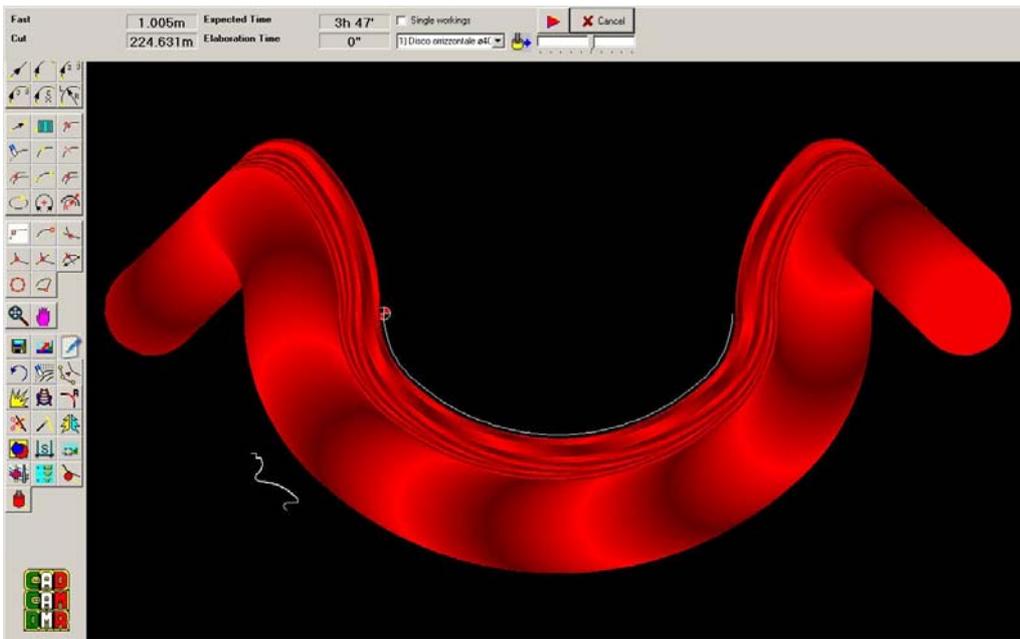


Tangent Approach

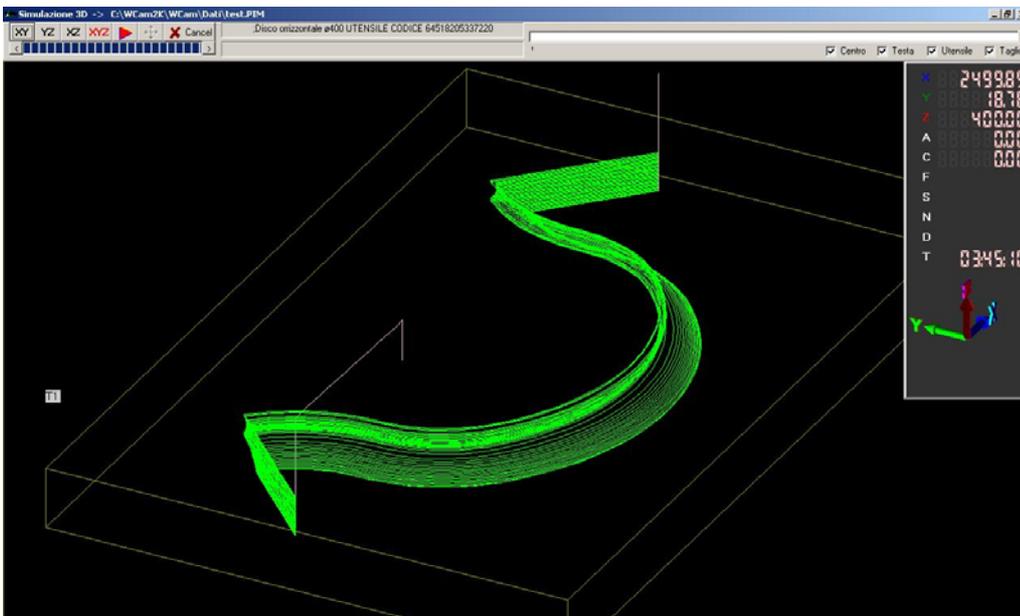
- Entry Distance (1000)
- % Entry Arc (50)
- Exit Distance (1000)
- % Exit Arc (50)

2D simulation:

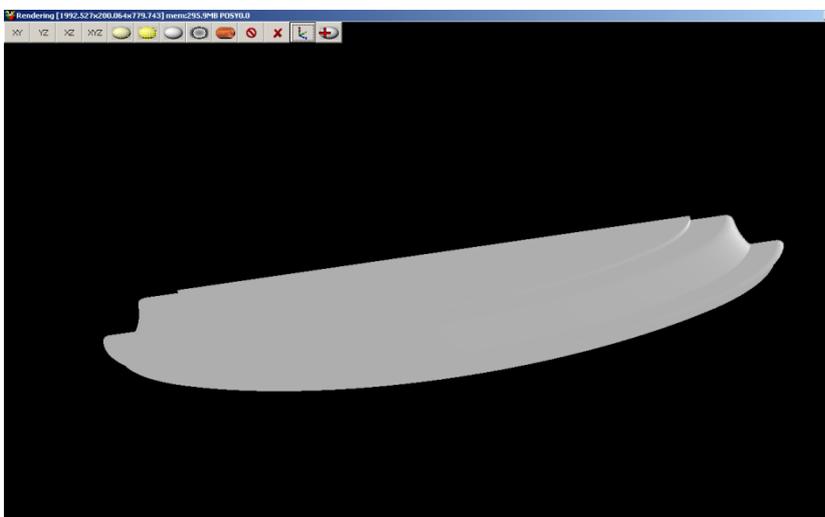




3D simulation:

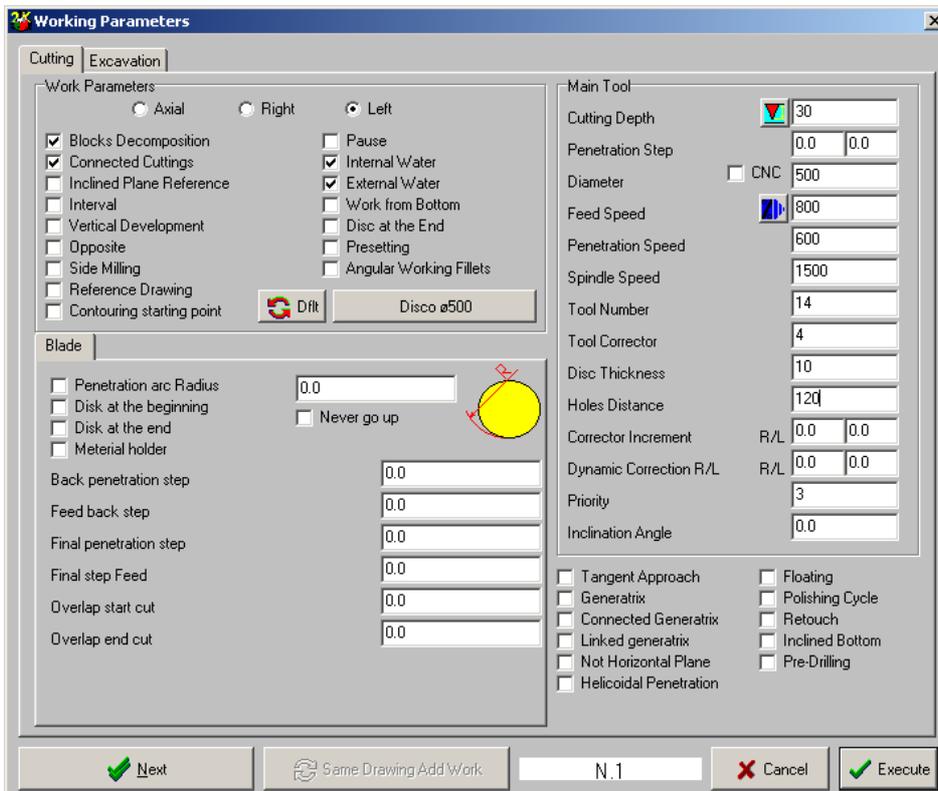
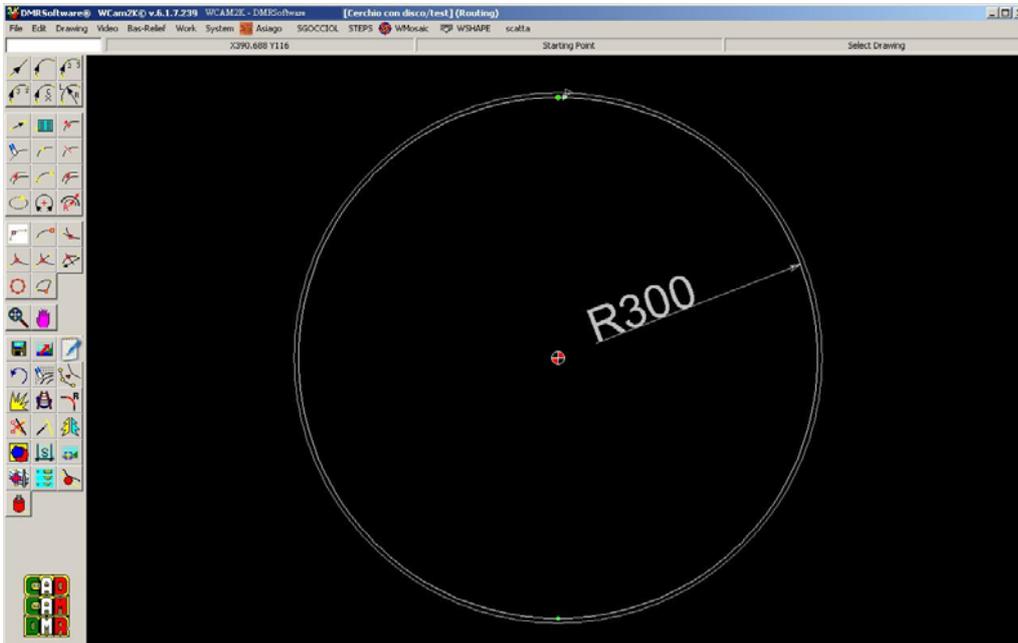


Rendering of the model:



4.8 Cut of a circle with the disk

If we want to cut a circle with the disk it is not possible to cut in continuous but it is possible to perform a series of cuts to a certain distance among them. The disk must be lifted above the material at the end of every cut, to allow the mandrel to rotate some correct angles

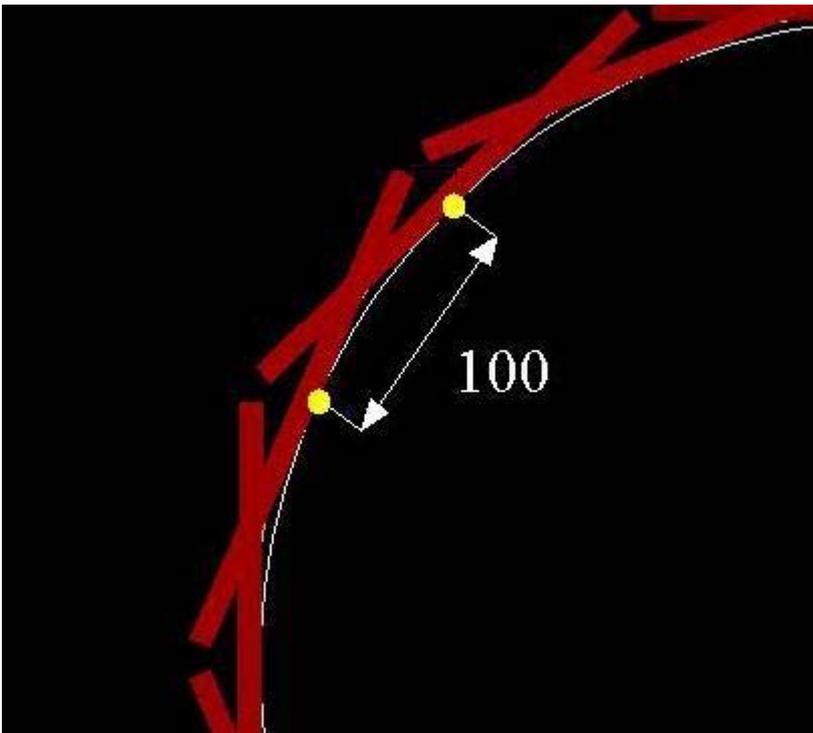


To select and to insert:

- Left
- Connected Cuttings
- Tool
- Cutting Depth=30 (Final depth)
- Holes Distance (120)

From the menu **WORK**, select **WORKING** → **CREATE** select the profile, for inserting the data work

It is necessary to insert the **CUTTING DEPTH** and the **HOLES DISTANCE**. This last value is the distance between a cut and the following one and it is calculated in comparison to the axle of the disk

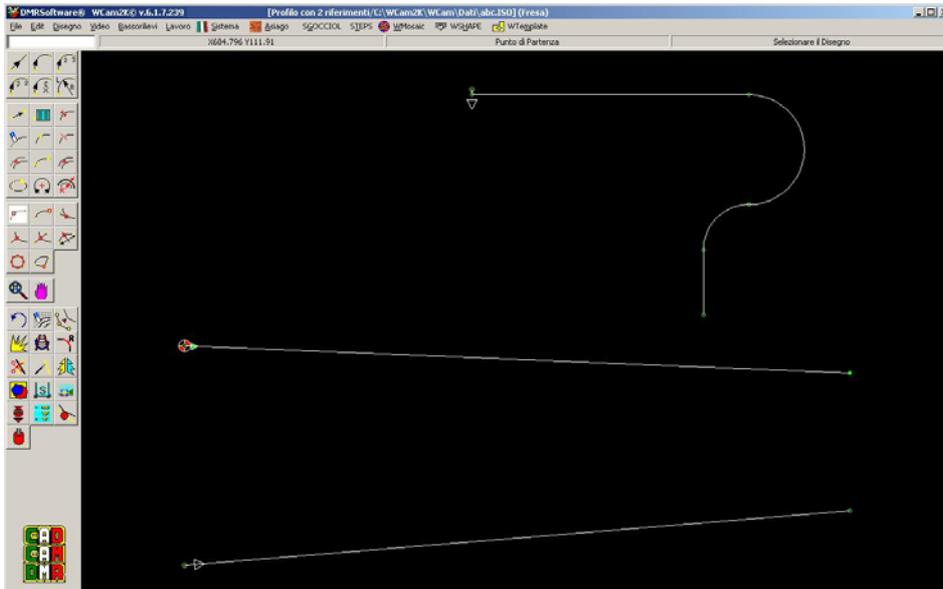


The figure on the left side represents the simulation of the cuts of the disk and the distance among the cuts

The representation shows the depth of the cut and it represents only the part of the disk that penetrates in the material

4.9 2D Shaping with 2 reference drawings

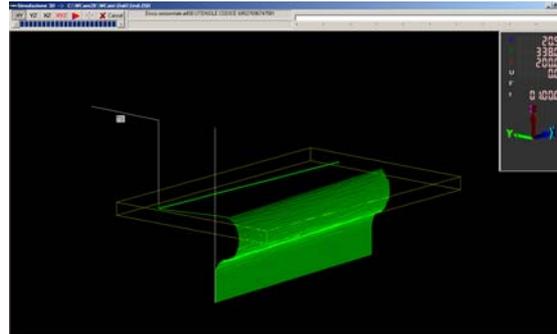
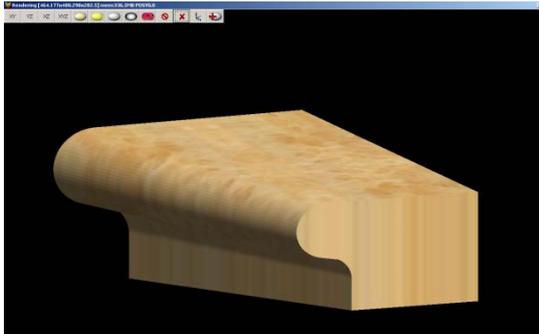
The generating one can be connected to a second reference to produce path of work that follow the



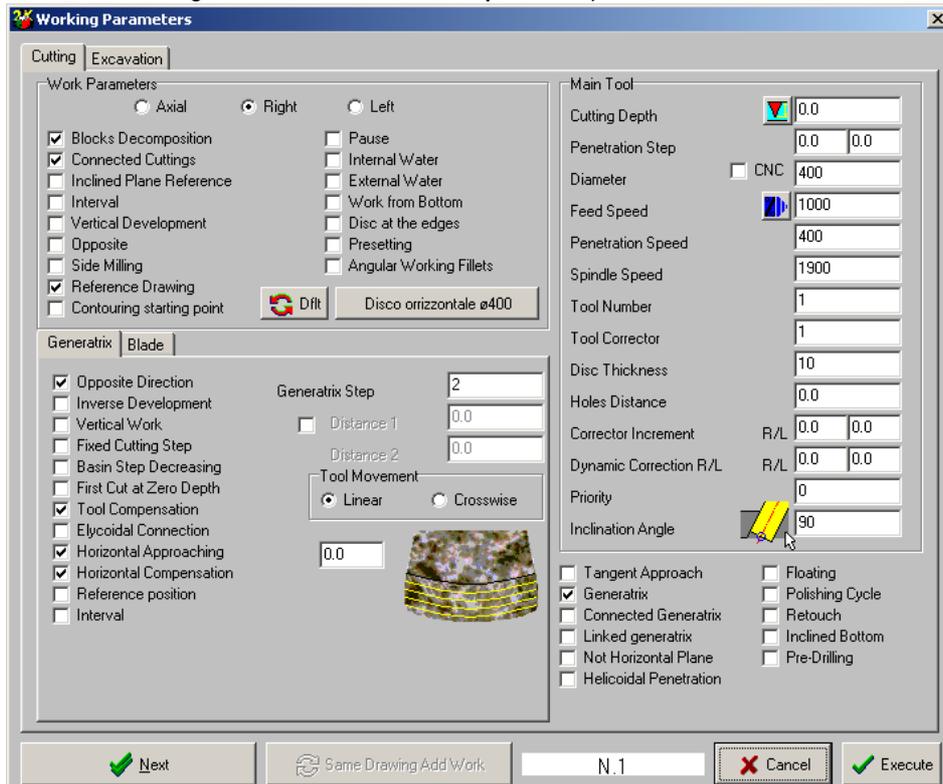
wanted profiles

In this case the beginning and the end of the generatrix one he is connected to two lines with directions and lengths that can be different

Rendering of the model:



Work→working→Create→select the profile 1 (the line that star from the origin point)



To select and to insert:

- Right
- Connected Cuttings
- Reference Drawing (Select the second line)
- Tool

- Generatrix
- Opposite
- Direction
- Generatrix Step (2)
- Tool Compensation
- Horizontal Approaching
- Horizontal Compensation

- Tool Movement
- Linear

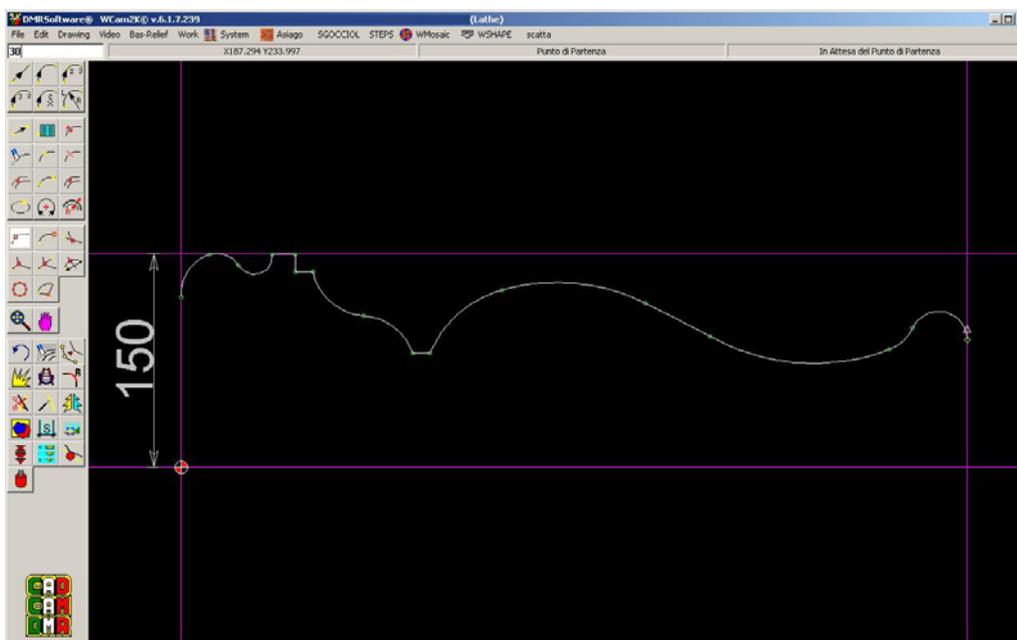
5LATHE

5.1 Configuration for the lathe



5.2 Simple profile with circular section

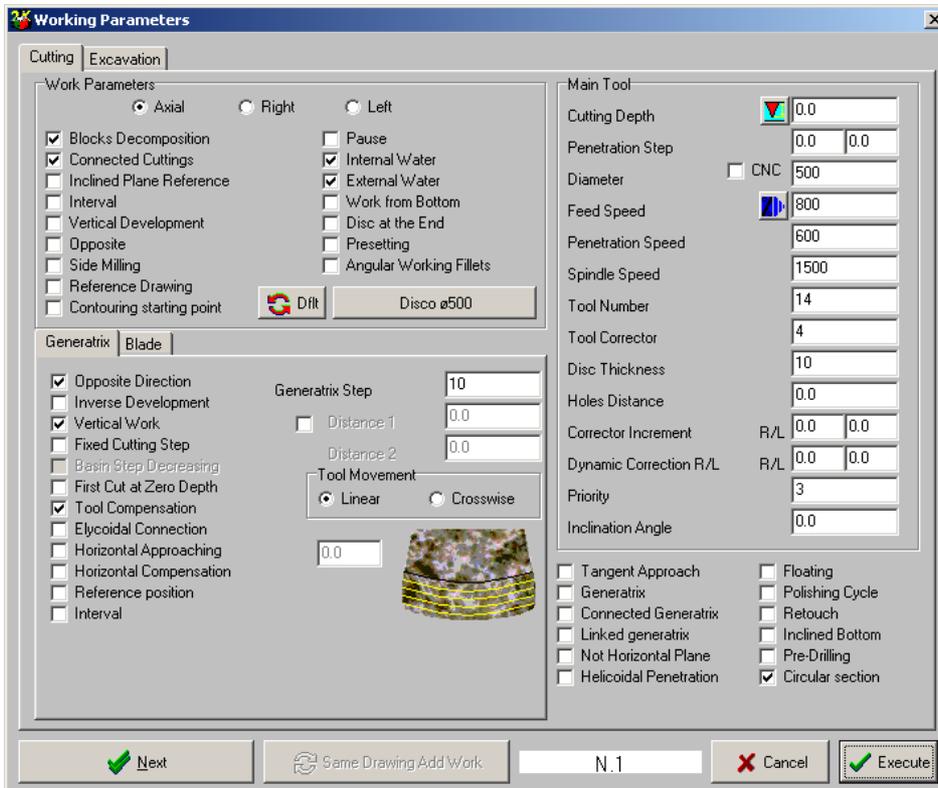
Draw the profile considering the horizontal reference line as central axis of the lathe



Put the starting point (arrow) on the right side in order to start the job at that position

Roughing:

Work → working → Create the profile, select Generatrix, select the same drawing, take the tool from the tool store, insert the generatrix step for example the thickness of the disc, enables the tool compensation and Crosswise (usually Linear is for roughing with hard material like granite)



To select and to insert:

- Axial
- Blocks Decomposition
- Connected Cuttings
- Tool

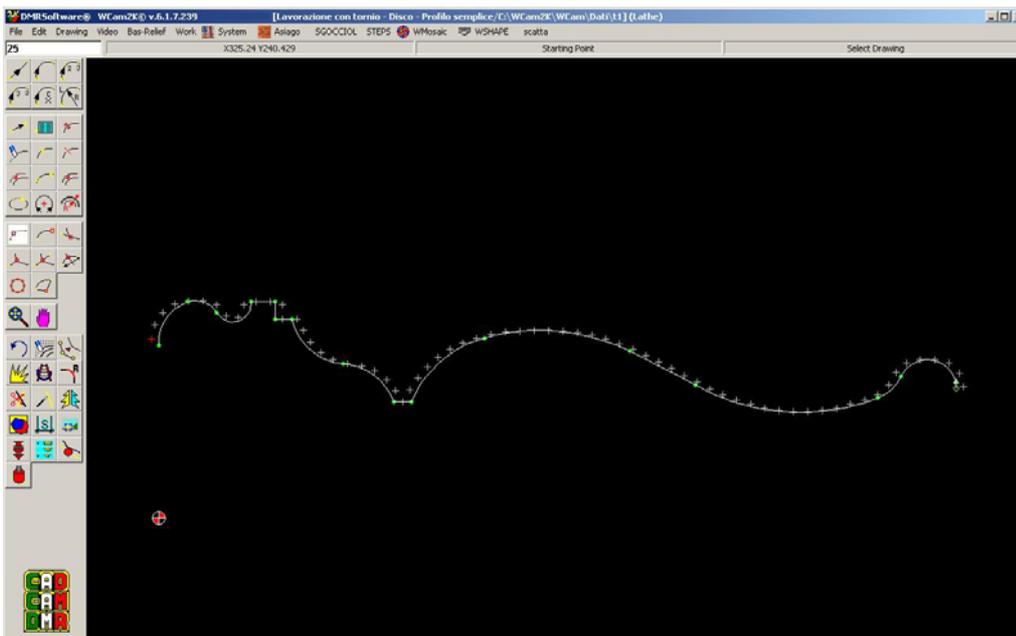
Generatrix

- Opposite
- Direction
- Generatrix Step (10)
- Tool Compensation

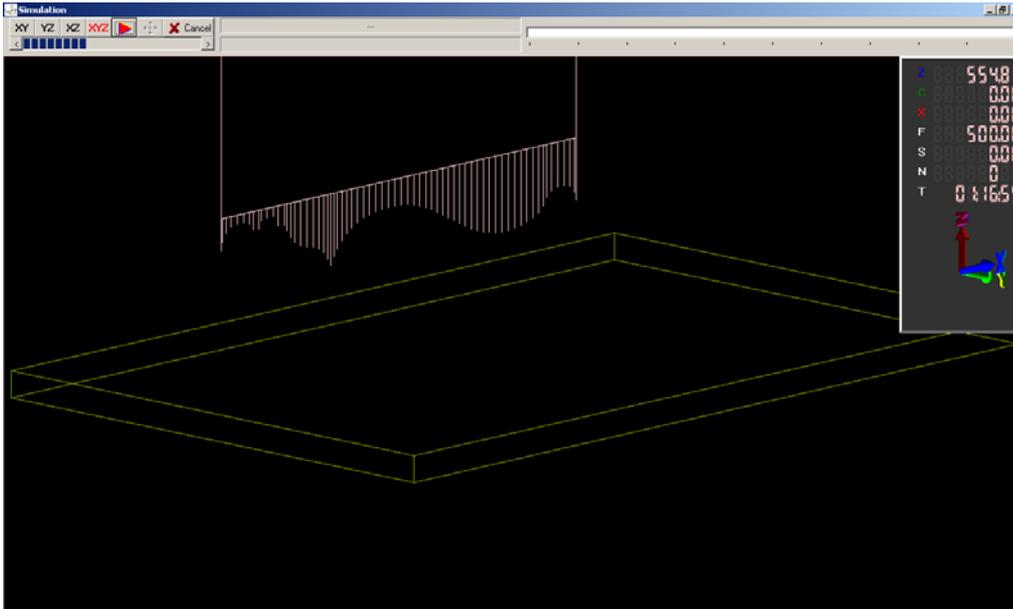
Tool Movement

- Linear

2D simulation:

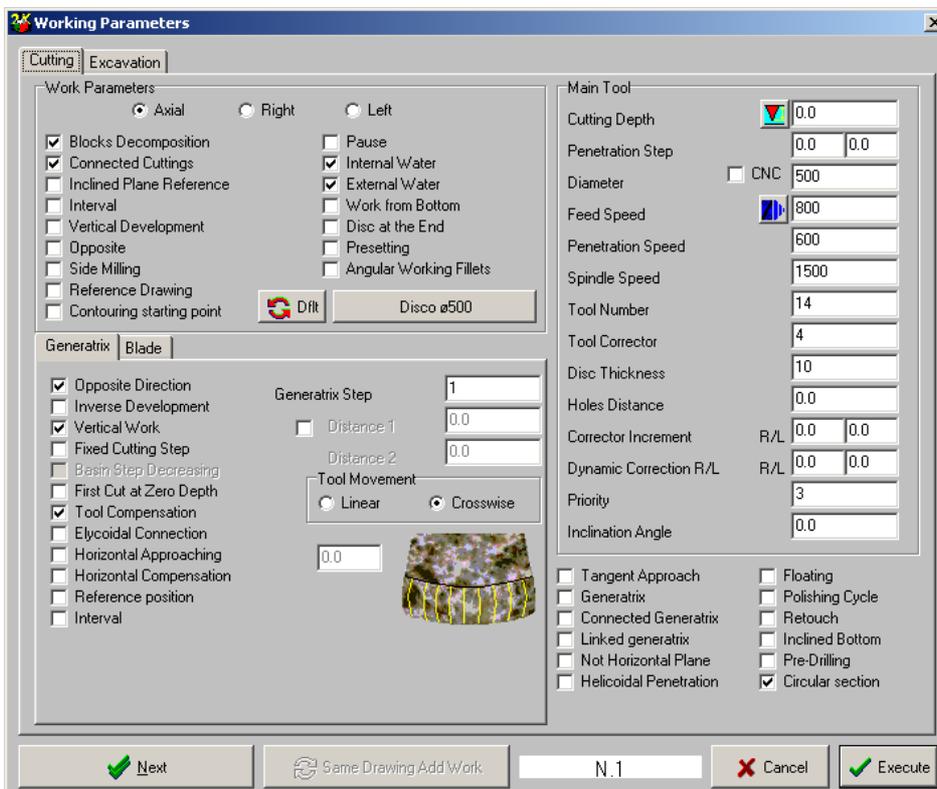


3D simulation:



Finishing:

Work → working → Create the profile, select Generatrix, select the same drawing, take the tool from the tool store, insert the generatrix step (each turn machine make 1 step) between 0.5 and 2 mm depending on the degree of finishing you want, enables the tool compensation and Crosswise (usually Linear is for roughing with hard material like granite)



In crosswise:

To select and to insert:

- Axial
- Blocks Decomposition
- Connected Cuttings
- Tool

Generatrix

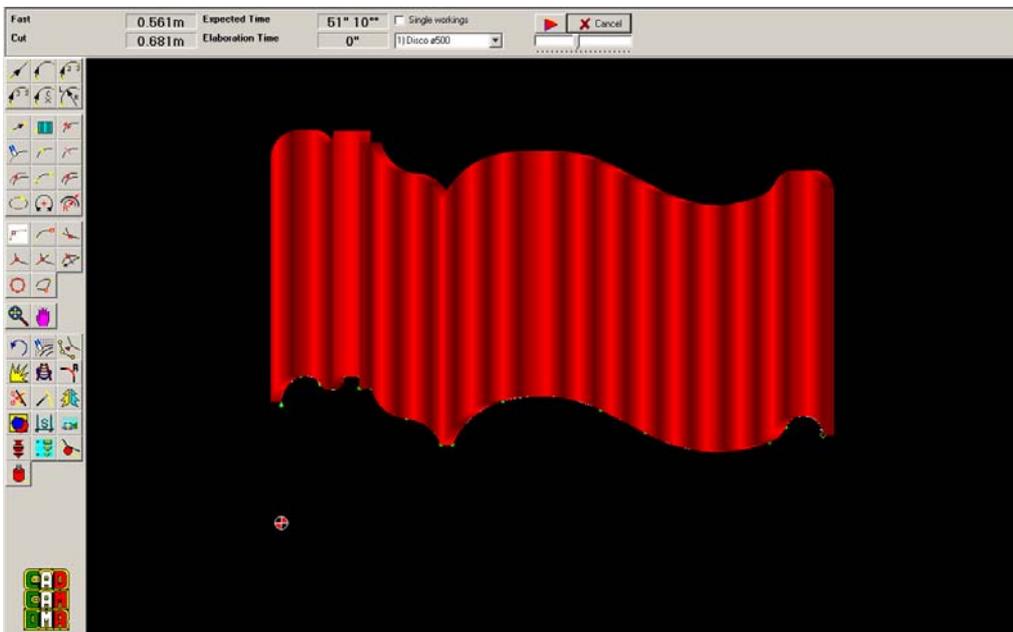
- Opposite Direction
- Generatrix Step (1)
- Vertical Work
- Tool Compensation

Tool Movement

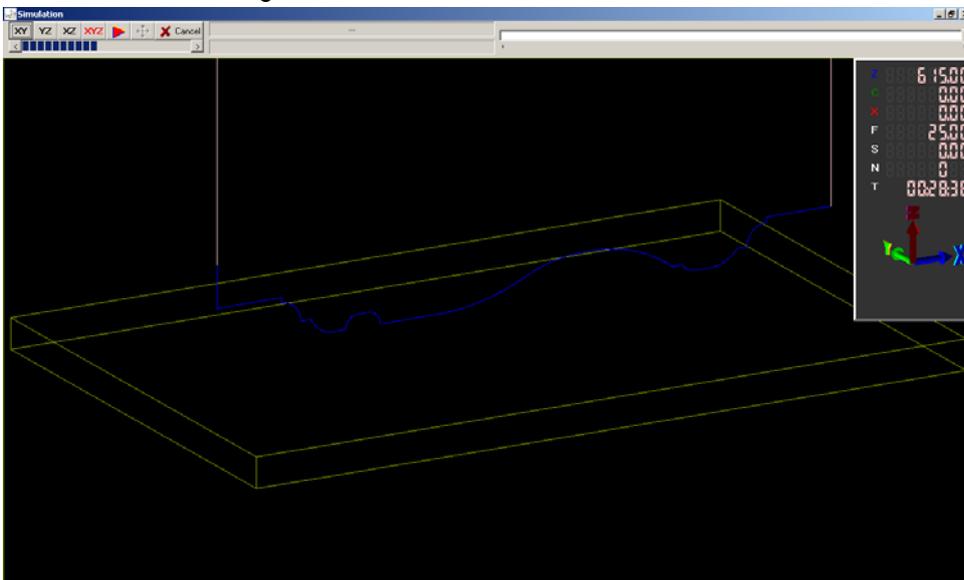
- Linear



2D Simulation:



and Work->Working->Save to create the G-code



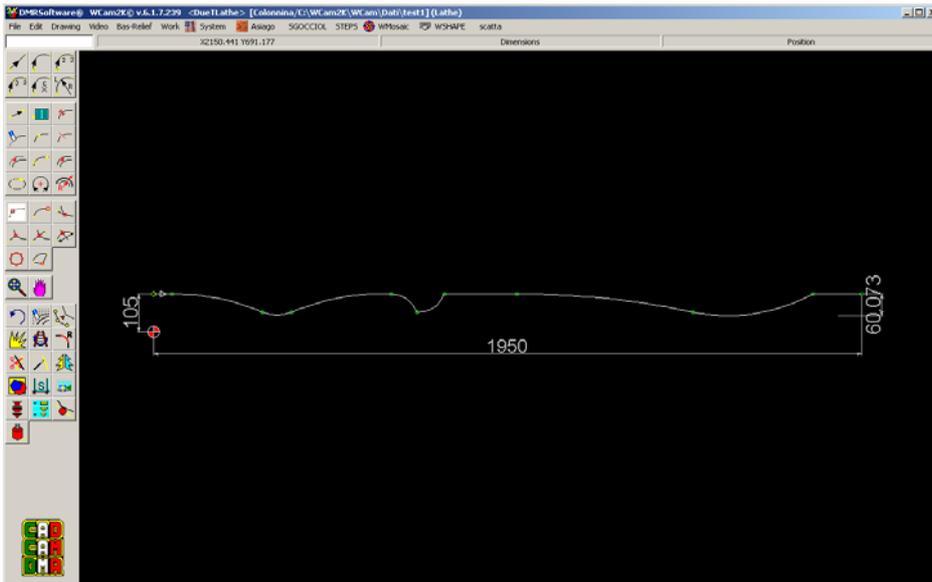
5.3 Realization of simple column in marble

5.3.1 Different possibilities of job between marble and granite

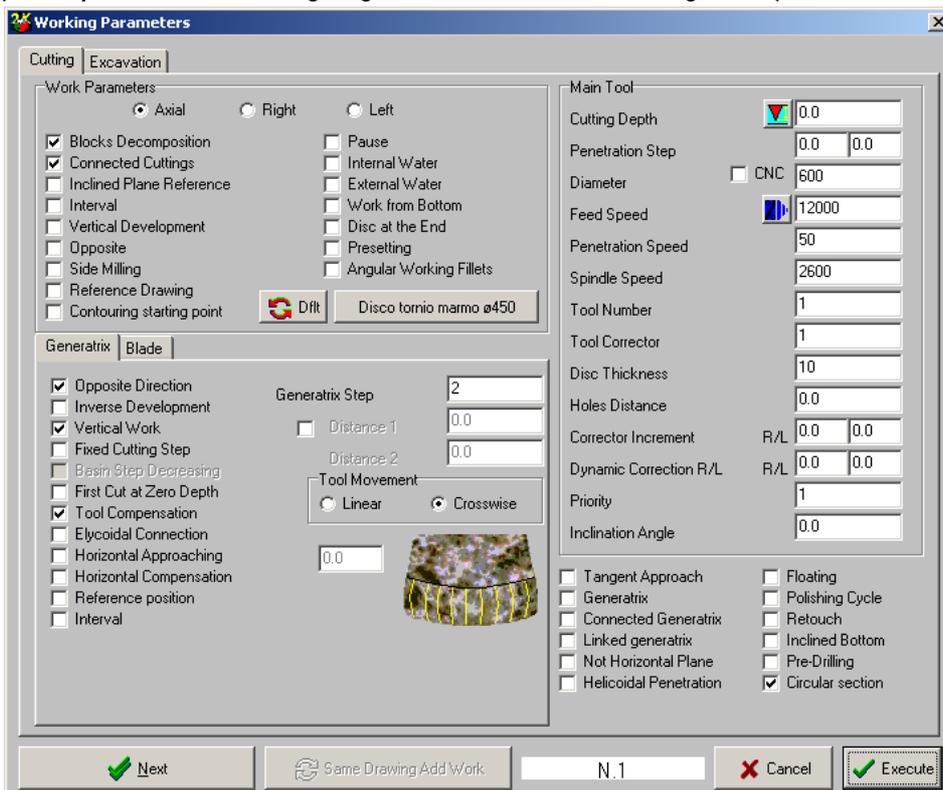
Draw the profile considering the horizontal reference line as central axis of the lathe

We suppose to have available a block of marble in dimensions of 220X220X1950. The first step is to know, if with the disk to disposition it is possible to create the wanted profile. You can select various solutions:

1) The disk can penetrate in all the points of the profile and to create the column in an only step working with crosswise movement



Work → working → Create → select the profile, select Generatrix, select the same drawing, take the tool from the tool store, insert the generatrix step (each turn machine make 1 step) between 0.5 and 2 mm depending on the degree of finishing you want, enables the tool compensation and Crosswise (usually Linear is for roughing with hard material like granite)



To select and to insert:

- Axial
- Blocks Decomposition
- Connected Cuttings
- Tool

Generatrix

- Opposite

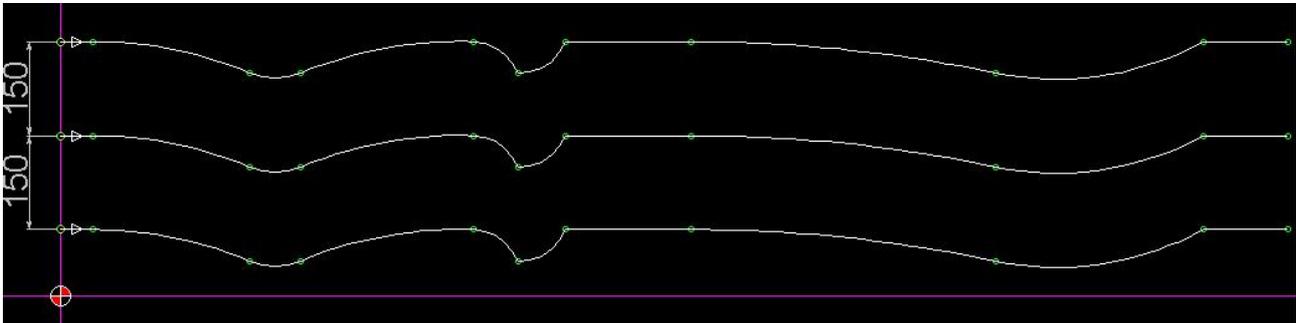
Direction

- Generatrix Step (10)
- Tool Compensation

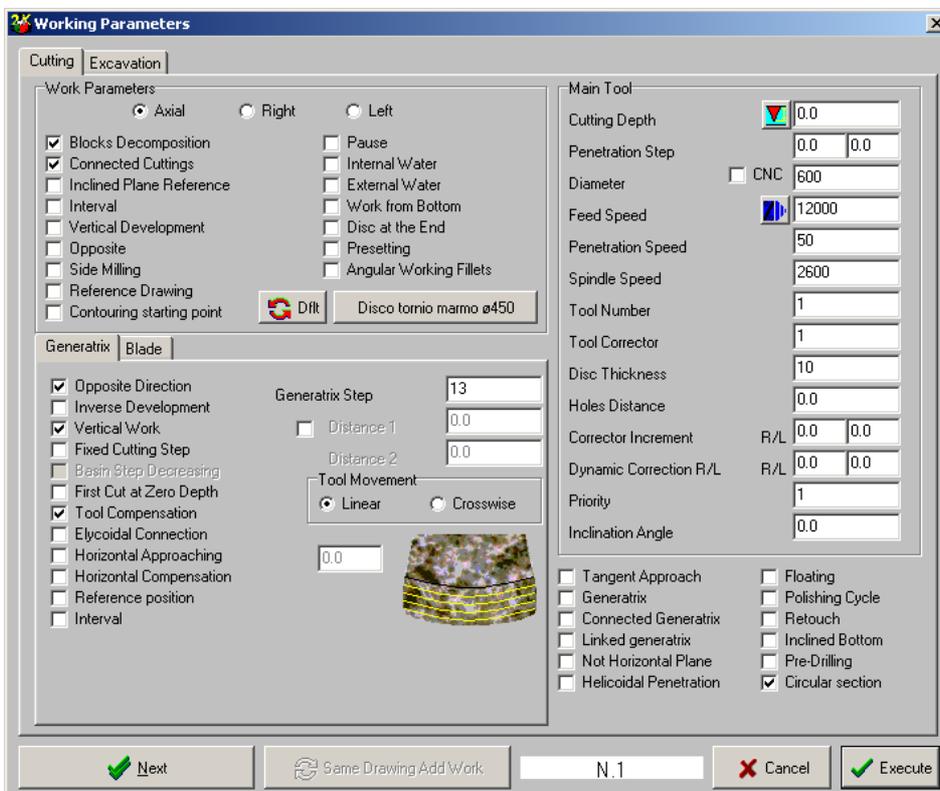
Tool Movement

- Linear

2) In case, the solution in diagram 1 is not available it is possible to create more programs that separately offsets to reach the wanted dimensions. For example if the disk has a diameter of 450mm and the flange of 140mm the separated difference for two it is 155mm. The maximum penetration of this disk is of 150mm. Then it is possible to determine how much programs to create for reaching the wanted dimensions



3) The third possibility allows to make the roughing of the piece working with the blade of the disk and penetrating to steps. It is mostly used in granite and sometimes in marble.



To select and to insert:

- Axial
- Blocks Decomposition
- Connected Cuttings
- Tool

Generatrix

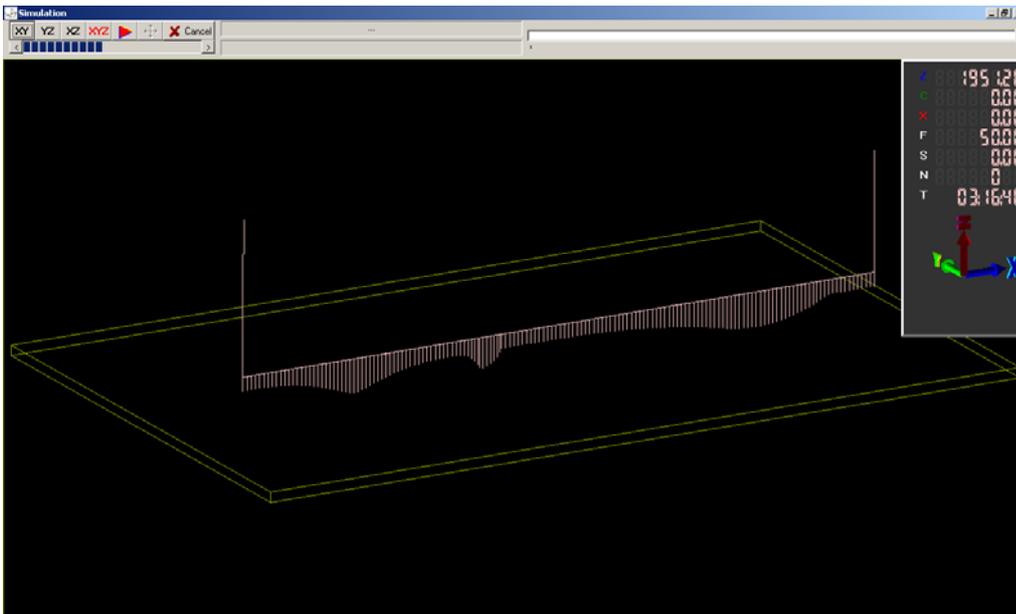
- Opposite Direction
- Vertical Work
- Generatrix Step (13)
- Tool Compensation

Tool Movement

- Linear

And is recommended for make the roughing with linear movement to use a cut disk

In this case it is almost always worthwhile to make the roughing with linear movements making some cuts with a suitable step. Normally the step can be great of some millimeter in comparison to the thickness of the disk. At the end the material that has remained must have removed with the hammer and the piece must be ended with an unique step as to the point 1

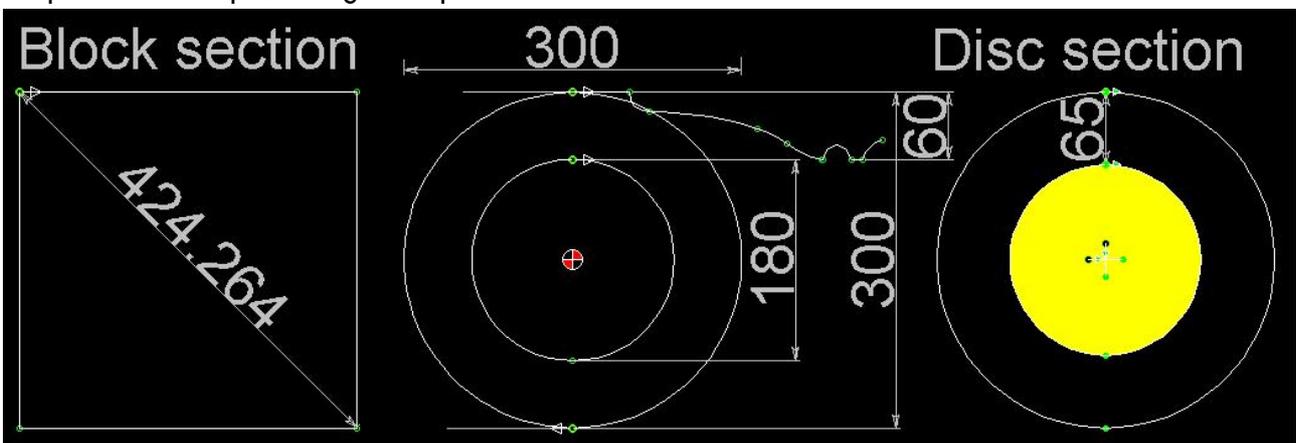


4) It is also sometimes convenient to make the cylindrical piece as first step if he is sure to be able to subsequently work with an only step.

Is important if directly works on the square piece to correctly determine the distance of departure for make the roughing. This distance must be calculated drawing the rectangular section of the piece and must be measured the maximum diagonal. The disk must penetrate departing from a great distance of halves the maximum diagonal for not to go to beat the material at a not appropriate speed.

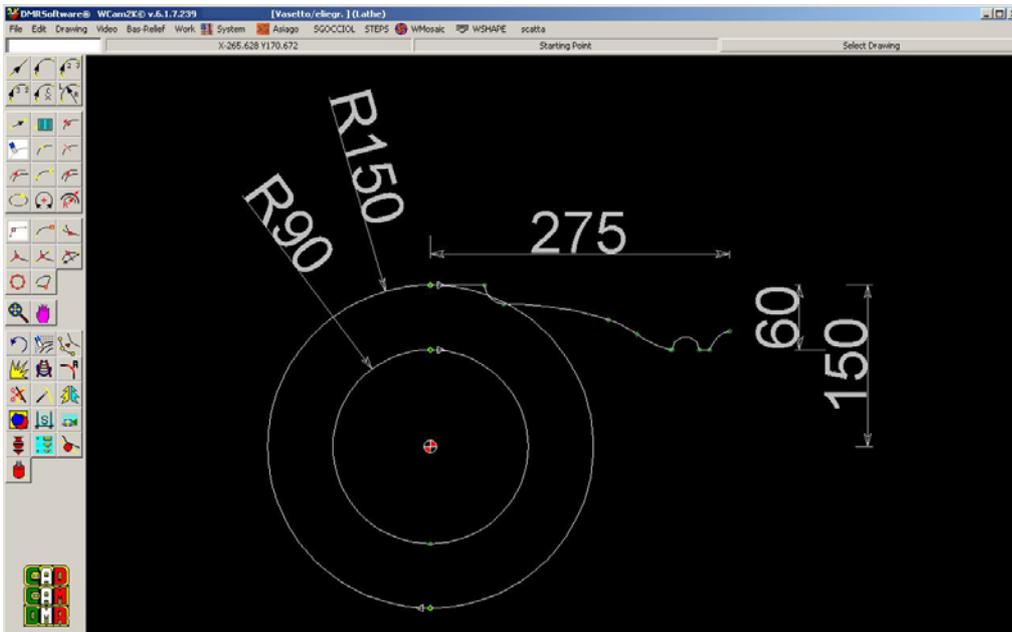
5.3.2 Calculation of the encumbrances

Example: We suppose to have available a disk of diameter 300mm with flange from 170mm. In this case the maximum penetration is $(300-170) / 2 = 65\text{mm}$. We suppose besides to have a profile as represented in figure. The maximum penetration is of 60mm and this give the possibility to create the model with an only step. We suppose to have a block piece of dimensions 400X400 to square section. We must set attention to the dimension of the piece on the diagonal for not to beat on the flange disc cover. In the illustrated case the diagonal is of 424.264mm. The maximum depth of cut is $424.264-180=244.264/2=112.132\text{ mm}$. With the disc that we have to disposition would not be realizable! It is worthwhile therefore to make a roughing the more possible the block piece or creating the cylinder on the maximum (300mm) diameter, always setting attention at the maximum depth of job that must be smaller of that allowed by the disk (65mm) or to make a roughing as to the point 2 of the preceding example.

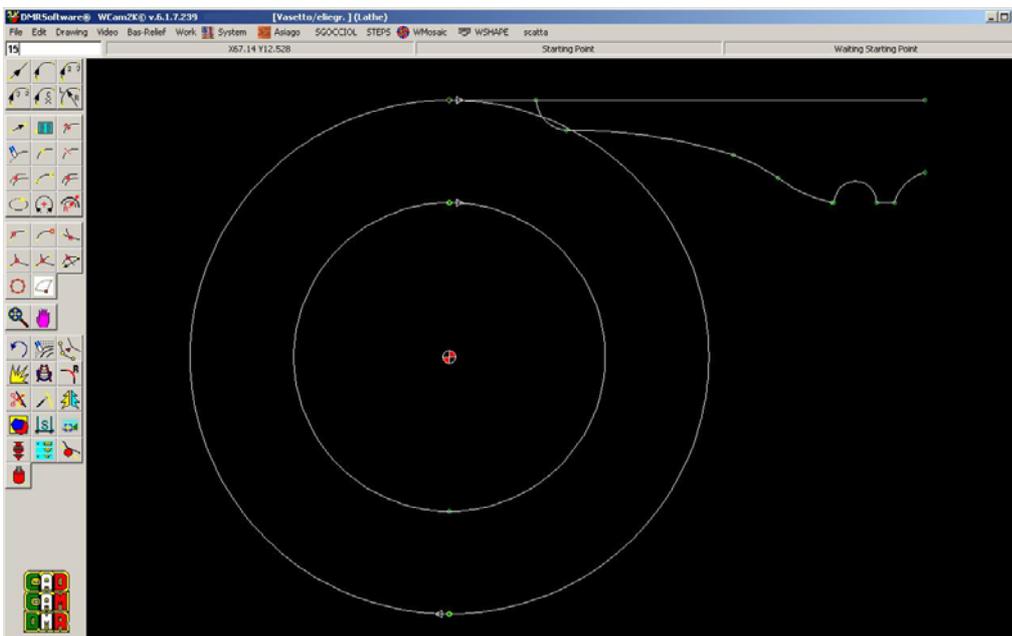


5.4 Incision projection on surface for lathe

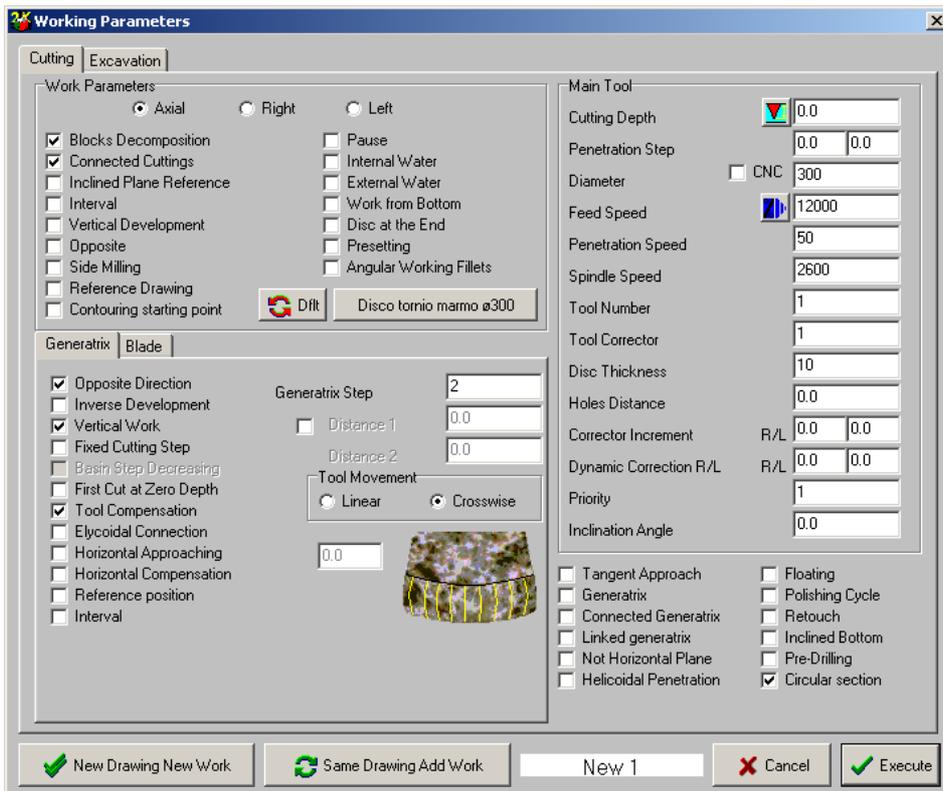
Realization model 3D with procedure section-profile, Bas-reliefs → Creation surfaces 3D → Lathe



For the considerations done to the chapter 5.3.2 we realize the cylinder on the maximum diameter.



Work → working → Create select the straight line, select Generatrix, select the same line, take the tool from the tool store, insert the generatrix step.



To select and to insert:

- Axial
- Blocks Decomposition
- Connected Cuttings
- Tool

Generatrix

- Opposite Direction
- Vertical Work
- Generatrix Step (2)
- Tool Compensation

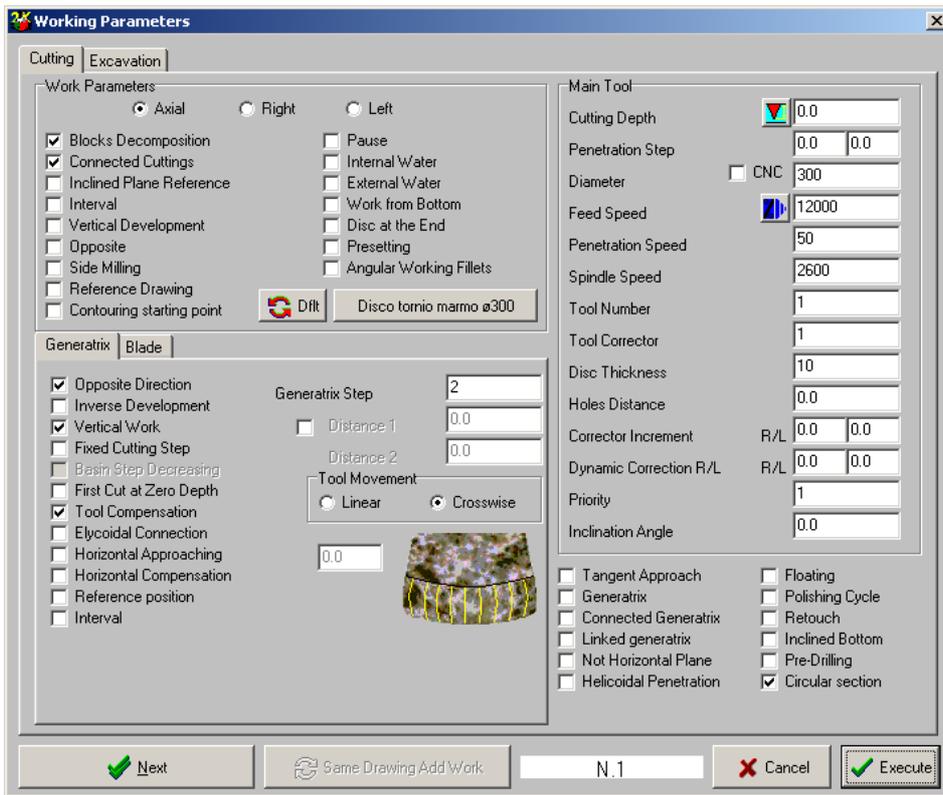
Tool Movement

- CrossWise

Rendering of the cylinder:



Work → working → Create select the profile, select Generatrix, select the same line, take the tool from the tool store, insert the generatrix step.



To select and to insert:

- Axial
- Blocks Decomposition
- Connected Cuttings
- Tool

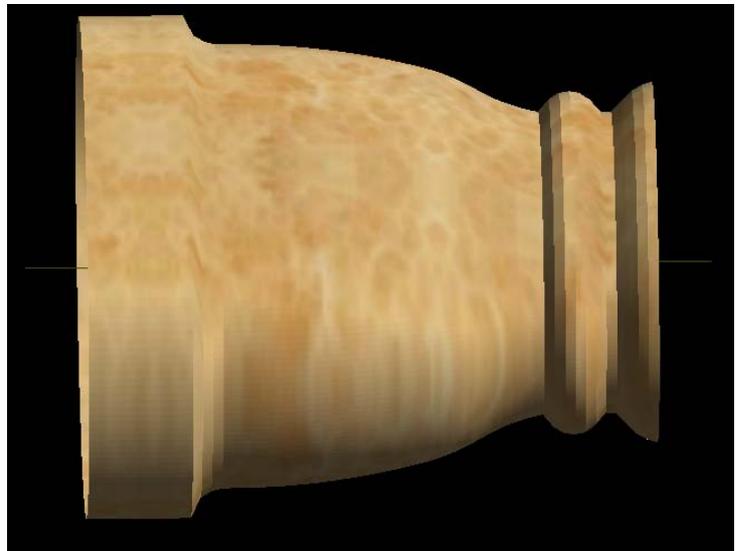
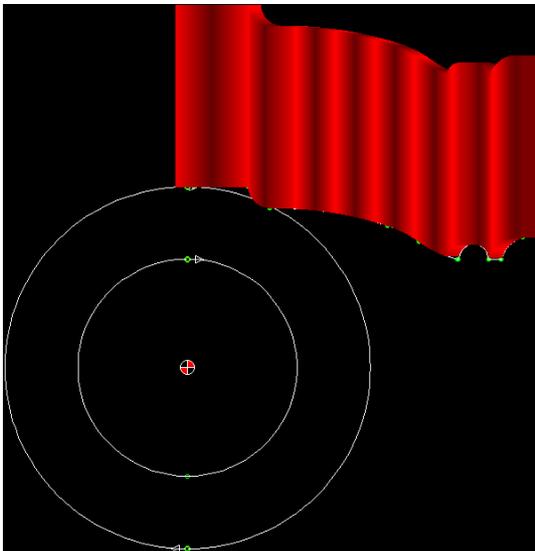
Generatrix

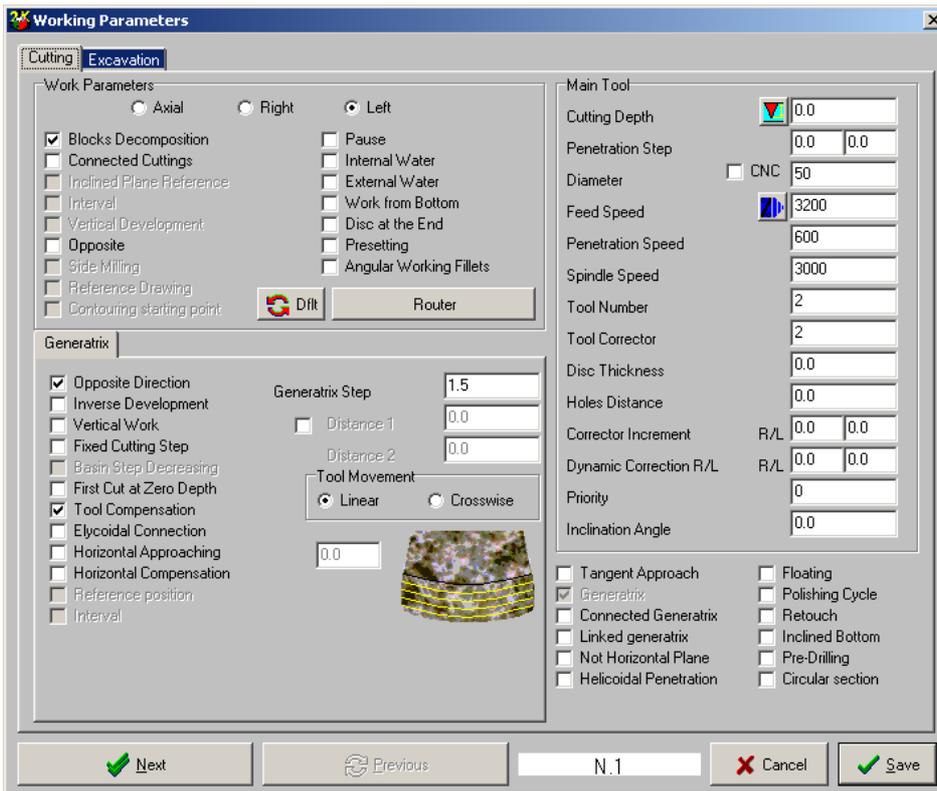
- Opposite Direction
- Vertical Work
- Generatrix Step (2)
- Tool Compensation

Tool Movement

- CrossWise

2D simulation and the model:





To select and to insert:

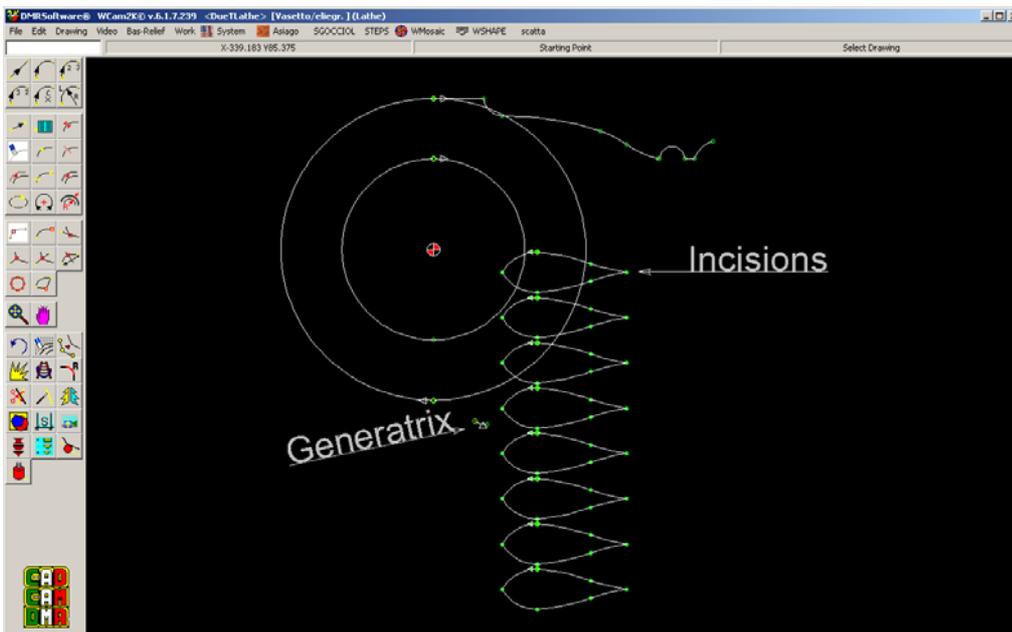
- Left
 - Blocks Decomposition
 - Tool
- Generatrix
- Opposite Direction
 - Generatrix Step (1.5)
 - Tool Compensation

Tool Movement

- Linear

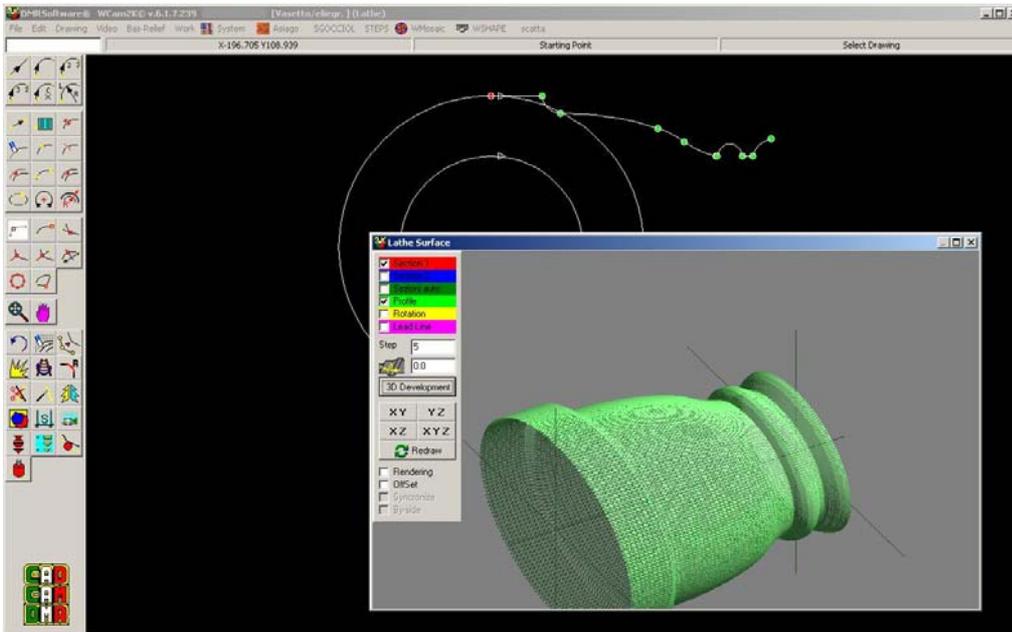
We suppose to want to

engrave some figures on a vase.



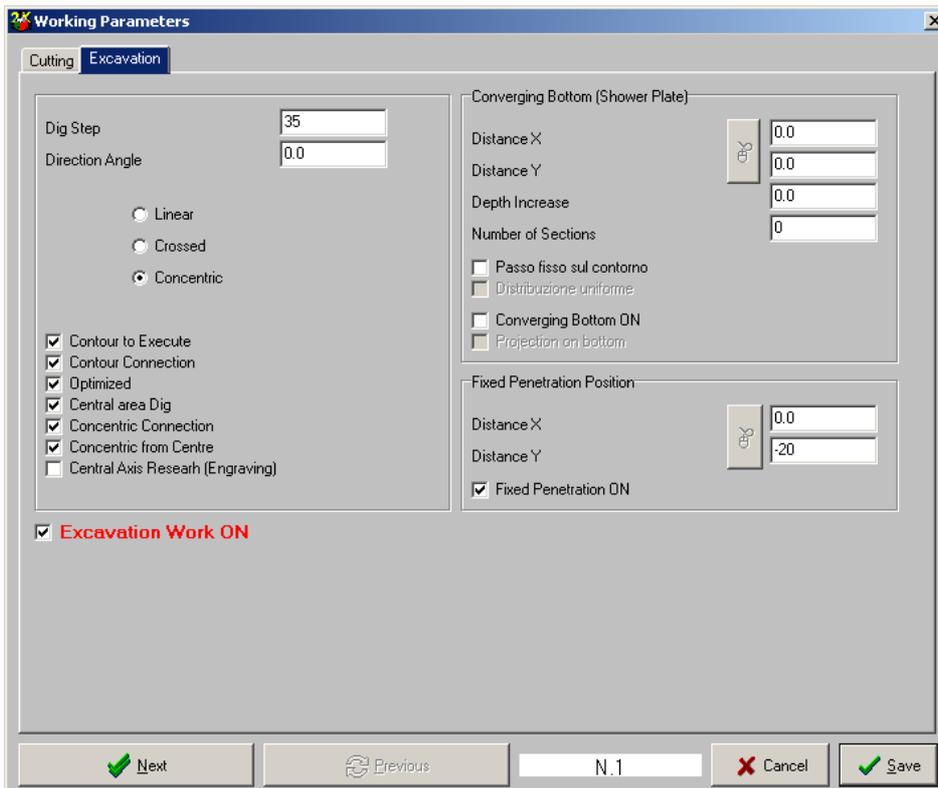
We create the model from Bas-reliefs → Surface 3D creation → Lathe

On the page that appears to activate section and to select the section, to activate profile and to select profile. To insert a step for the calculation of the model [5]



Work→working→Create select the incisions, select Generatrix, select the little profile, take the tool from the tool store, insert the generatrix step, tool compensation

In the Excavation:



To select and to insert:

- Dig step (35)
- Direction Angle (0°)
- Concentric
- Contour to Execute
- Contour Connection
- Optimized
- Central Area Dig
- Concentric Connection
- Concentric from Center

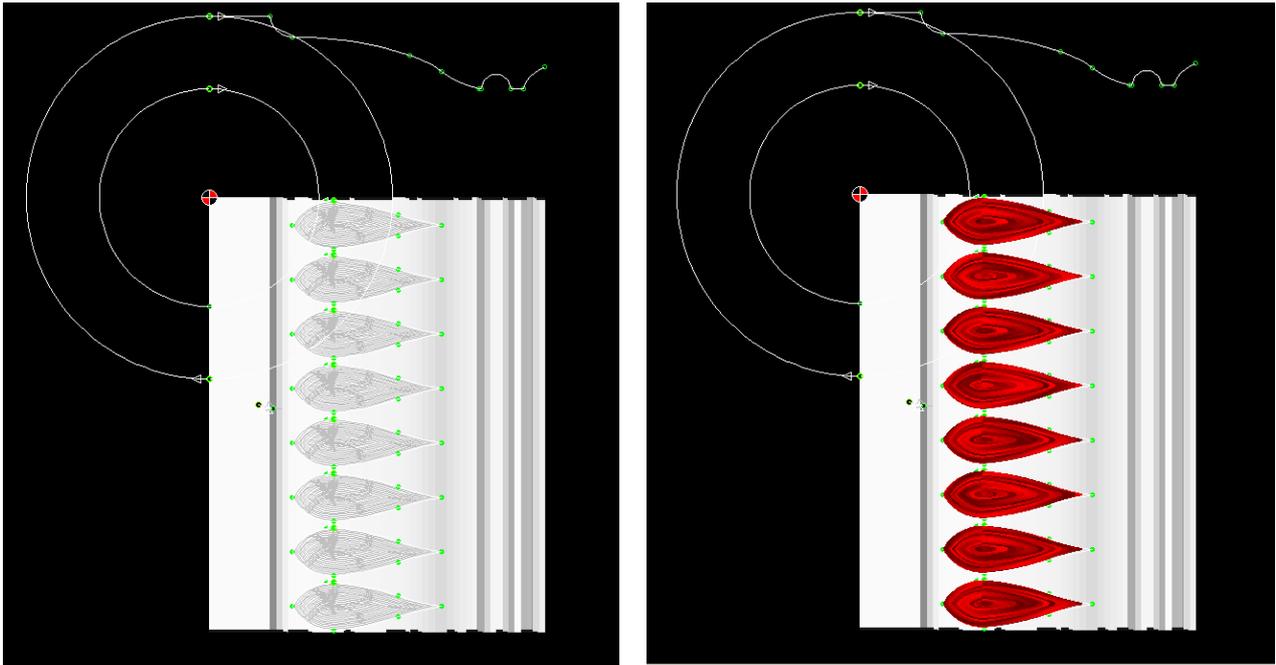
Excavation Work ON

Fixed Penetration

Position:

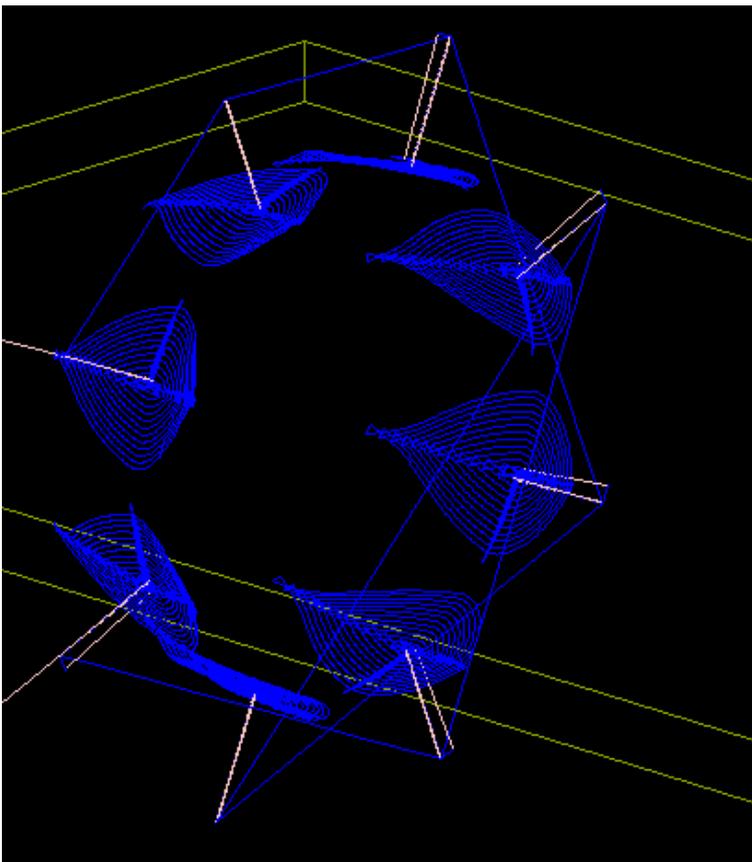
- Fixed Penetration ON (0.0,-20.0)

2D simulation:



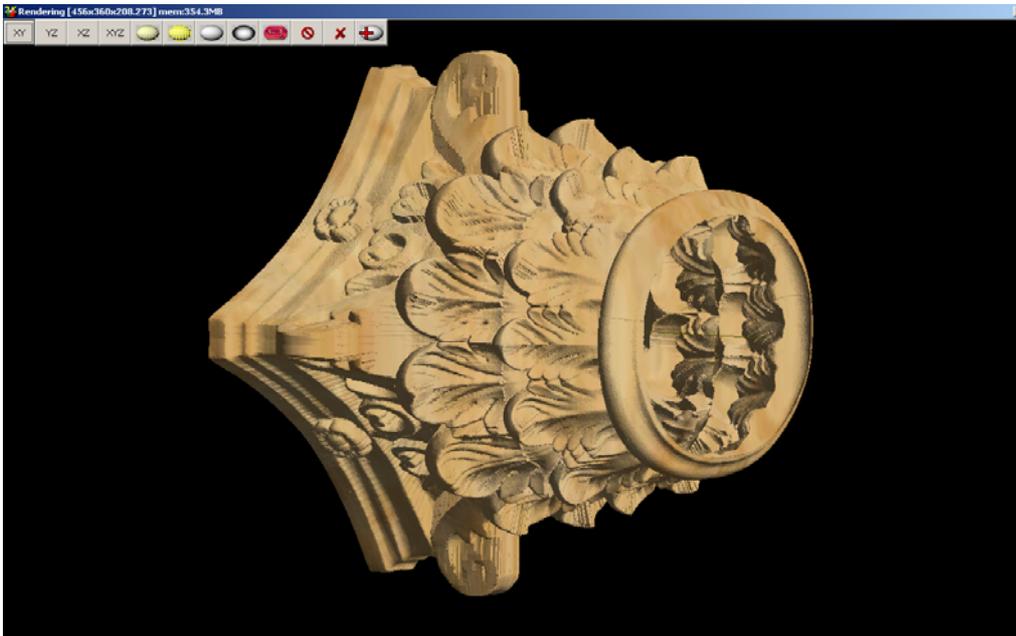
Bass-Relief → Surface projection and save the file in a new name.

3D simulation:



5.5 Realization a Capitol from model

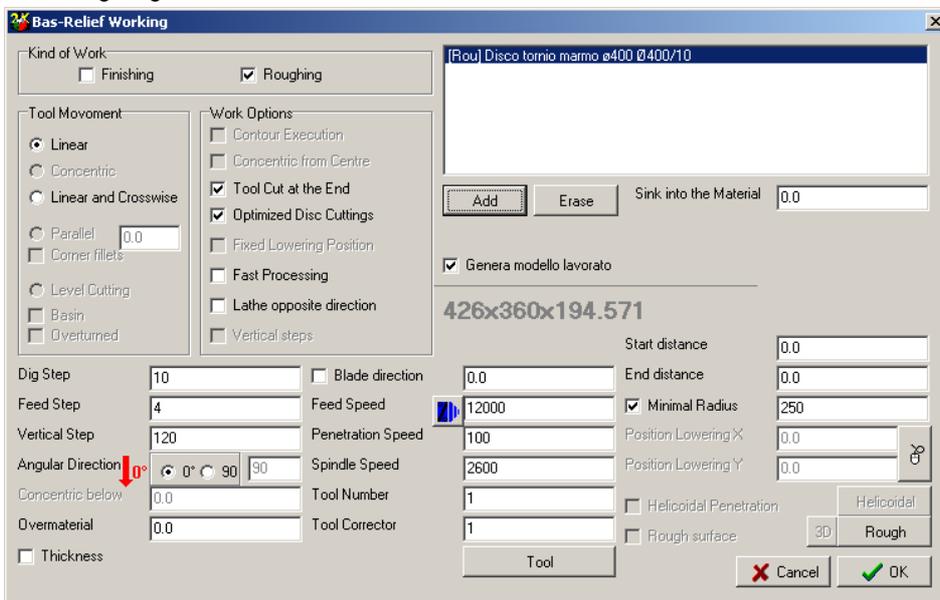
We suppose we want to realize this model, the dimension is length 426mm radius max about 350mm and radius min about 155mm so we must remove about 195mm of marble.



We have available a disk of diameter 400mm. Considerations give sorts in the preceding examples first we create the cylinder with diameter 700mm.

The disk allows us to penetrate at the most 120mm so we make 2 roughing, the first one up to reach a least diameter of 500mm the second to reach the diameter of the model.

First roughing:



Kind of Work:

Roughing

Tool Movement:

Linear

Work Option:

Tool Cut at the End

Optimized Disc

Cuttings

Dig Step (10)

Feed Step (4)

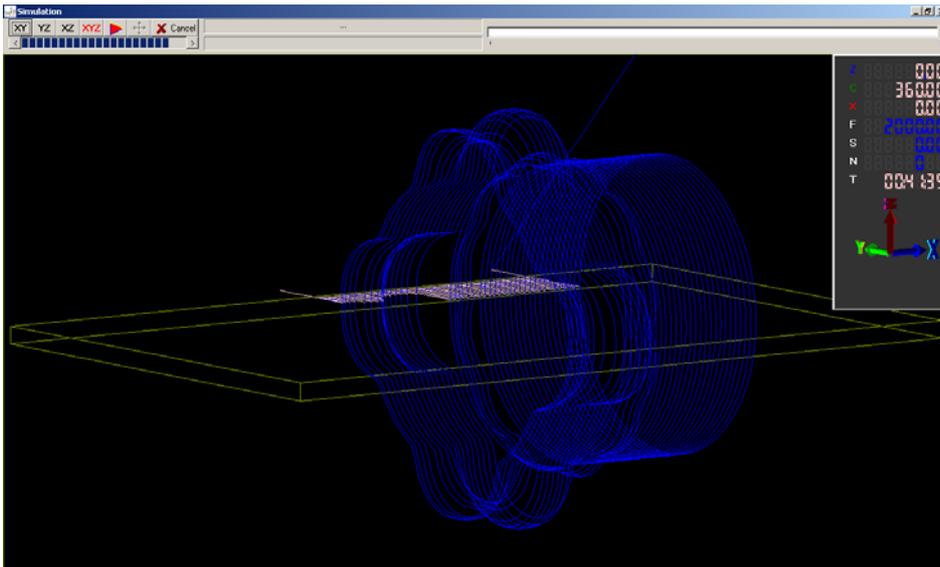
Vertical Step (120)

Angular Direction (0°)

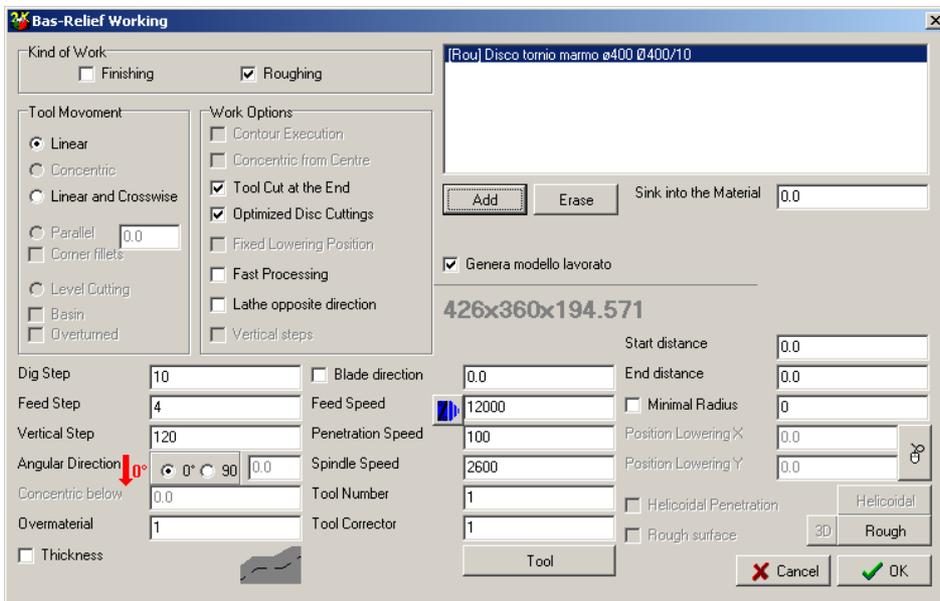
Tool

Minimal Radius

3D simulation:



Second roughing:



Kind of Work:

Roughing

Tool Movement:

Linear

Work Option:

Tool Cut at the End

Optimized Disc Cuttings

Dig Step (10)

Feed Step (4)

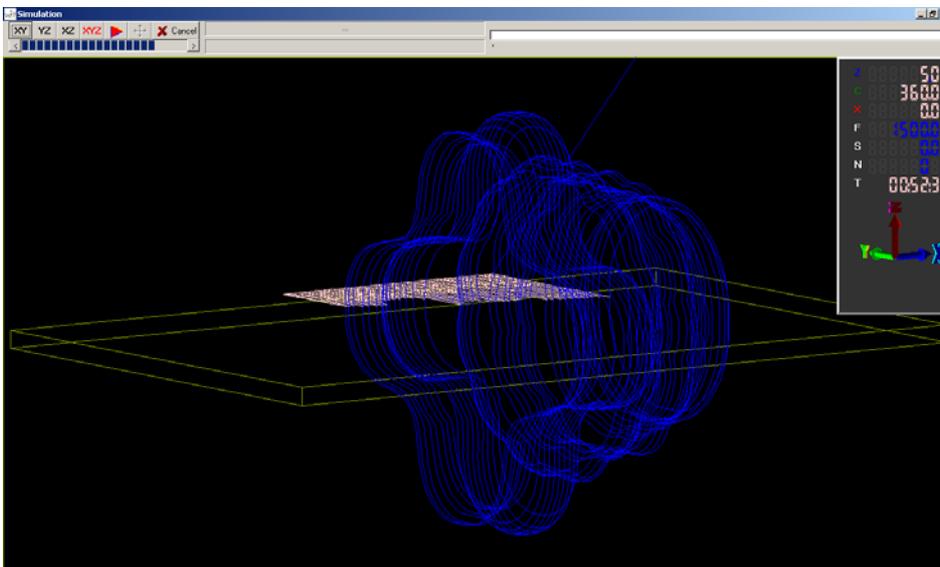
Vertical Step (120)

Angular Direction (0°)

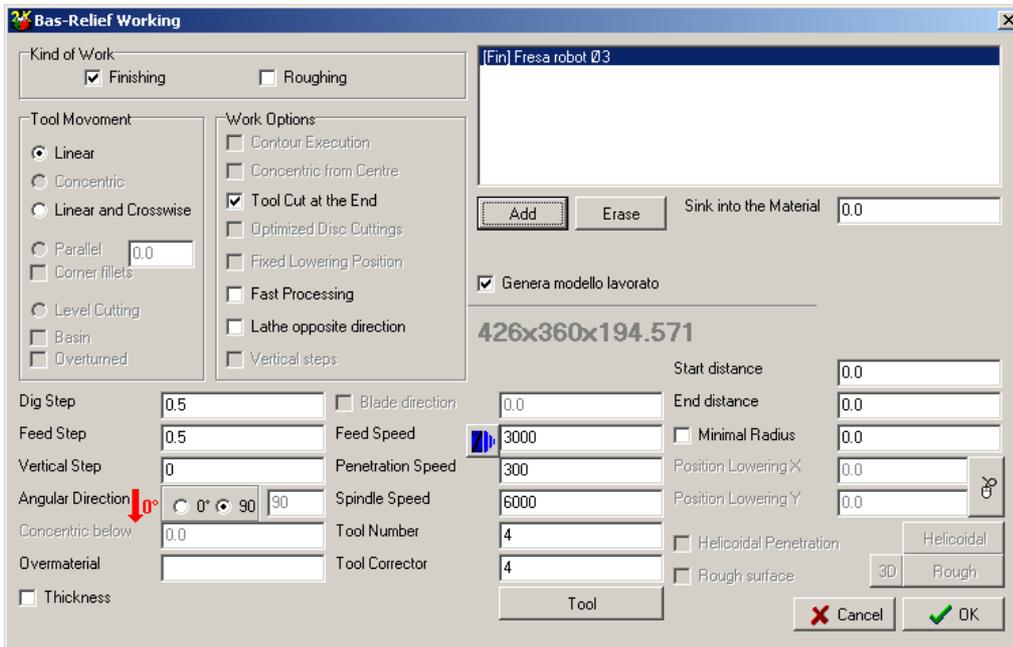
Tool

Overmaterial (1)

3D simulation:



For the finishing:



Kind of Work:

Finishing

Tool Movement:

Linear

Work Option:

Tool Cut at the End

Dig Step (0.5)

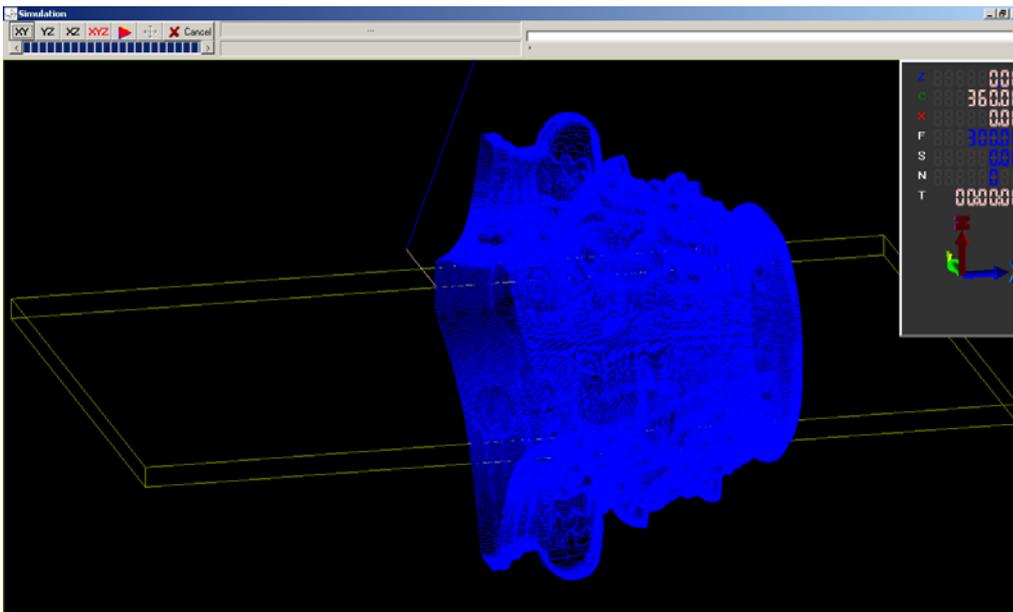
Feed Step (0.5)

Angular

Direction (90°)

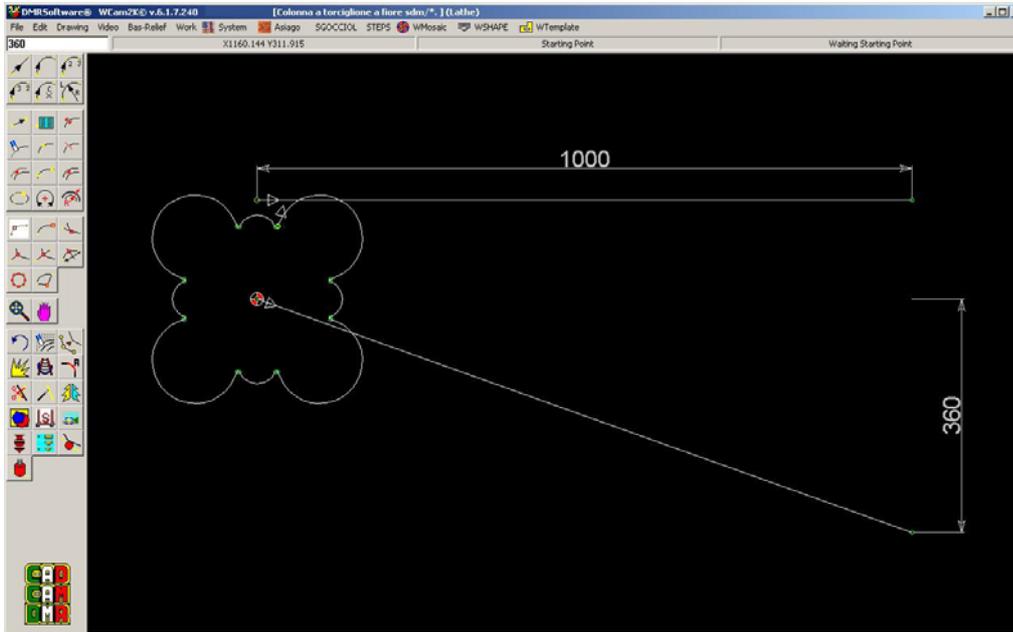
Tool

3D simulation:



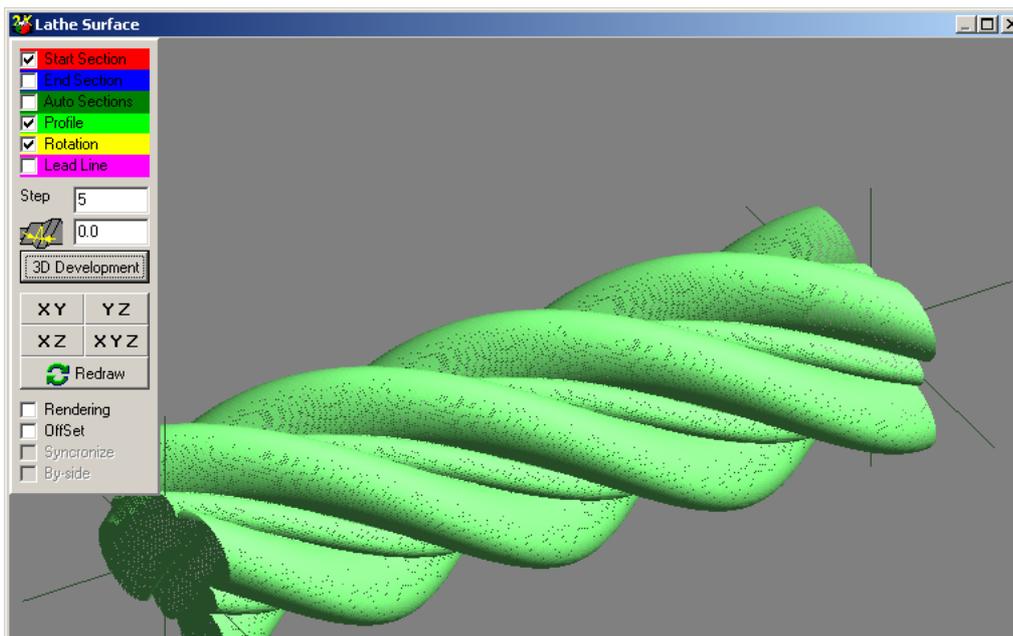
5.6 How to make twisted columns

We suppose we want to realize this a twisted column with a particular section:



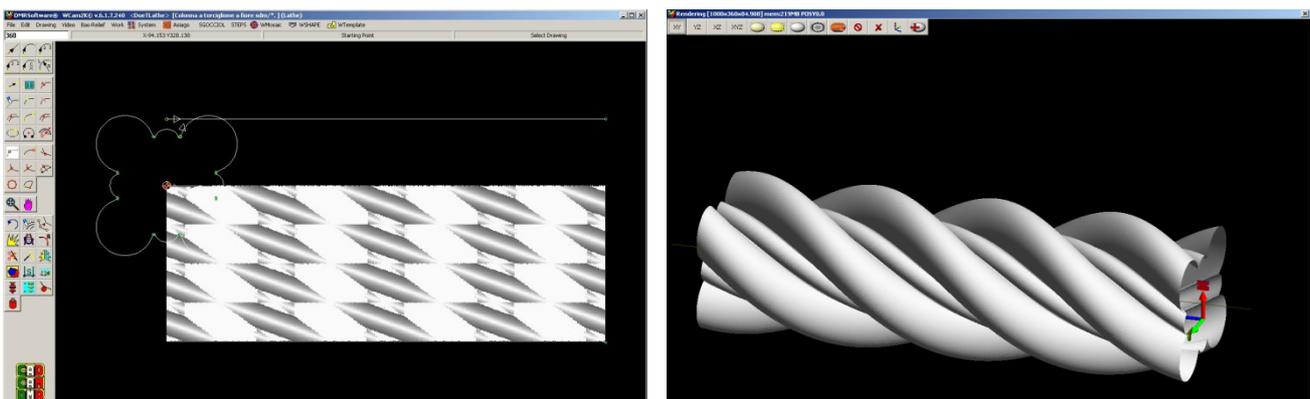
It is important to draw the section, the profile and an oblique line that it identifies the torsion, every point of the section is rotated some number of degrees corresponding to the height in Y of the oblique line (in the example 360° every point completes a complete turn)

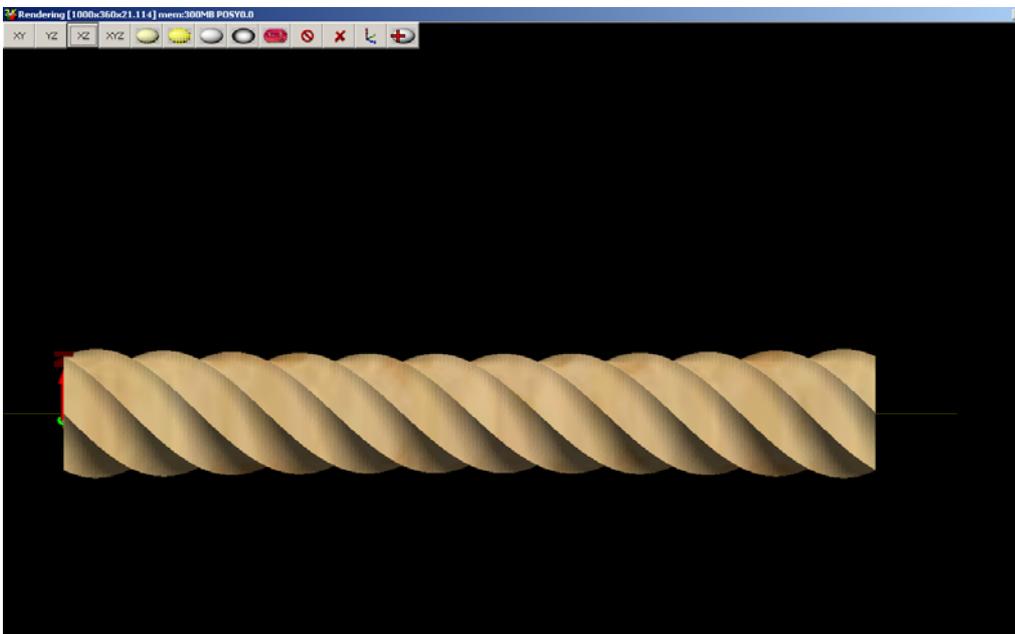
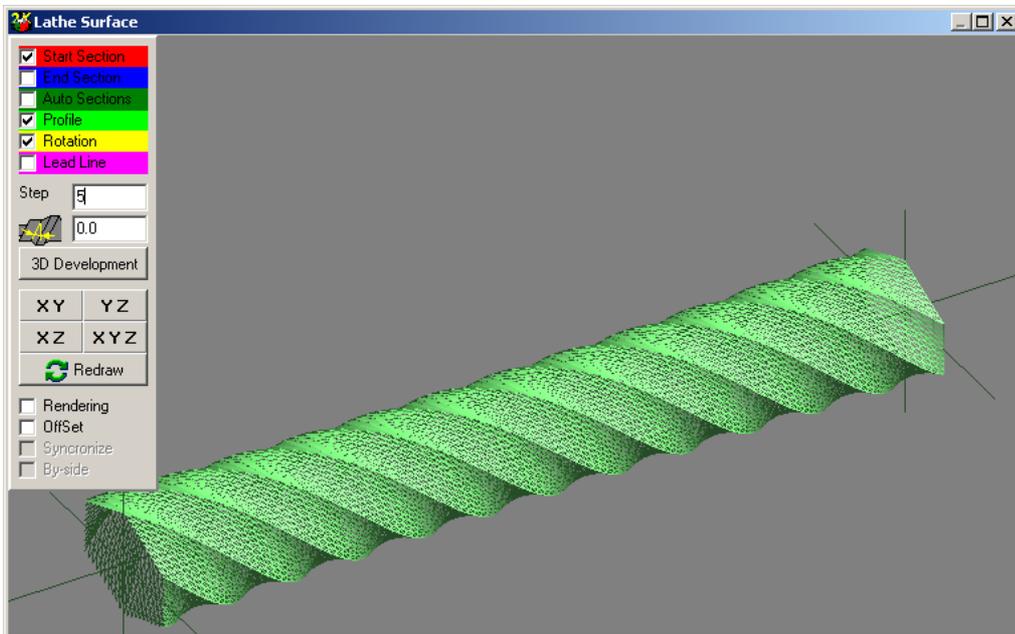
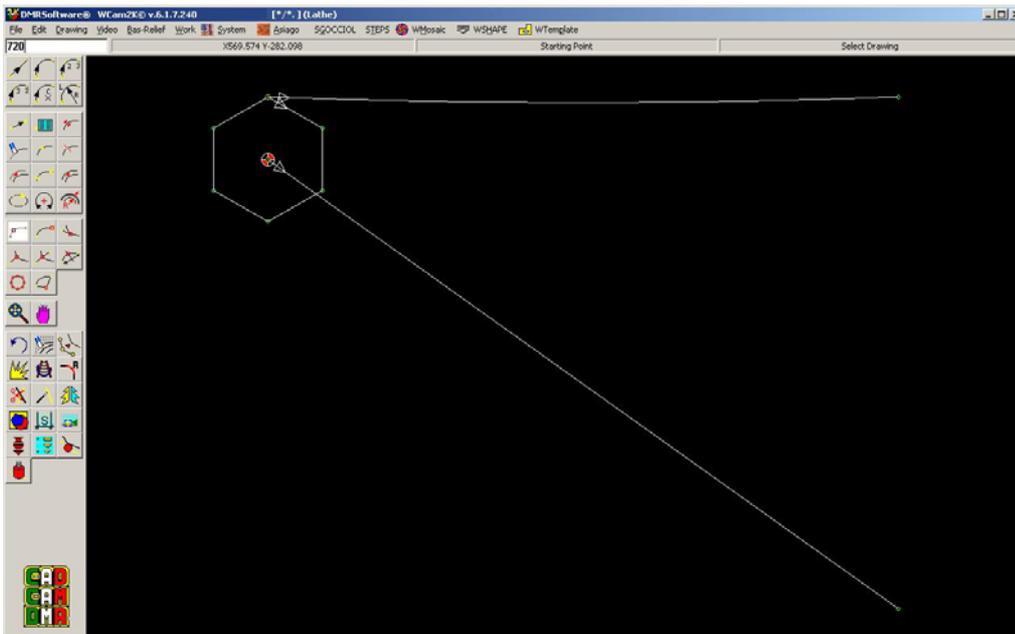
We create the model: Bass-Relief → Surface 3D Creation → Lathe



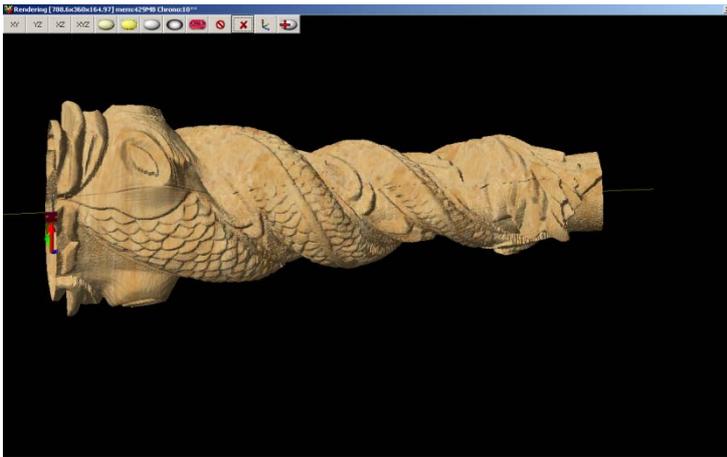
To select Start Section and to strike the section, Profile and to strike the the line of the profile and finally Rotation and to select the oblique line To select 3D Development

Produced model and rendering:

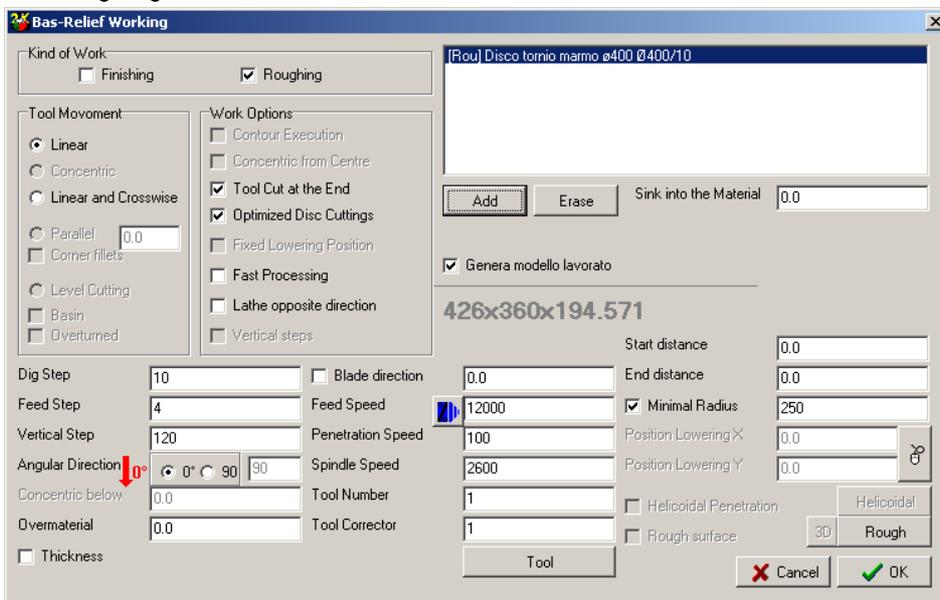




5.7 Realization of a model column 3D



First roughing:



Kind of Work:

Roughing

Tool Movement:

Linear

Work Option:

Tool Cut at the End

Optimized Disc Cuttings

Dig Step (10)

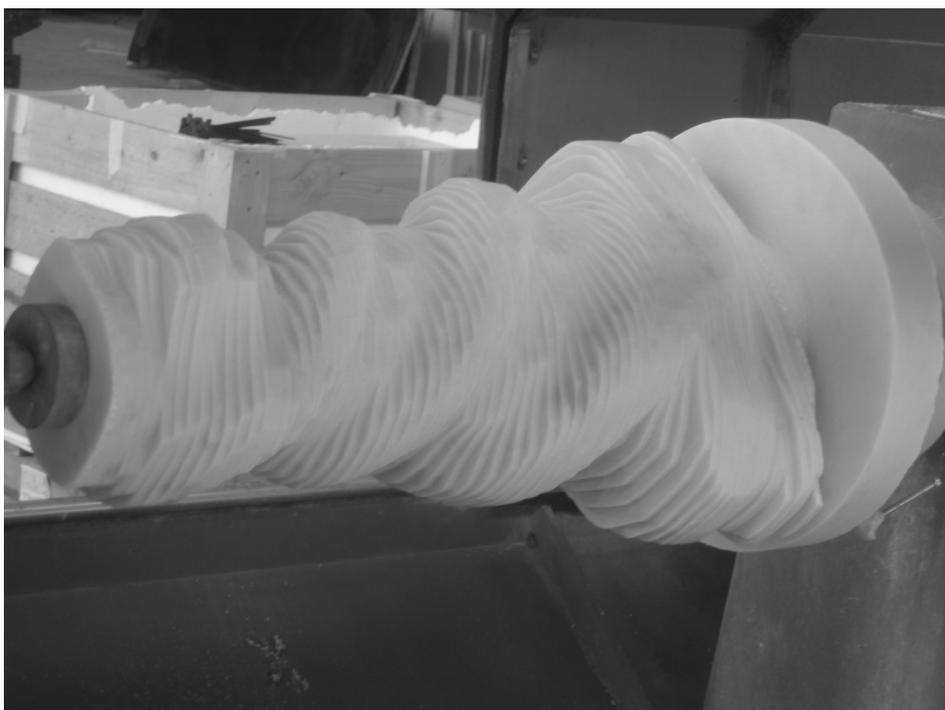
Feed Step (4)

Vertical Step (120)

Angular Direction (0°)

Tool

Minimal Radius



For the finishing:

Bas-Relief Working

Kind of Work: Finishing Roughing

Tool Movement: Linear Concentric Linear and Crosswise

Work Options: Contour Execution Concentric from Centre Tool Cut at the End Optimized Disc Cuttings Fixed Lowering Position Fast Processing Lathe opposite direction Vertical steps

Parallel: 0.0
Corner fillets
Level Cutting
Basin
Overturned

Blade direction: Blade direction

Dig Step: 0.5
Feed Step: 0.5
Vertical Step: 0
Angular Direction: 0° 0° 90° 90°

Concentric below: 0.0
Overmaterial: Thickness

Genera modello lavorato

426x360x194.571

Sink into the Material: 0.0

Start distance: 0.0
End distance: 0.0
Minimal Radius: 0.0
Position Lowering X: 0.0
Position Lowering Y: 0.0

Feed Speed: 3000
Penetration Speed: 300
Spindle Speed: 6000
Tool Number: 4
Tool Corrector: 4

Helicoidal Penetration: Helicoidal
Rough surface: 3D Rough

Buttons: Add, Erase, Tool, Cancel, OK

Kind of Work:

Finishing

Tool Movement:

Linear

Work Option:

Tool Cut at the End

Dig Step (0.5)

Feed Step (0.5)

Angular Direction (90°)

Tool



6MILLING MACHINE

6.1 Configuration

In MAIN MENU:

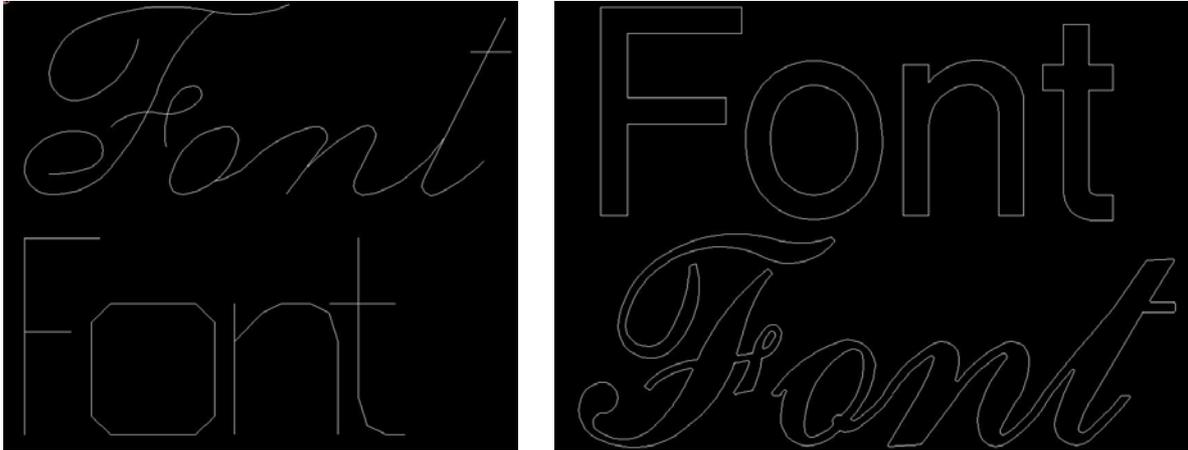
Select **SYSTEM** → **GENERAL PARAMETERS** → **SUBPARAMETER**

In KIND OF MACHINE Select **ROUTING** and press **OK**

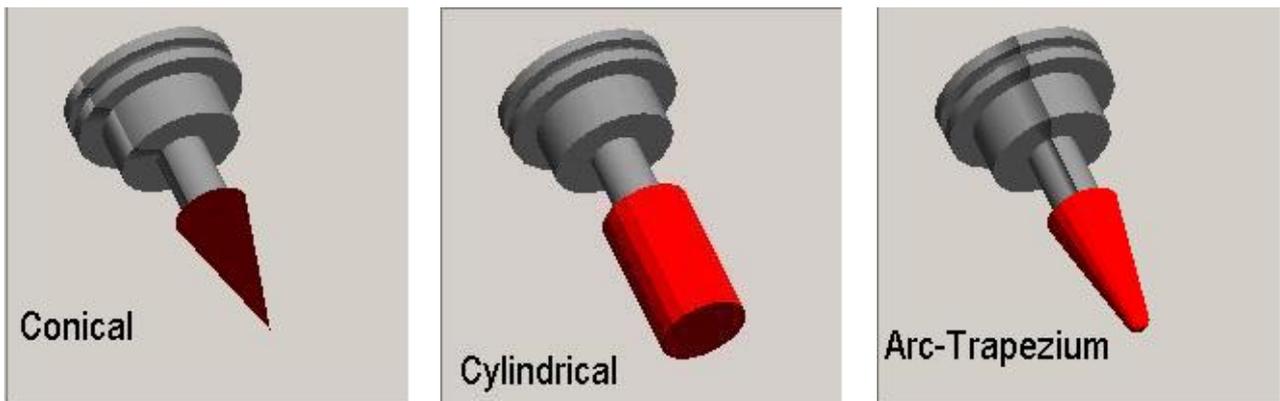


6.2 Engraving

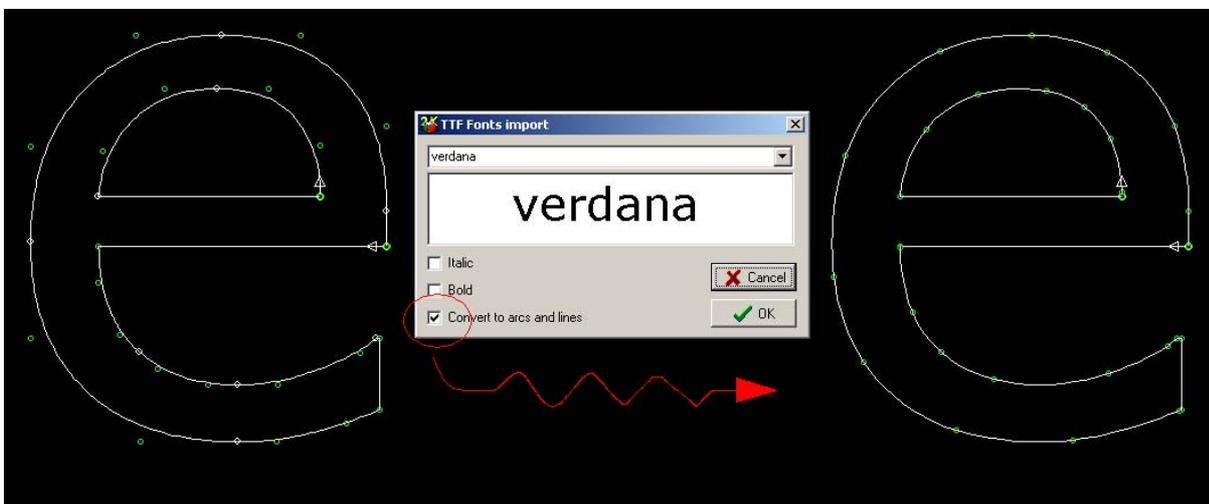
The software has the possibility to engrave characters and writings. The connected cursive fonts can be created or to load the fonts TTF introduces in his own computer in the chart of the fonts of windows. Is possible to create writings all to the same depth in bass-relief or to exploit the function of search central axle for the characters to double line as the example in figure:



In the second case if a conic toll is used they are created some incisions with varying depth in 3D. The typical utensils used for incisions and bass-relief are:



When you load a font from the chart of the fonts of windows it is to always select Convert in Arcs and Lines because the TTF fonts are composed from b-spline and this could cause errors in the calculation of the path of the work and the incision could result not correct



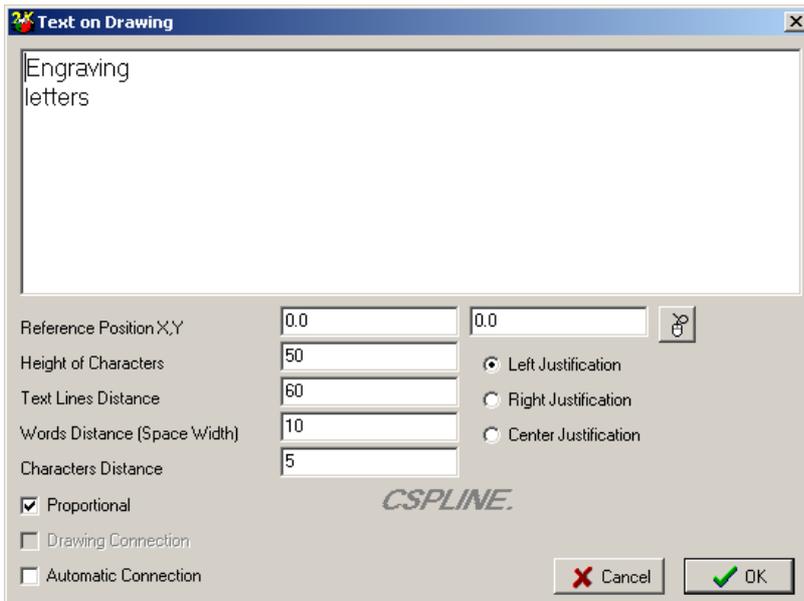
The menu to load the fonts is found in Drawing→Characters→Load→Fonts(Wcam2K fonts) or Font TIF(Windows font) Import. And is possible to also convert the fonts in arcs and lines from: Edit→Drawing→Change Arcs and Lines

6.3 Examples of engraving

6.3.1 Engraving at fixed depth

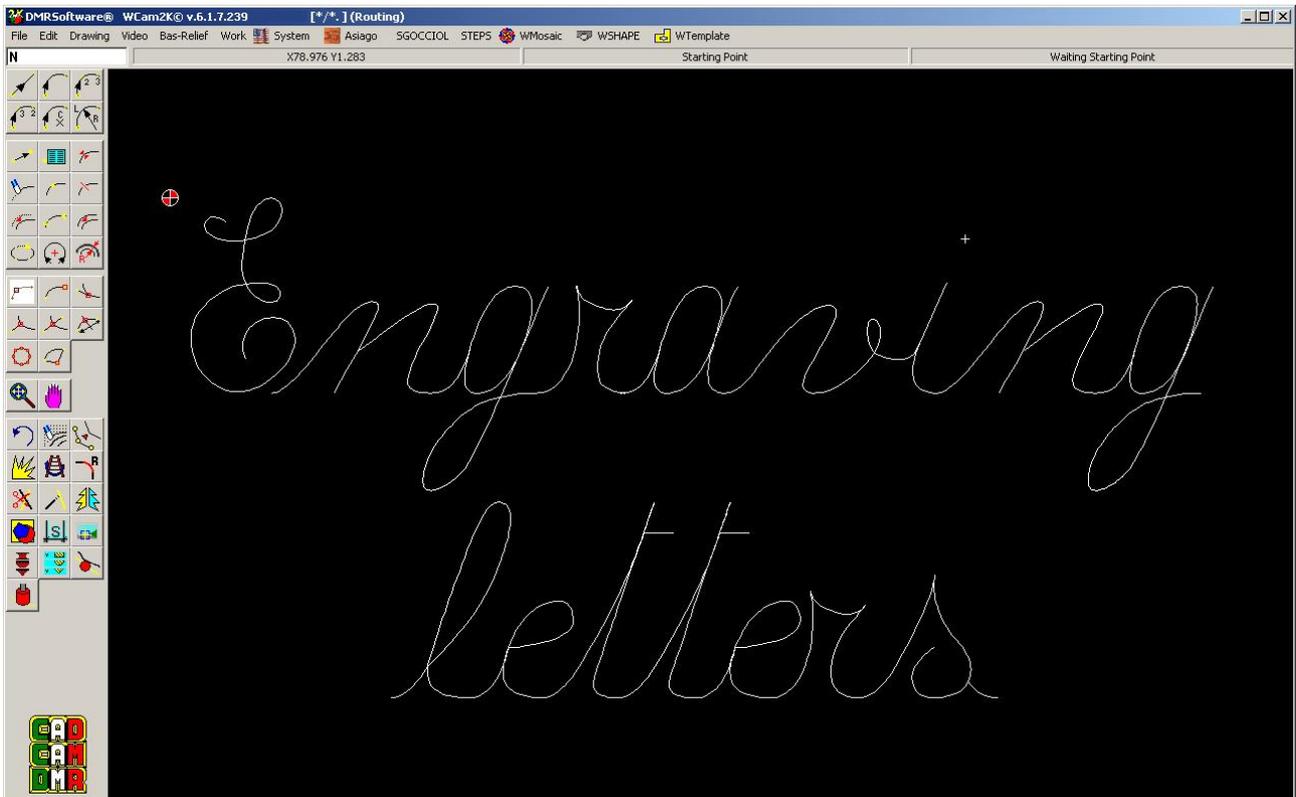
Drawing→Characters→Font→Load Font(or Font TIF Import)

We suppose we want to write: Drawing→Characters→Insert String

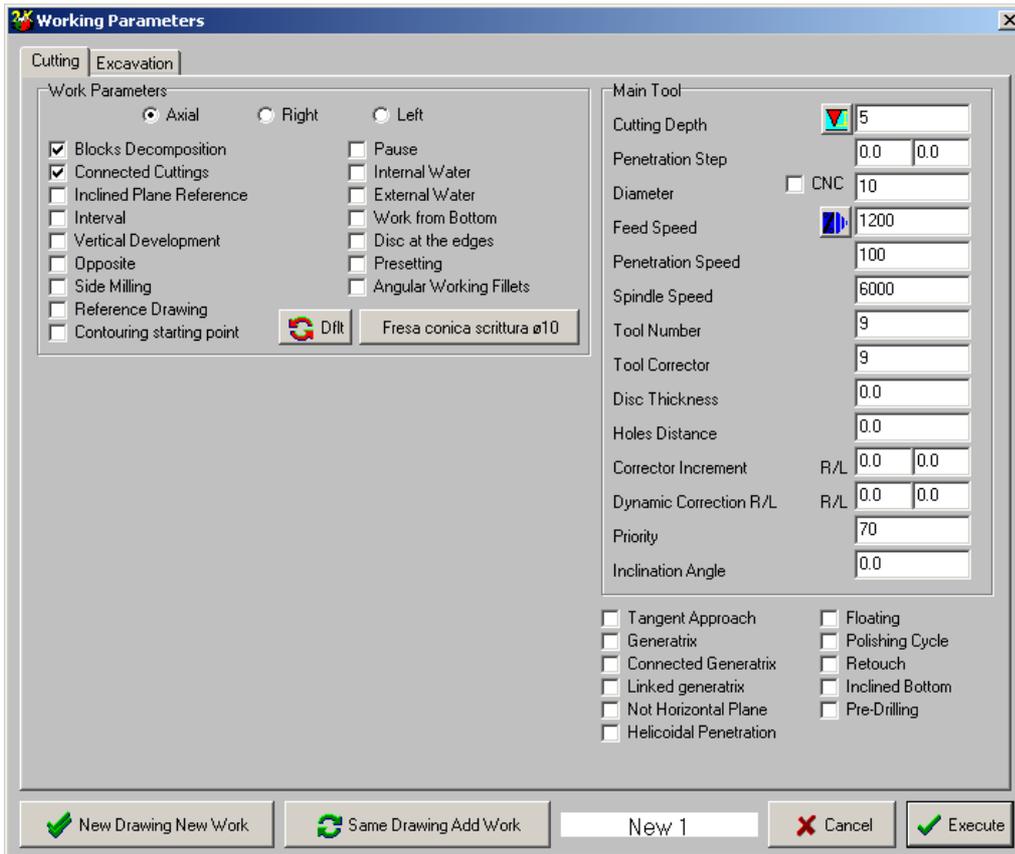


In this menu is possible to insert Reference Position X,Y, the Height of Characters, the Text Lines Distance, the distance between the words; to put the text with different justification. With Proportional the software calculate the dimension of the text in kind proportional. Automatic connection is for having the continuous and connected path in an only line

Press Ok



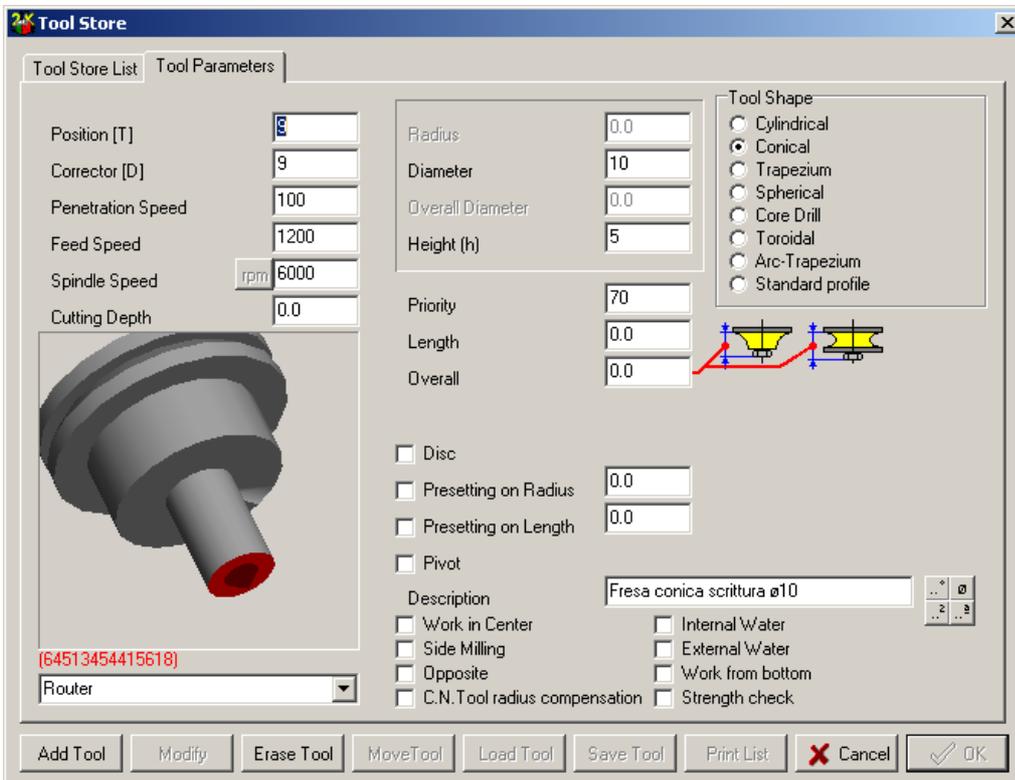
To create the work: Work→Working→Create and select all the text(right key of the mouse to confirm)



To select and to insert:

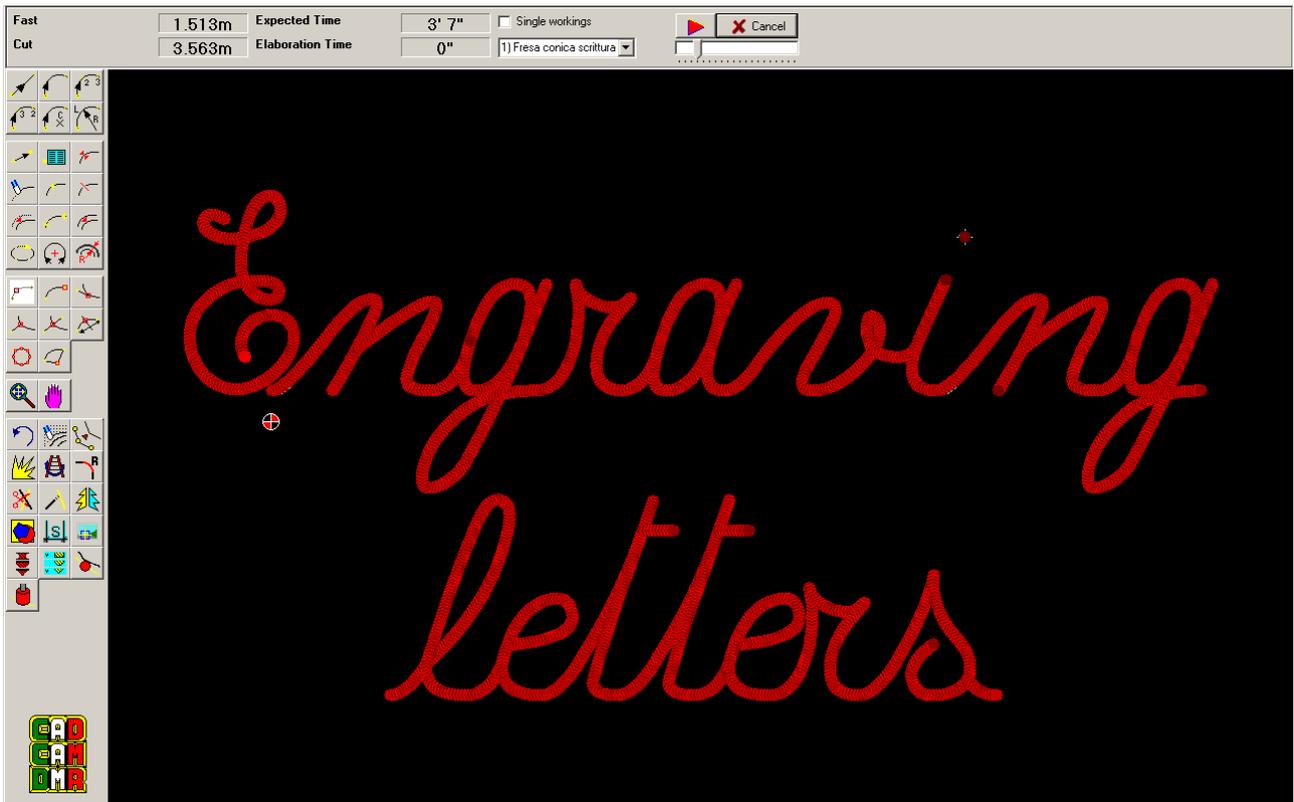
- Axial
- Cutting Depth=5

Select the tool:

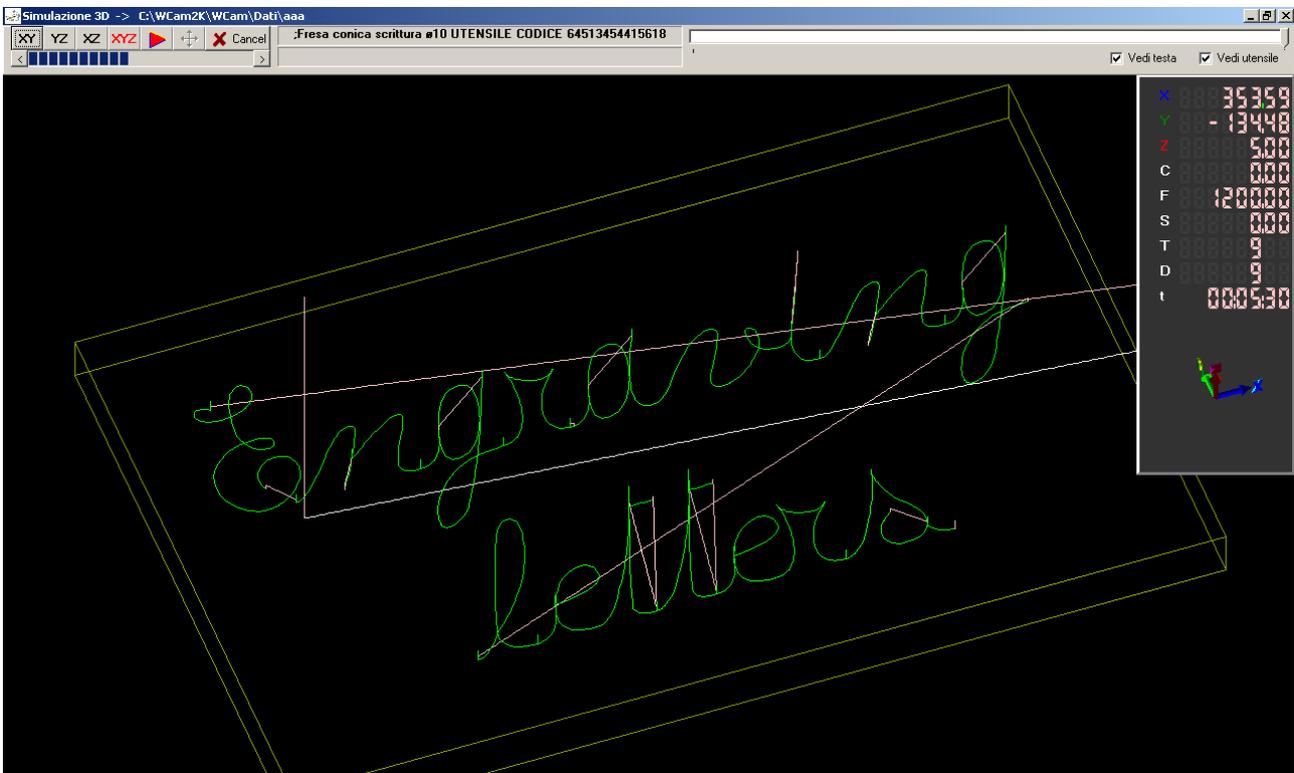


To press Execute

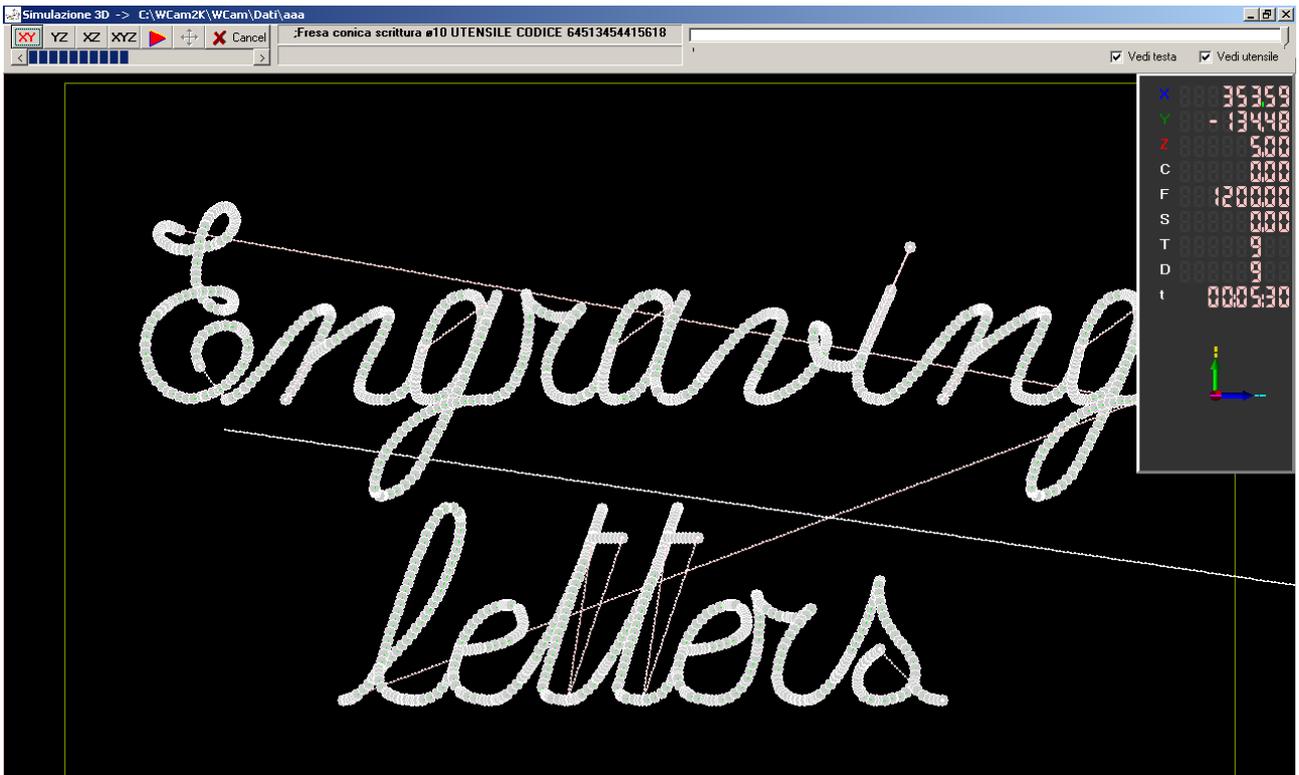
To select Work→2D simulation, for to see the simulation and the measure of the path in meters effected in rapid movement, the measure of the engraved path and the presumed time of job



To crate the ISO file: Work→Working→Save

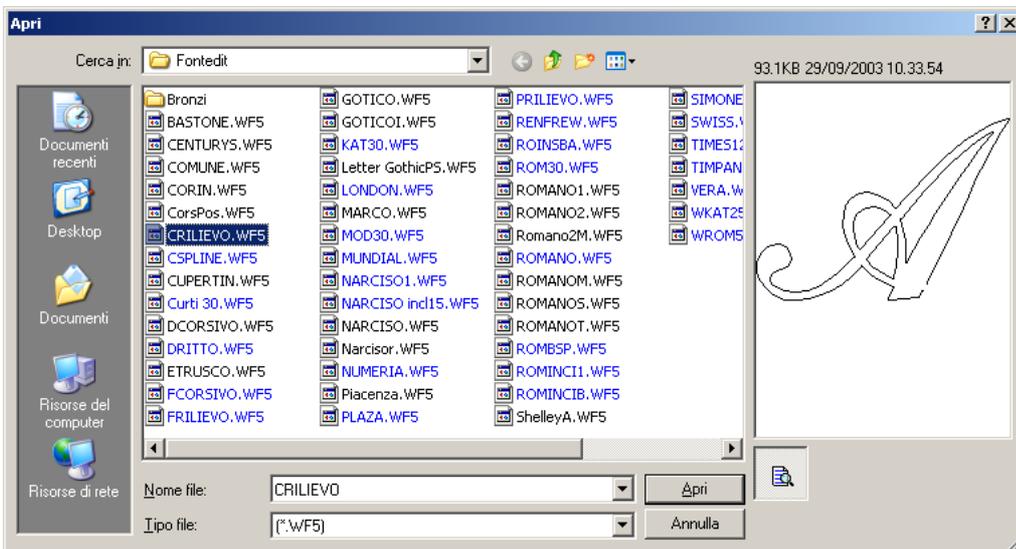


Selecting the sight XY in the window of the simulation 3d and decreasing the speed of the simulation pressing the left key of the mouse in the left part of the screen is possible to see the eliminated material because the software also simulates the dimensions of the used tool

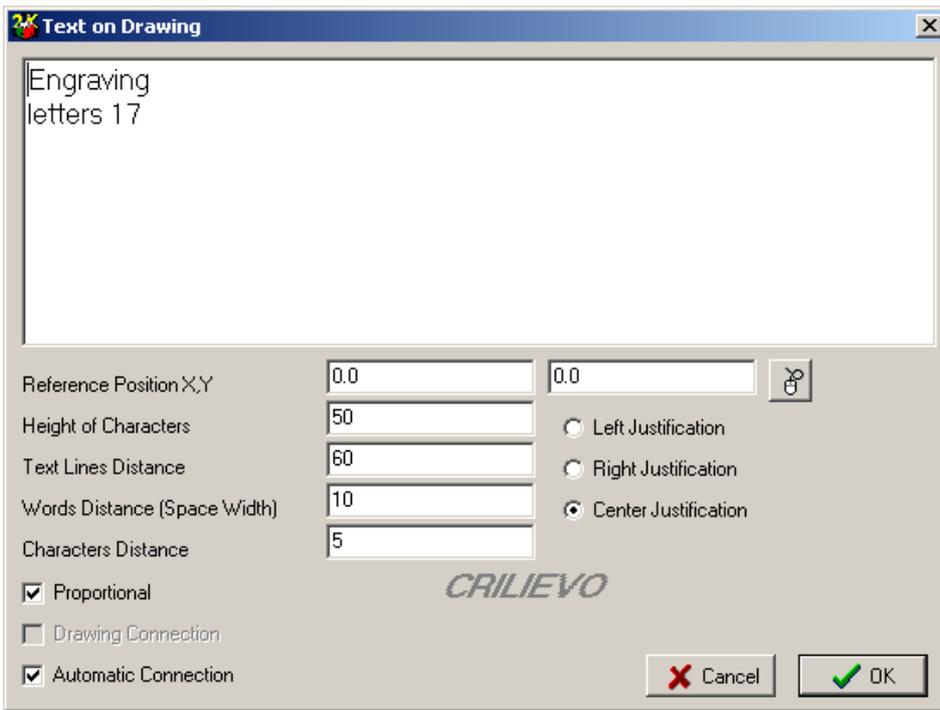


6.3.2 Central Axis Research (Engraving)

If we use a tool with a conic shape it is possible to create engraving with different depth because the toll it follows the run lifting itself and lowering itself so that to get the thickness of the inserted text



Drawing → Characters → Insert String

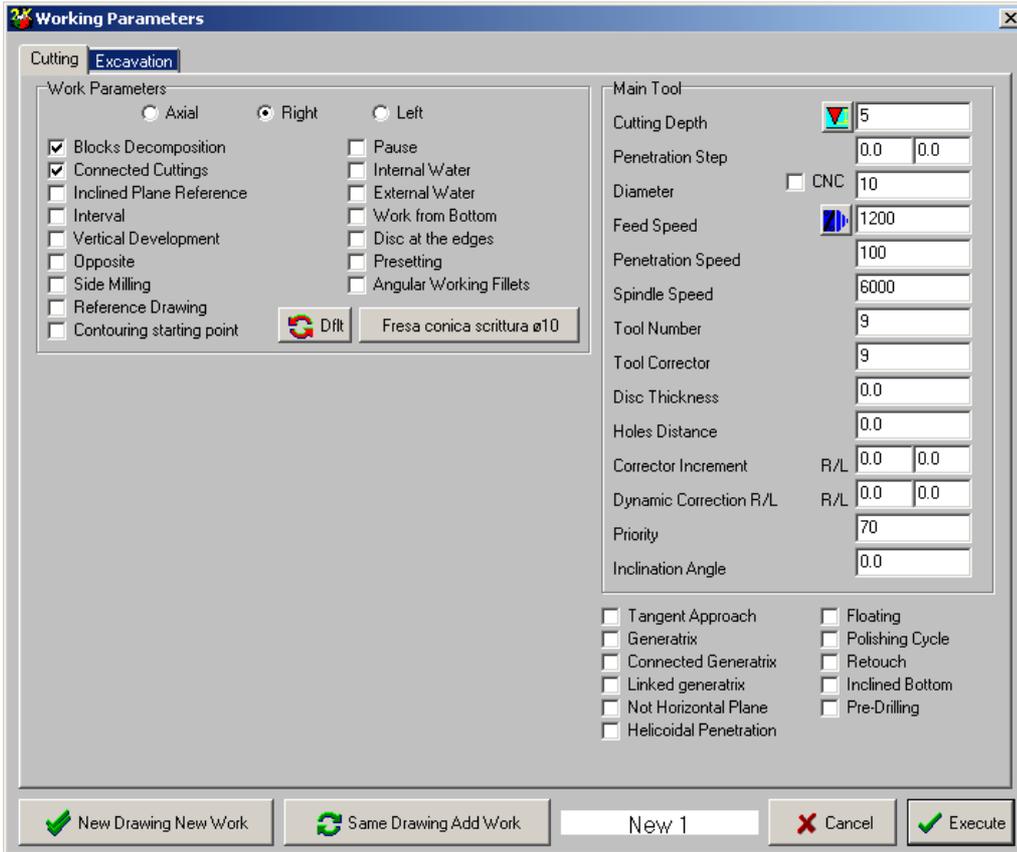


If the automatic connection of the lines doesn't happen, to correct the disconnected points and to proceed to the manual connection from Edit→Drawing→Automatic Connection



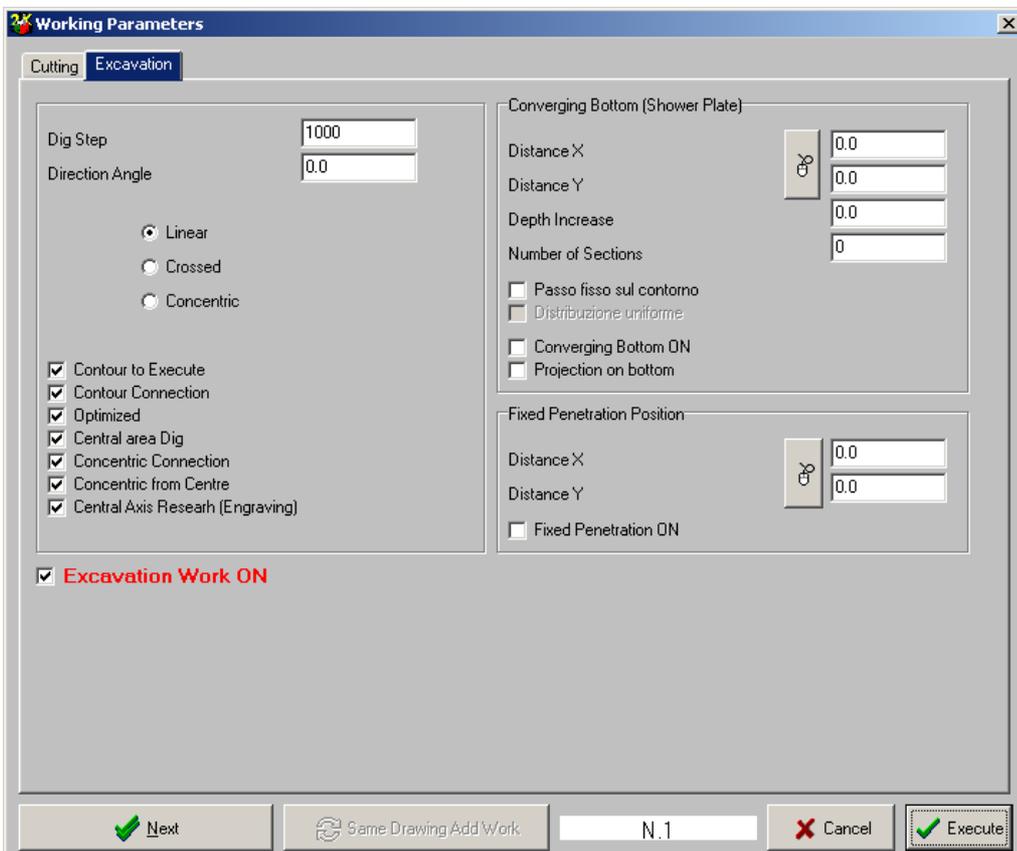
To also select Edit→Drawing→Clockwise Turning

To create the work: Work→Working→Create and select all the text(right key of the mouse to confirm)

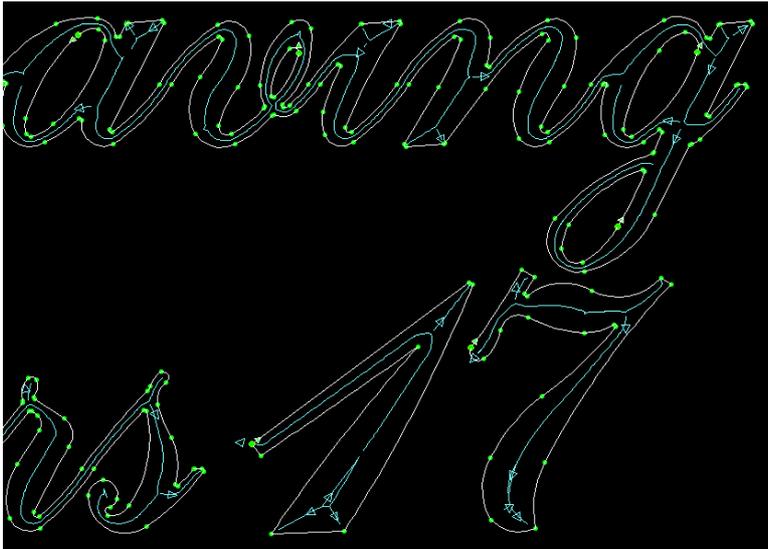


To select and to insert:
 Right
 Cutting Depth=5
 (maximal depth)

In the Excavation Window:



To select and to insert:
 Dig step
 Linear
 Contour to Execute
 Contour Connection
 Optimized
 Central Area Dig
 Concentric Connection
 Concentric from Center
 Central Axis Research
 Excavation Work ON



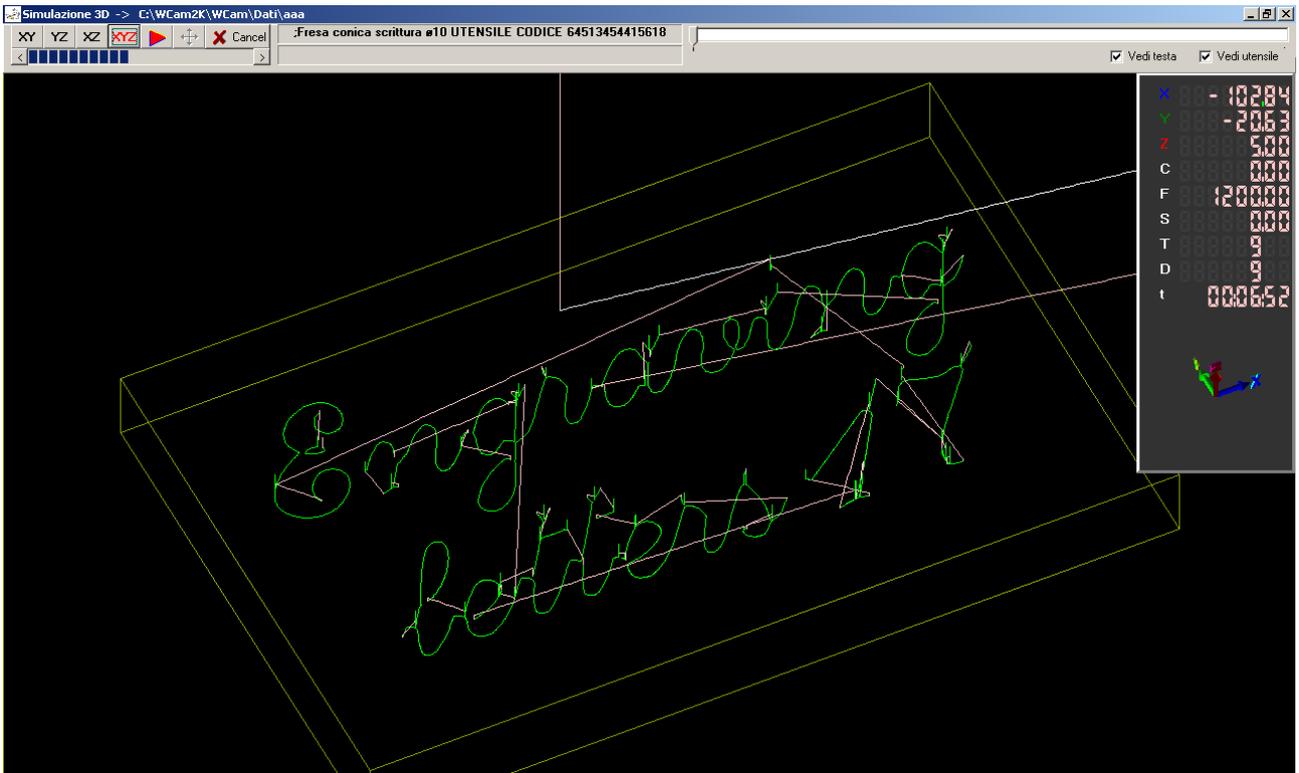
In the figure you can be seen how the path has centrally been calculated for the whole text

To select Work→2D simulation, for to see the simulation and the measure of the path in meters effected in rapid movement, the measure of the engraved path and the presumed time of job



To create the ISO file: Work→Working→Save

To select Work→3D simulation for to load the and to see the simulation of the file ISO that has been created in the preceding passage. The green path corresponds to the center of the tool

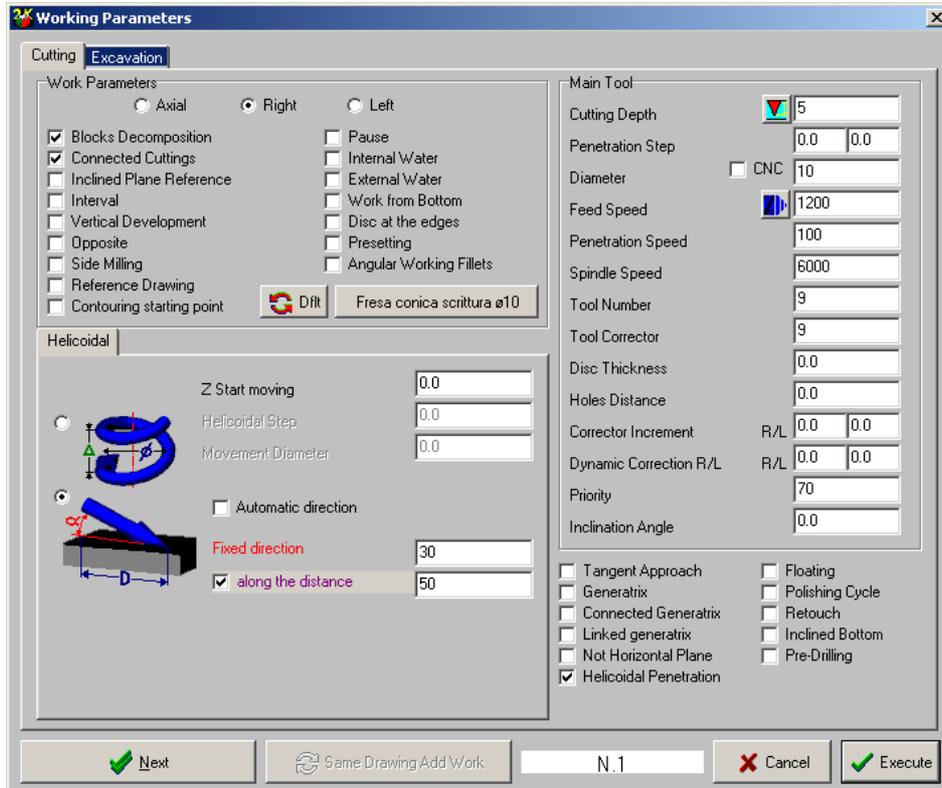


Selecting the sight XY in the window of the simulation 3d and decreasing the speed of the simulation pressing the left key of the mouse in the left part of the screen is possible to see the eliminated material because the software also simulates the dimensions of the used tool



6.3.3 Advanced Penetration

Activating the menu Helicoidal Penetration is possible to select the command to penetrate in the material with a certain angle rather than perpendicular



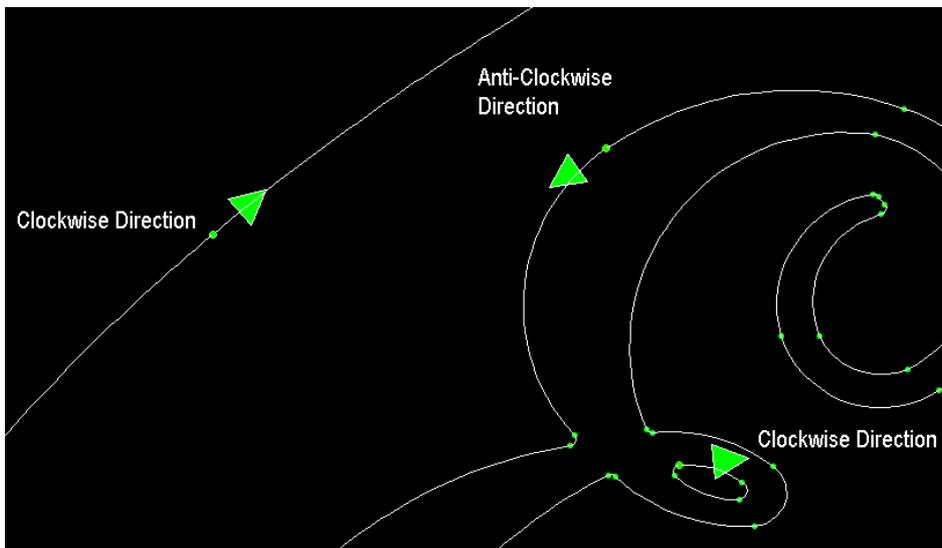
- To select and to insert:
- Right
 - Blocks Decomposition
 - Connected Cuttings
 - Cutting Depth(5)

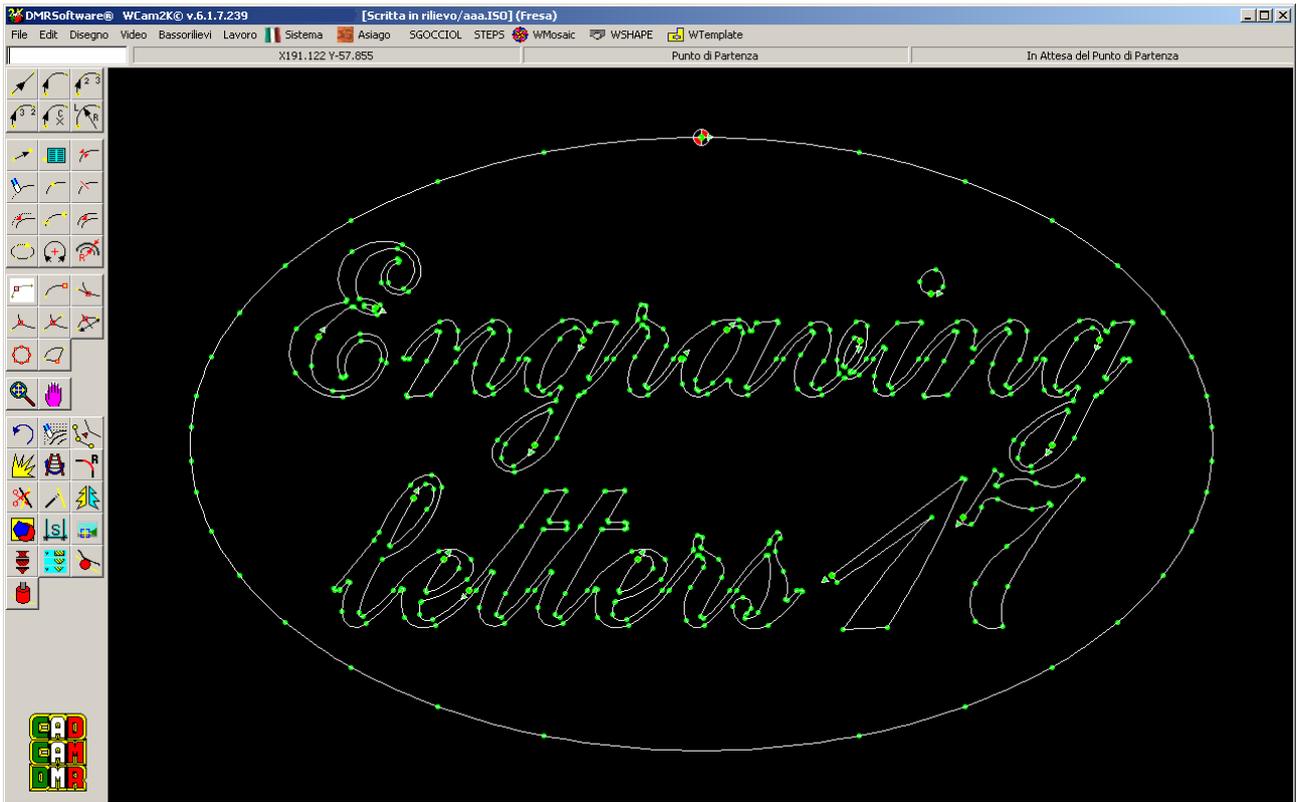
- Advanced Penetration:**
- Fixed Direction(30)
 - Along the Distance(50)

If you select Automatic Direction the software automatically calculate the angle of penetration in base to the over material measure. Fixed Direction must be expressed in degrees and it imposes the written angle. Along the distance must be expressed in millimeter and it imposes the approach distance

6.3.4 Engraving in relief

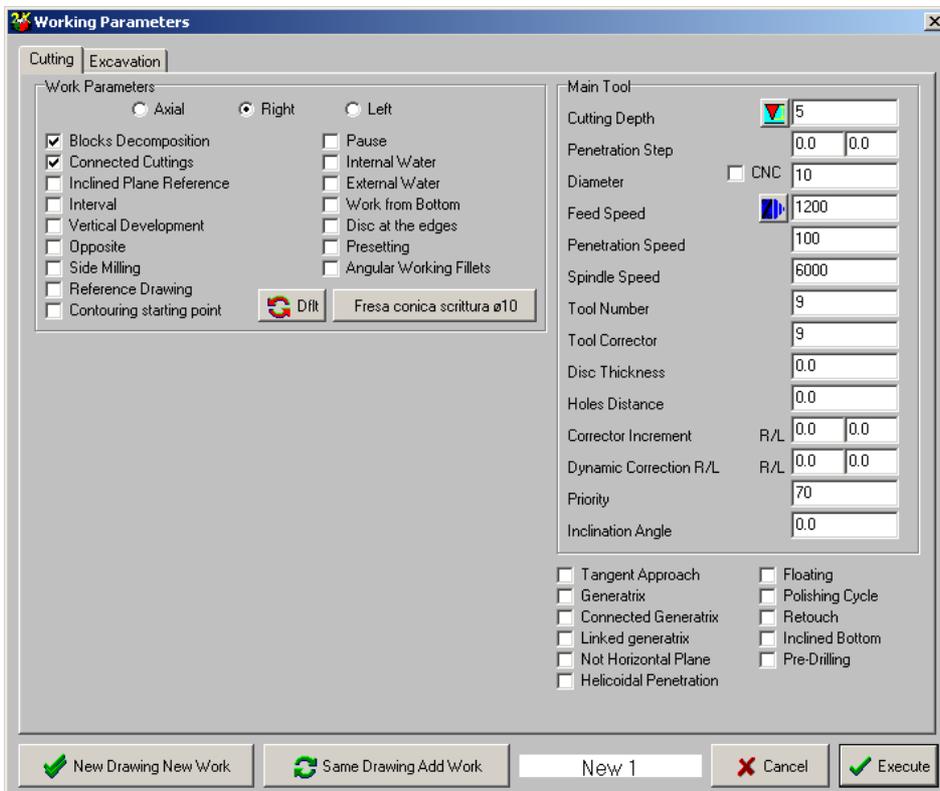
To engrave the writing in relief we must draw the pocket that contains the writing. Is important that the lines are connected and the directions of the path inside internal each other are inverted





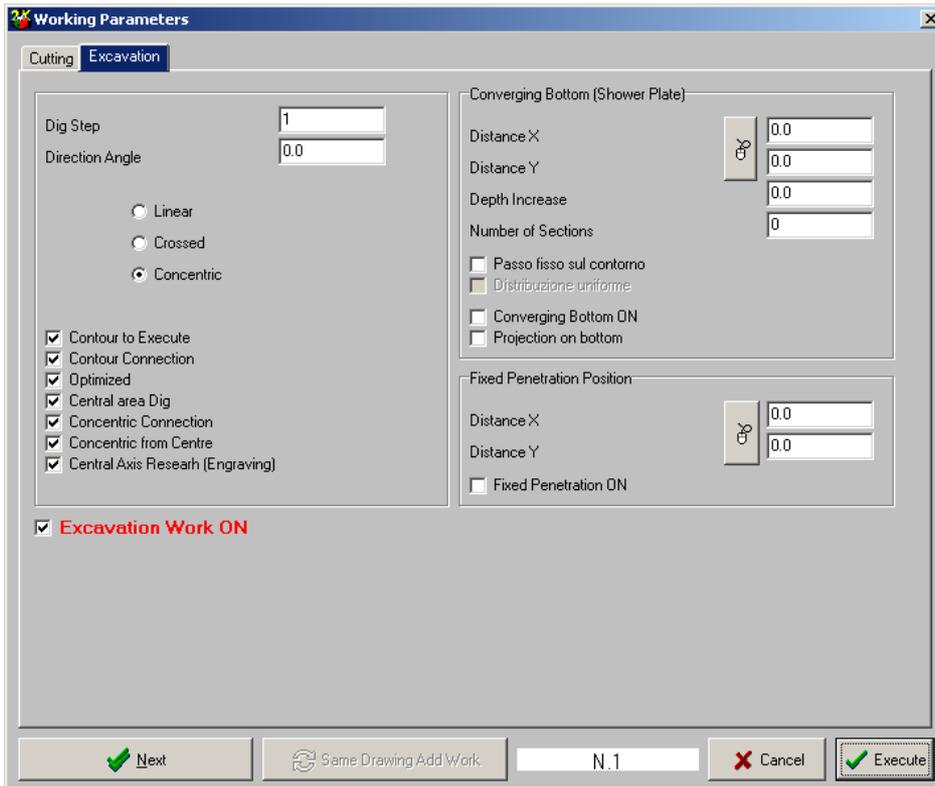
To create the work file: Work→Working→Create Select all lines and press left button

Cuttings:



- To select and to insert:
- Right
 - Blocks Decomposition
 - Connected Cuttings
 - Cutting Depth(5)

Excavation:



To select and to insert:

- Dig step(1)
- Concentric
- Contour to Execute
- Contour Connection
- Optimized
- Central Area Dig
- Concentric Connection
- Concentric from Center
- Central Axis Research

- Excavation Work ON

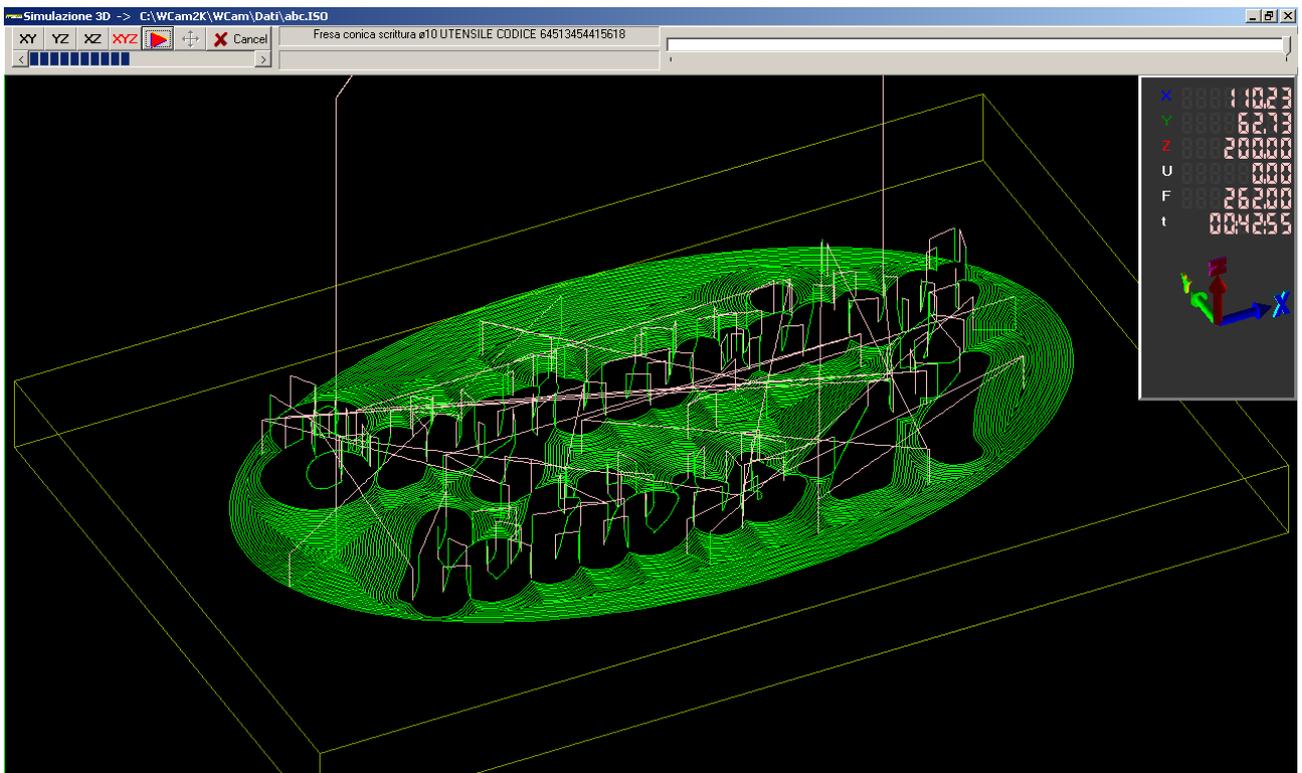
Tool path:



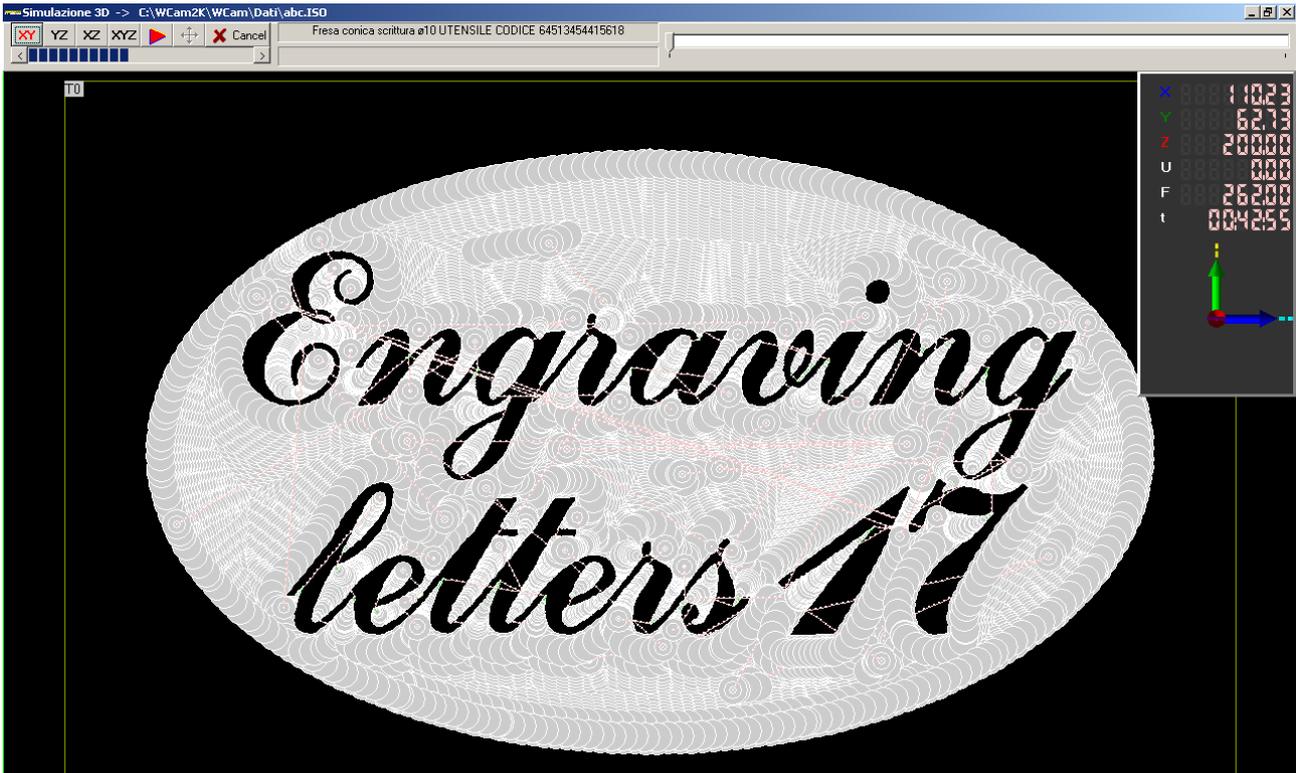
2D Simulation:



3D Simulation:

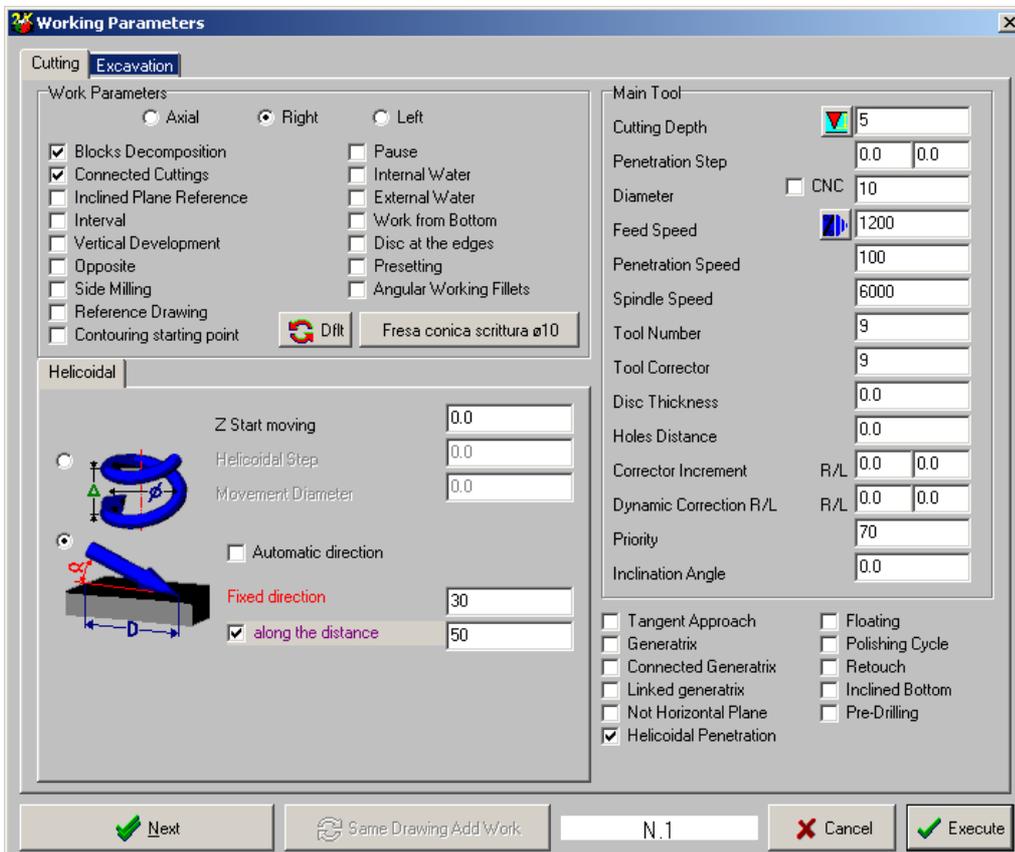


In the XY view is seen the material excavate and the encumbrance of the utensil



6.3.5 Advanced Penetration

Activating the menu Helicoidal Penetration is possible to select the command to penetrate in the material with a certain angle rather than perpendicular



If you select Automatic Direction the software automatically calculate the angle of penetration in base to the over material measure

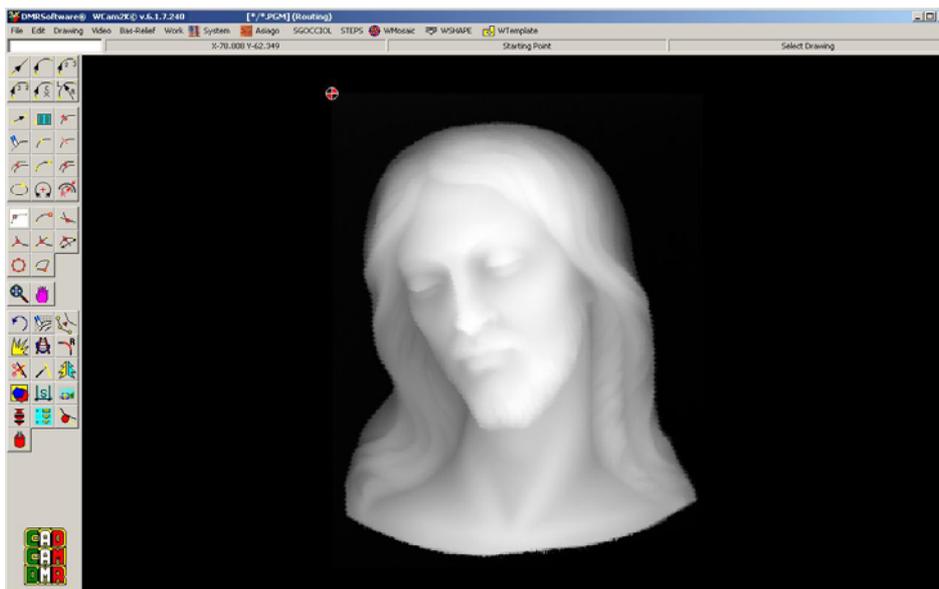
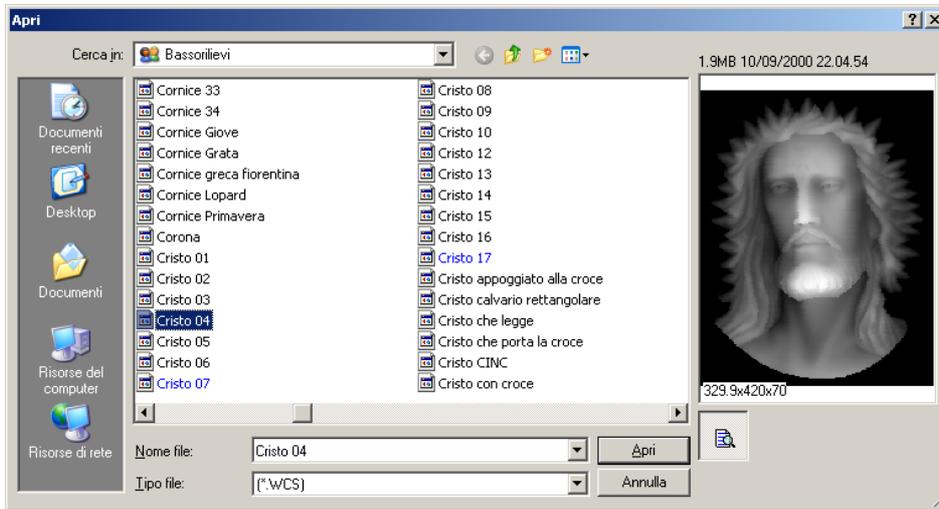
Fixed Direction must be expressed in degrees and it imposes the written angle

Along the distance must be expressed in millimeter and it imposes the approach distance

6.4 Bass-Relief

WCam has the possibility to engrave models of bas-reliefs.

Bass-Relief → Load WCam Format

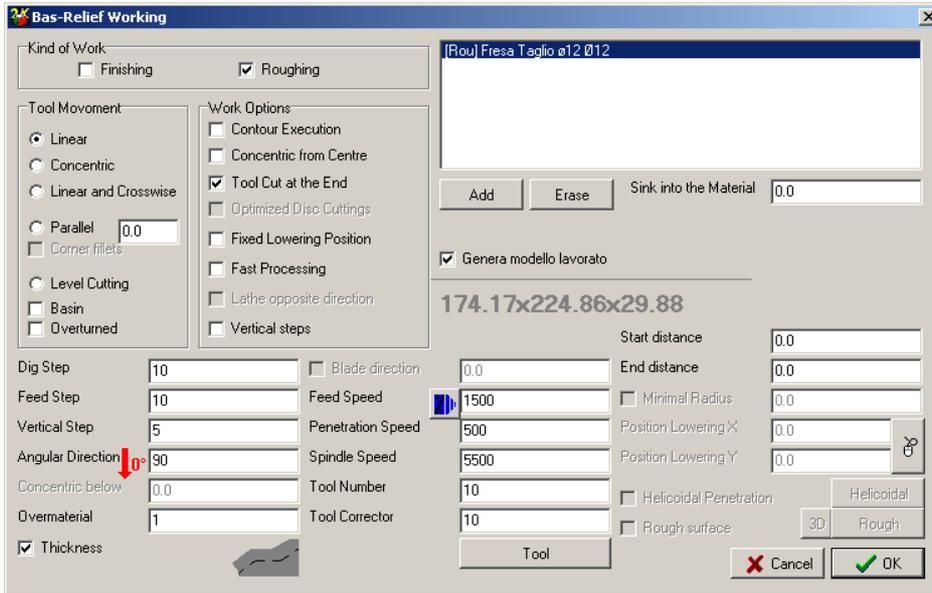


Rendering of the model:



Bass-Relief → Contour Rectangle to determine the zone of job. And is possible to manually build the work area.

Bass-Relief → Surface Work select the area and to press right button:



For the roughing:

To select and to insert:

Kind of work:

Roughing

Tool movement:

Linear

Work Option:

Tool cut at the end

Dig step(10)

Feed step(10)

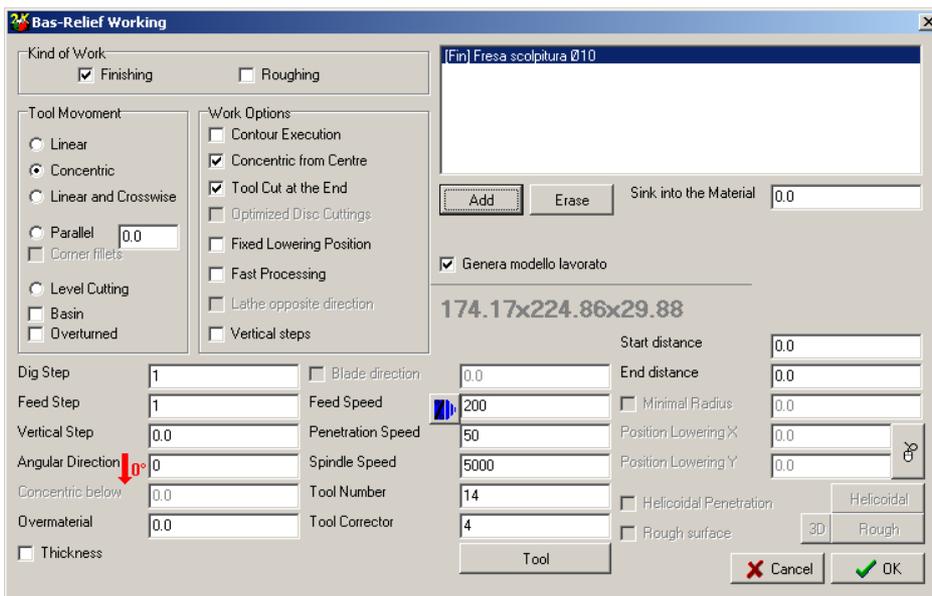
Vertical step(5)

Angular direction(90°)

Overmaterial(1)

Thickness

To select the tool in the tool store and press Add and Ok.



For the finishing:

To select and to insert:

Kind of work:

Finishing

Tool movement:

Concentric

Work Option:

Tool cut at the end

Concentric from the center

Dig step(1)

Feed step(1)

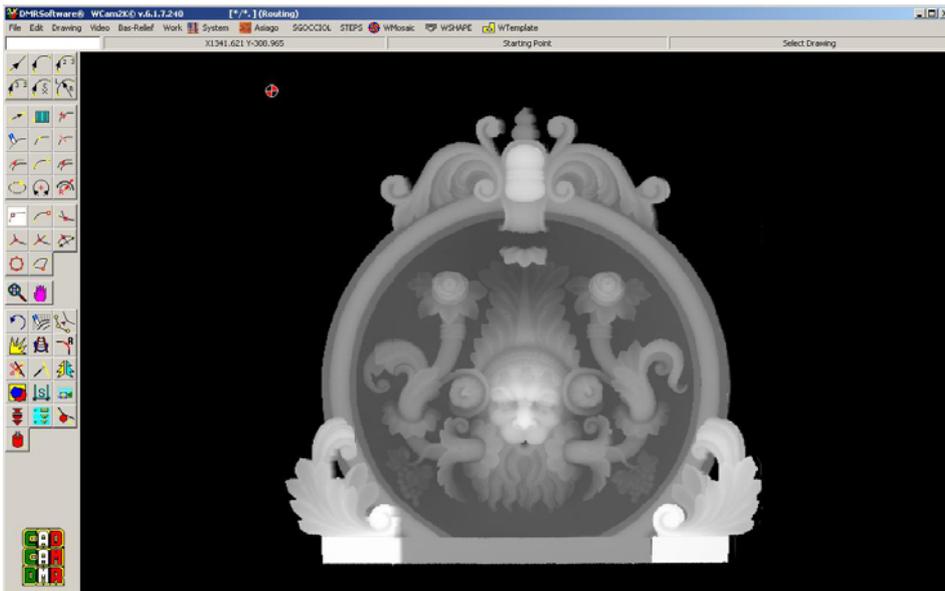
Angular direction(0°)

To select the tool in the tool store and press Add and Ok.

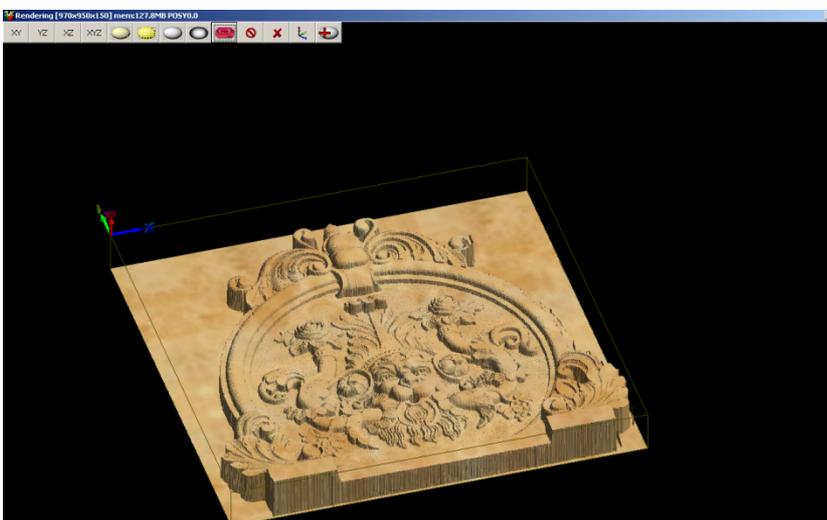
6.5 Scanning and realization fountain



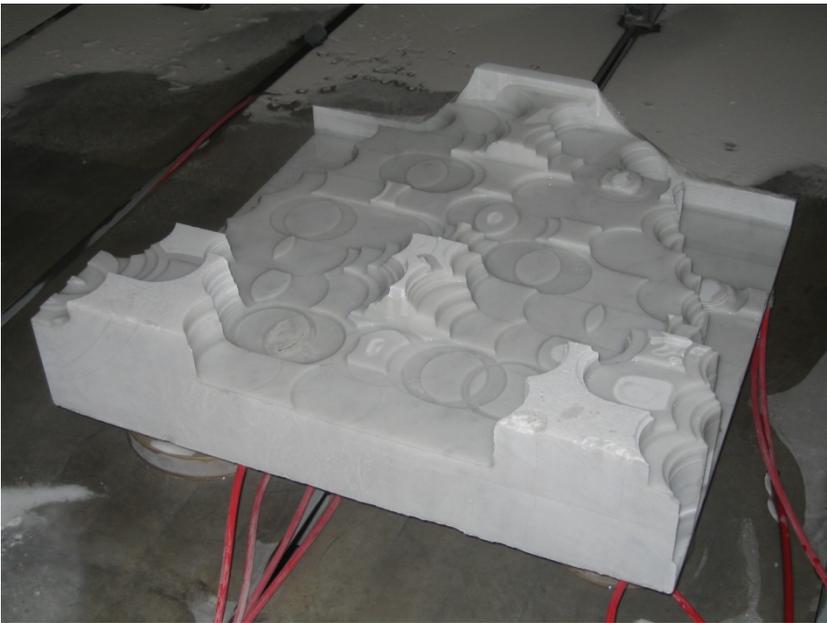
The scanning of the bas-relief has directly been made through laser sensor connected to the car and software WLaser



The file created by the scanning has loaded in WCam2K and he has been modified to the wanted dimensions



Rendering



First roughing



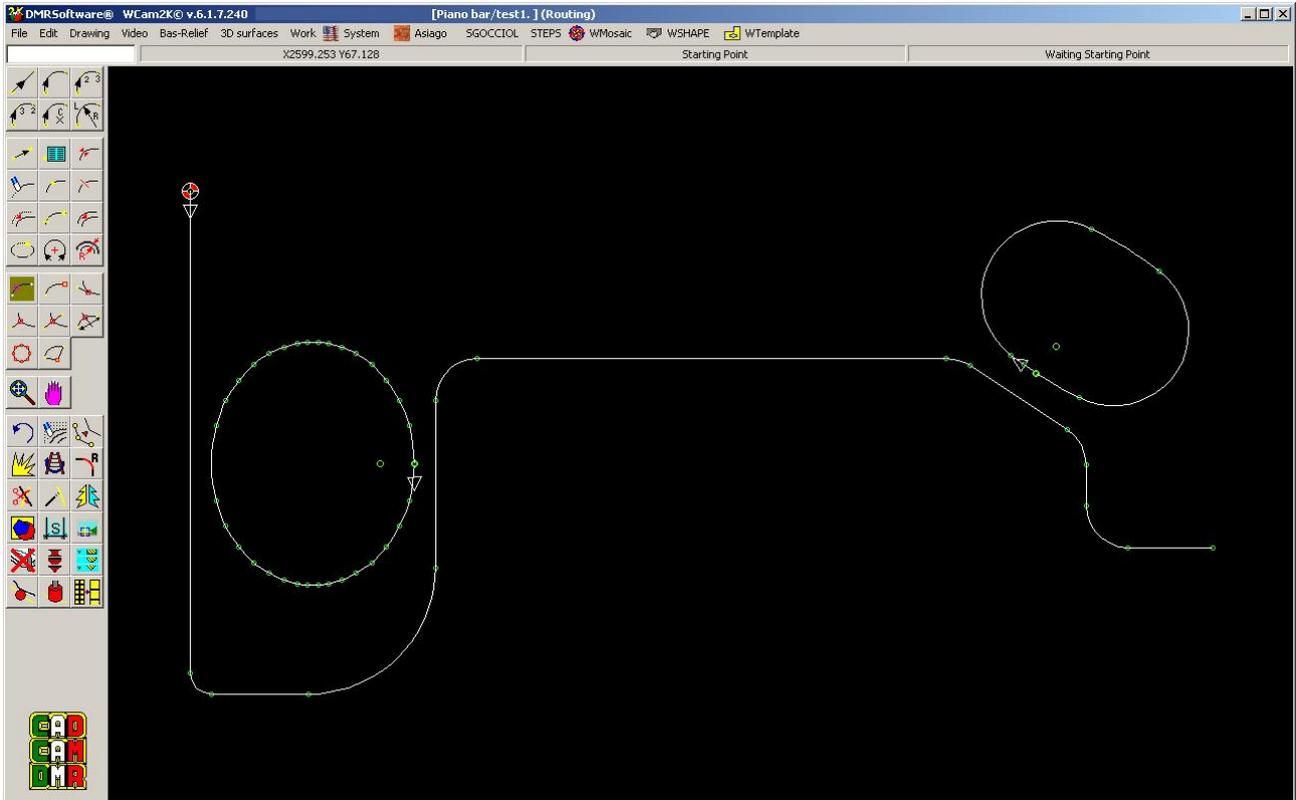
Second roughing



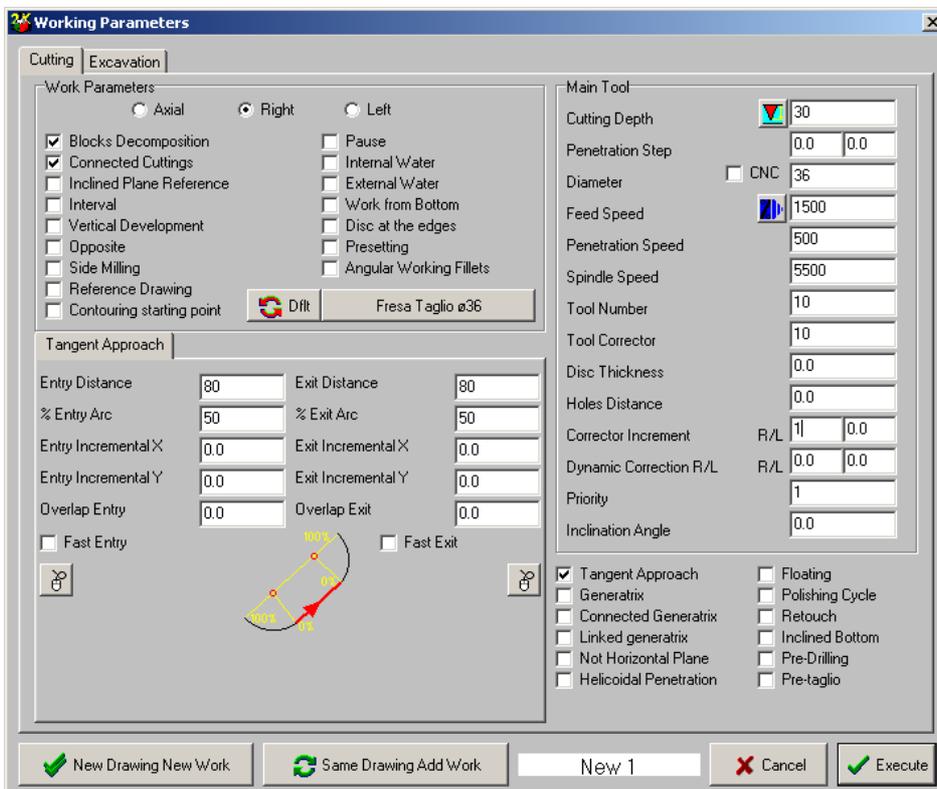
Finishing

6.6 Cut of kitchen's plan

We want to cut a plan for kitchen using a series of tools to perform the contour shaped of the sides increasing the correction on the ray to reach the correct measure of the plan.



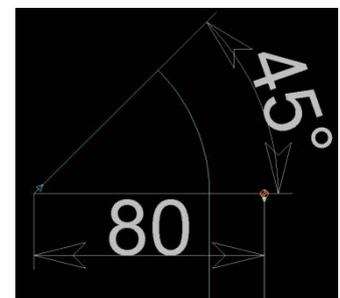
To create the work file: Work→Working→Create Select all lines and press left button and select the side then press right button after this screen appears:

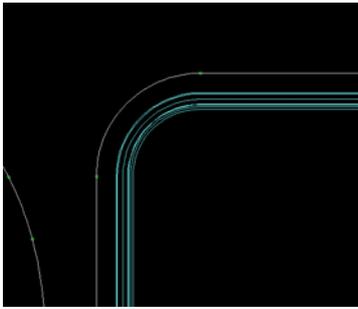


side then press right button after this screen appears:

To select and to insert:

- Right
- Blocks Decomposition
- Connected Cuttings
- Cutting Depth
- Tangent approach





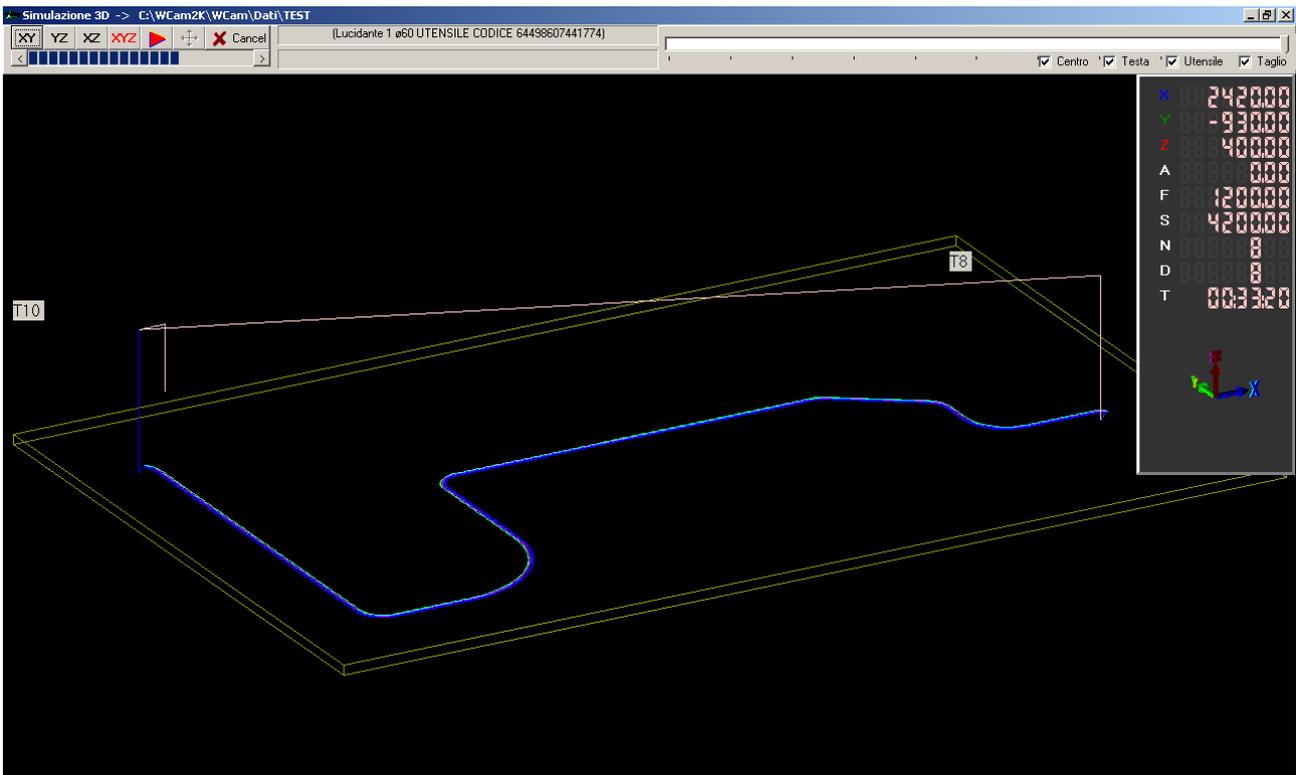
I have inserted other 6 utensils 3 to shape the side and others 3 to polish increasing the correction to reach the wanted measure of the plan.

In figure he notices the run of every utensil compensated respect the measure of the ray

Work list:

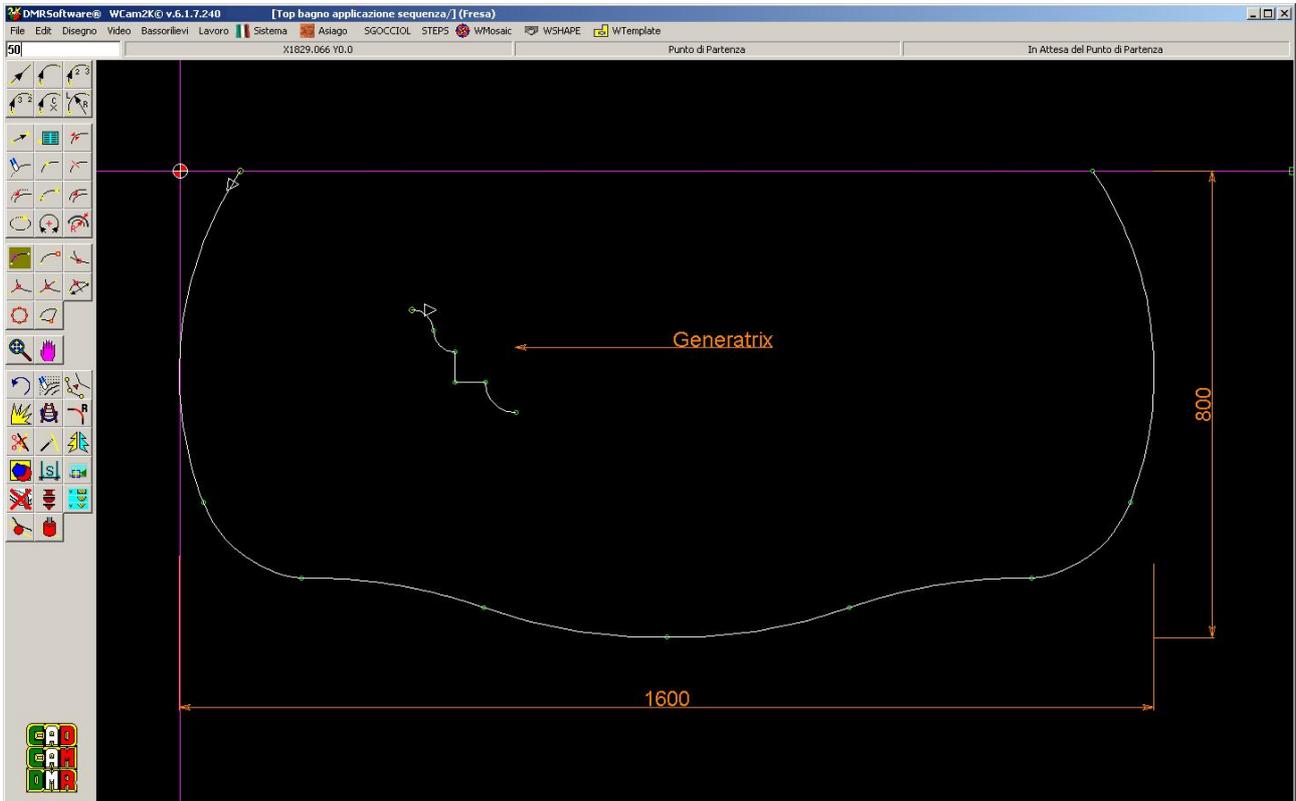
Description	Number	Corrector	Diameter	Lowering Speed	Feed Speed	Spindle Speed	Priority	Depth	Incremento	Usura Utensil	n
Fresa Taglio ø36	10	10 (>)	36	500	1,500	5,500	1	30	1/0.0	0.0/0.0	1
Toro1 30 ø60	1	1 (>)	60	600	1,200	4,200	31	30	0.6/0.0	0.0/0.0	2
Toro2 30 ø50	2	2 (>)	50	600	1,200	4,200	31	30	0.3/0.0	0.0/0.0	3
Toro3 30 ø40	4	4 (>)	40	600	1,200	4,200	31	30	0.1/0.0	0.0/0.0	4
Lucidante 1 ø60	8	8 (>)	60	600	1,200	4,200	90	30	0.1/0.0	0.0/0.0	5
Lucidante 2 ø65	8	8 (>)	65	600	1,200	4,200	91	30	0.0/0.0	0.0/0.0	6
Lucidante 3 ø70	8	8 (>)	70	600	1,200	4,200	92	30	0.0/0.0	0.0/0.0	7

3D simulation:



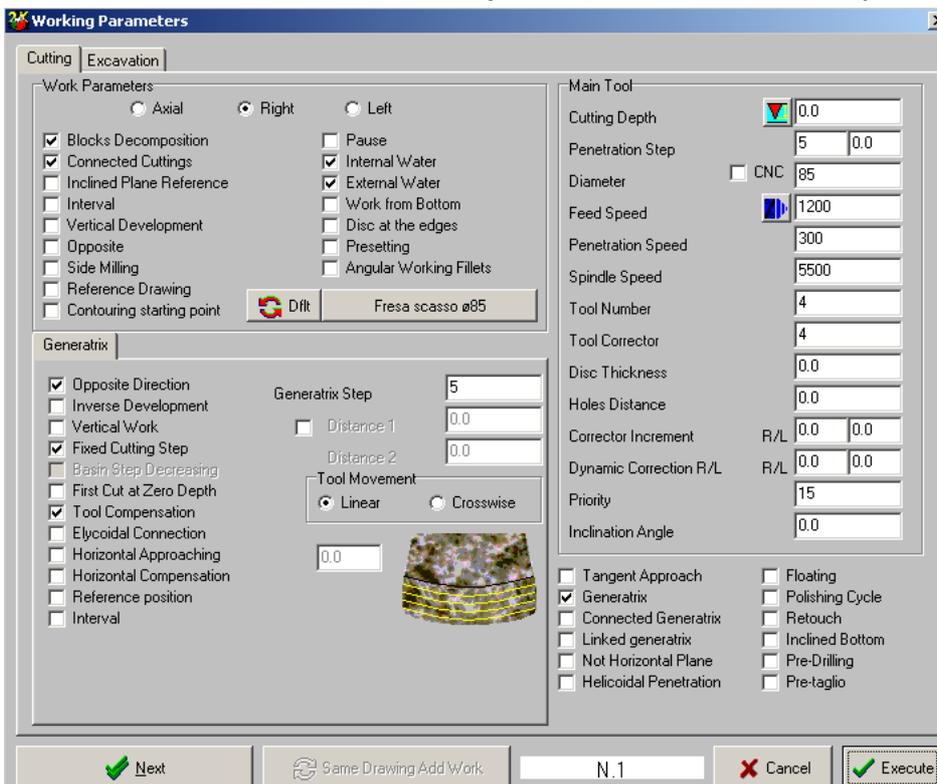
6.7 Use of generatrix

We want to create a profile with generatrix, it's important to draw the profile in a point precise respect the origin while the generatrix can be drawn anywhere.



For the roughing:

To create the work file: Work → Working → Create Select all lines and press left button and select the side then press right button after this screen appears:

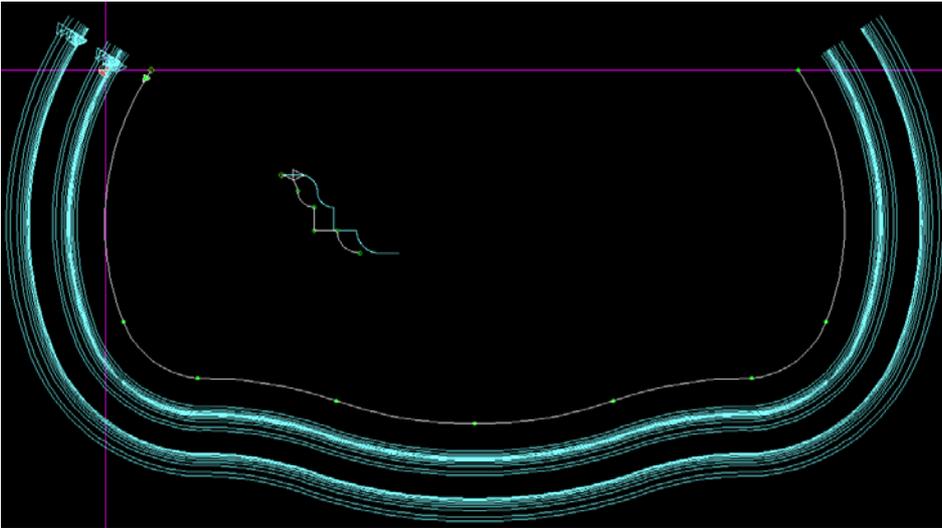


side then press right button after this screen appears:

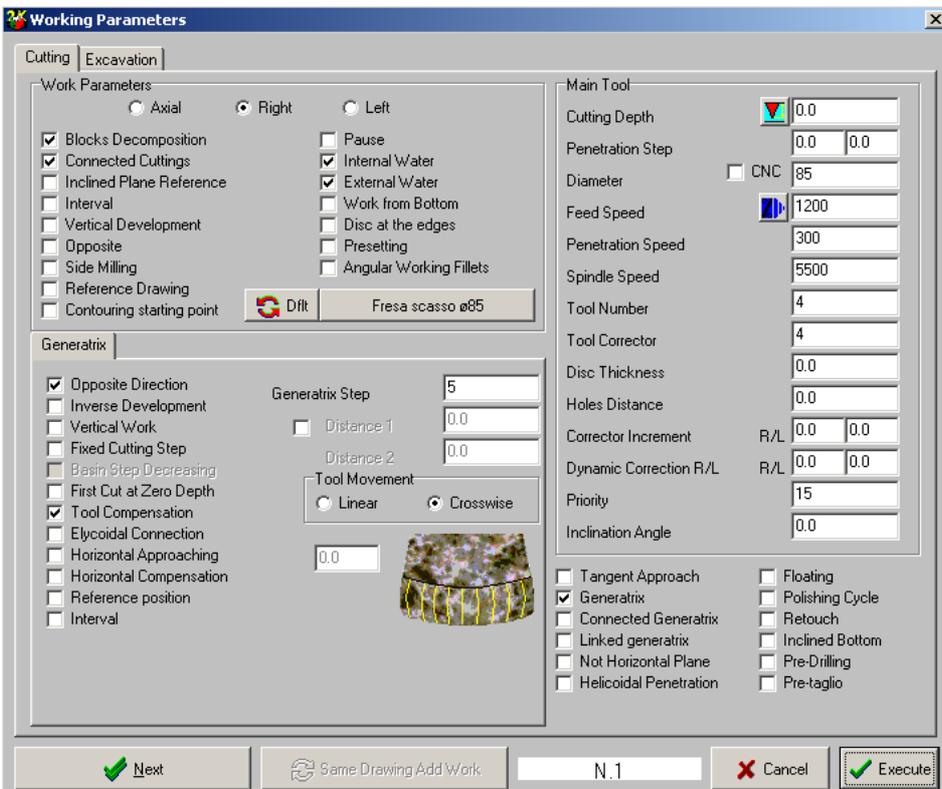
- To select and to insert:
- Right
 - Blocks Decomposition
 - Connected Cuttings
 - Penetration Step
- Generatrix
- Opposite Direction
 - Fixed Cuttings Step
 - Generatrix Step (5)
 - Tool Compensation

Tool Movement

- Linear



For the finishing:



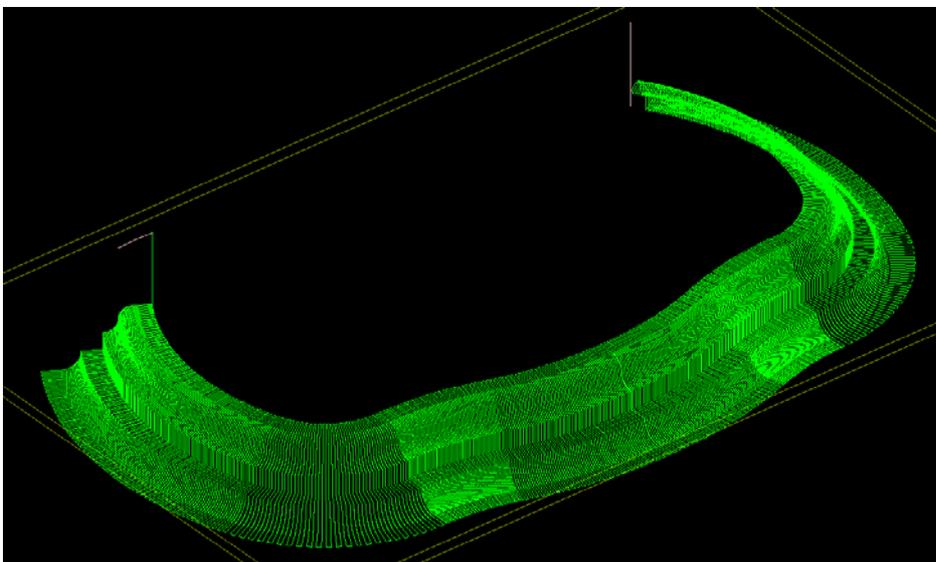
For the finishing:

To select and to insert:

- Right
- Blocks Decomposition
- Connected Cuttings
- Penetration Step
- Generatrix
- Opposite Direction
- Generatrix Step (5)
- Tool Compensation

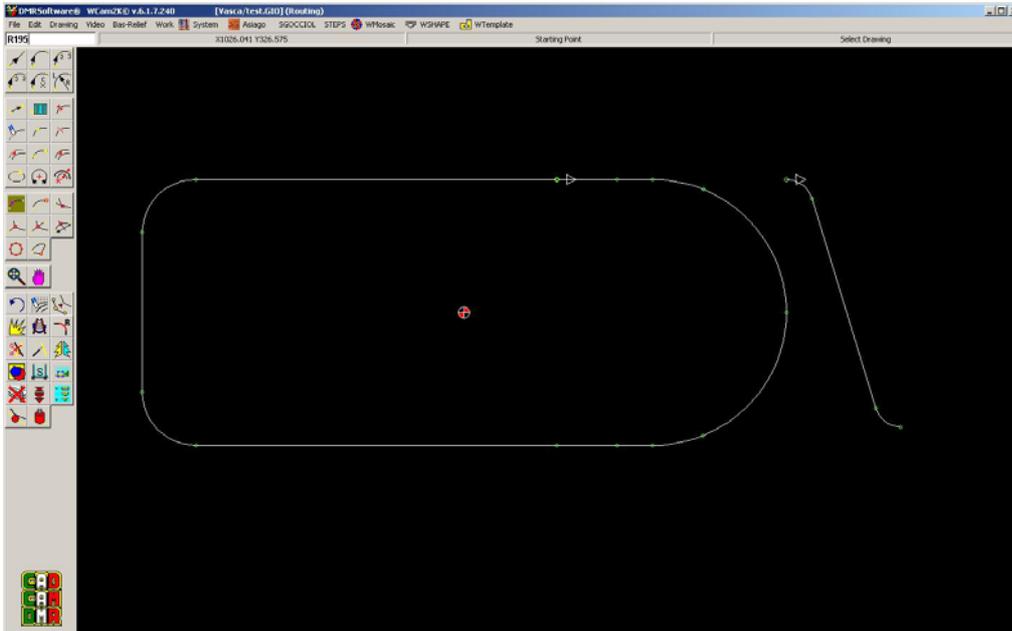
Tool Movement

- Crosswise

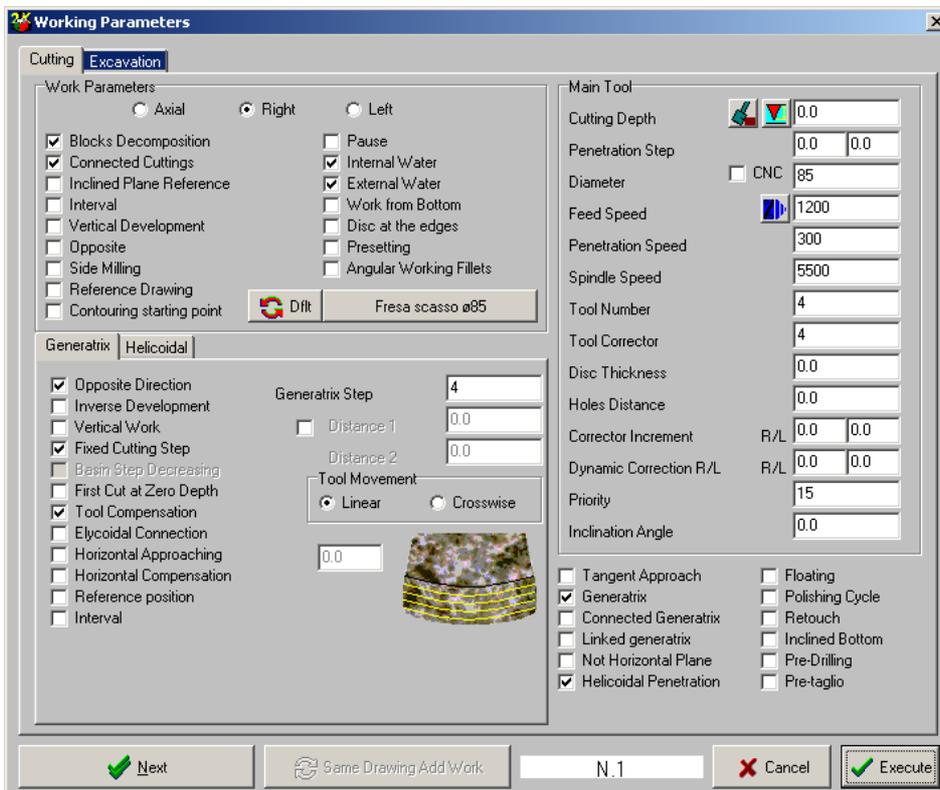


6.8 Basin with generatrix

We want to realize a basin:



To create the work file: Work→Working→Create Select all lines and press left button and select the side then press right button after this screen appears:

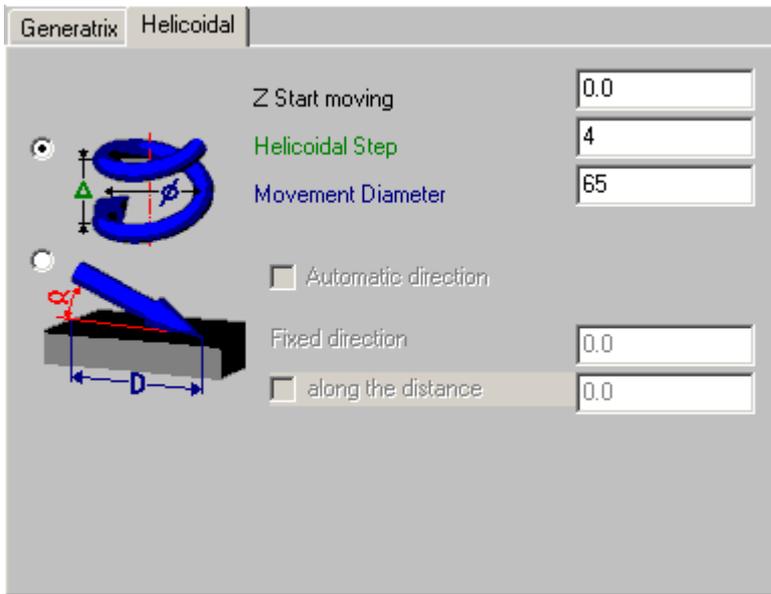


To select and to insert:

- Right
- Blocks Decomposition
- Connected Cuttings
- Generatrix
- Opposite Direction
- Generatrix Step (5)
- Tool Compensation

Tool Movement

- Linear

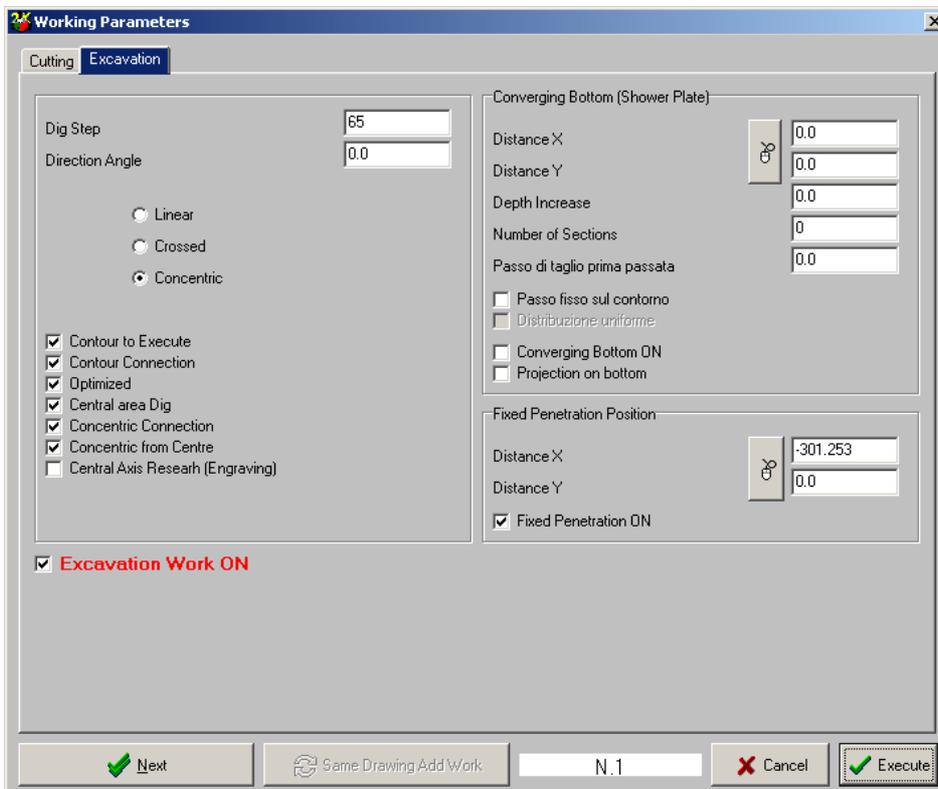


Activating the menu Helicoidal Penetration is possible to select the command to penetrate in the material with a certain angle rather than perpendicular.

- To select and to insert:
- Right
 - Blocks Decomposition
 - Connected Cuttings
 - Cutting Depth(5)

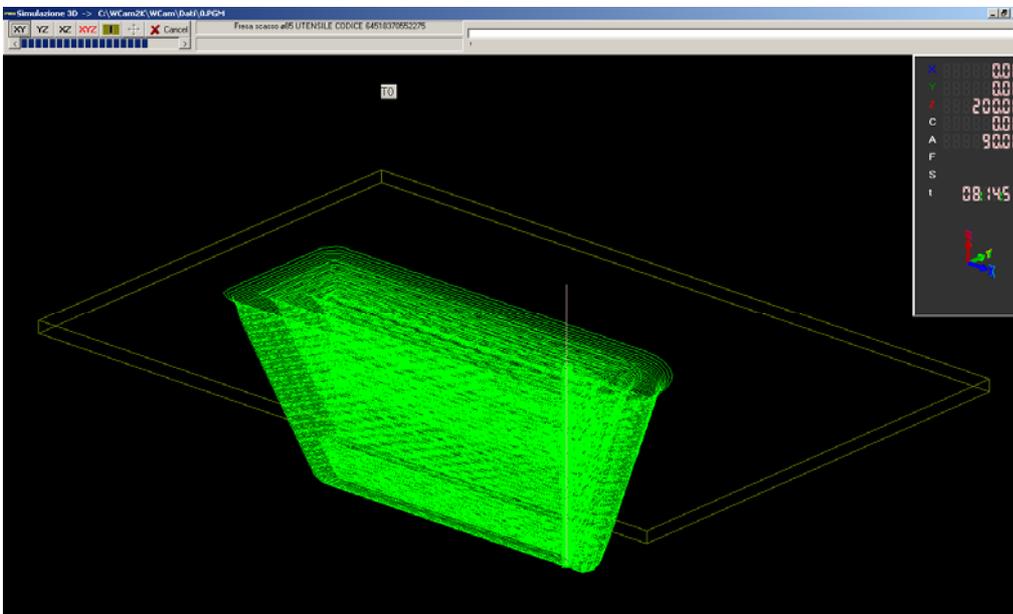
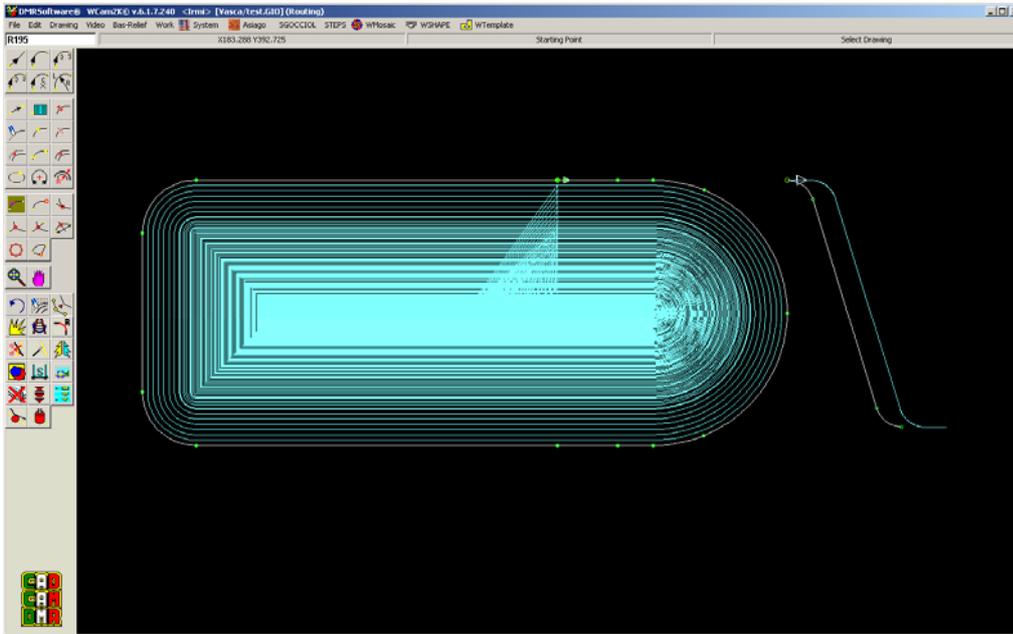
Advanced Penetration:

- Fixed Direction(30)
- Along the Distance(50)



To select and to insert:

- Dig step(65)
- Concentric
- Contour to Execute
- Contour Connection
- Optimized
- Central Area Dig
- Concentric Connection
- Concentric from Center
- Excavation Work ON
- Fixed Penetration ON

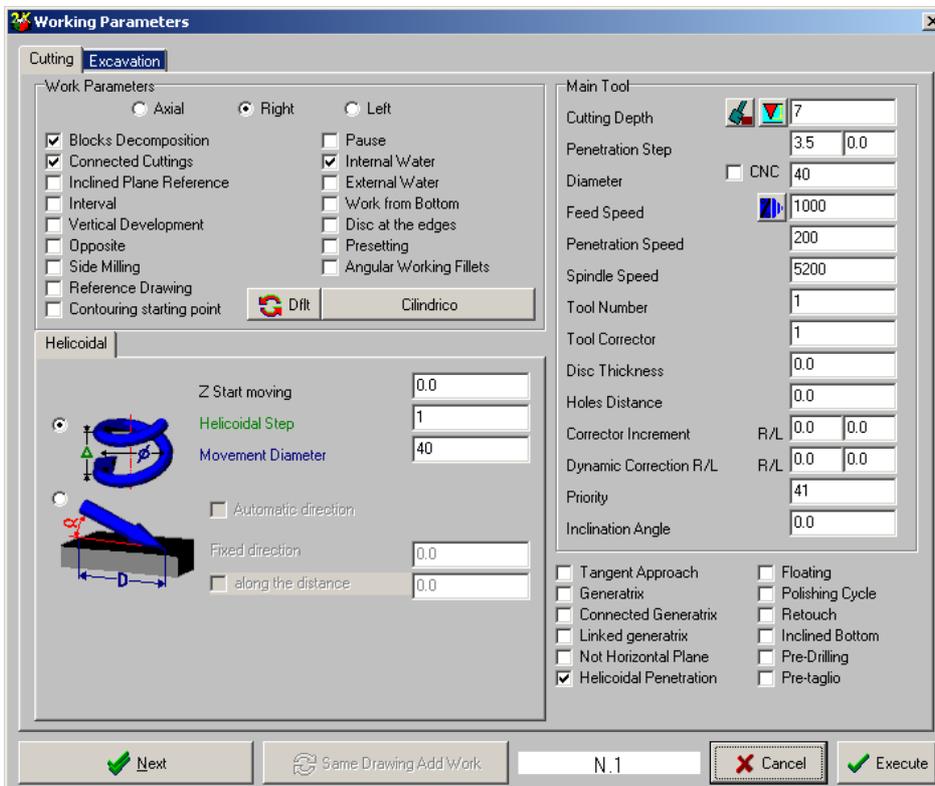


6.9 Shower plate with projection

We have to create a shower plate with a details in reliefs on the bottom of the surface. The bottom will be converging to the hole for the water. The details are directly draw in the plant of shower and we need to draw a generatrix for the details.

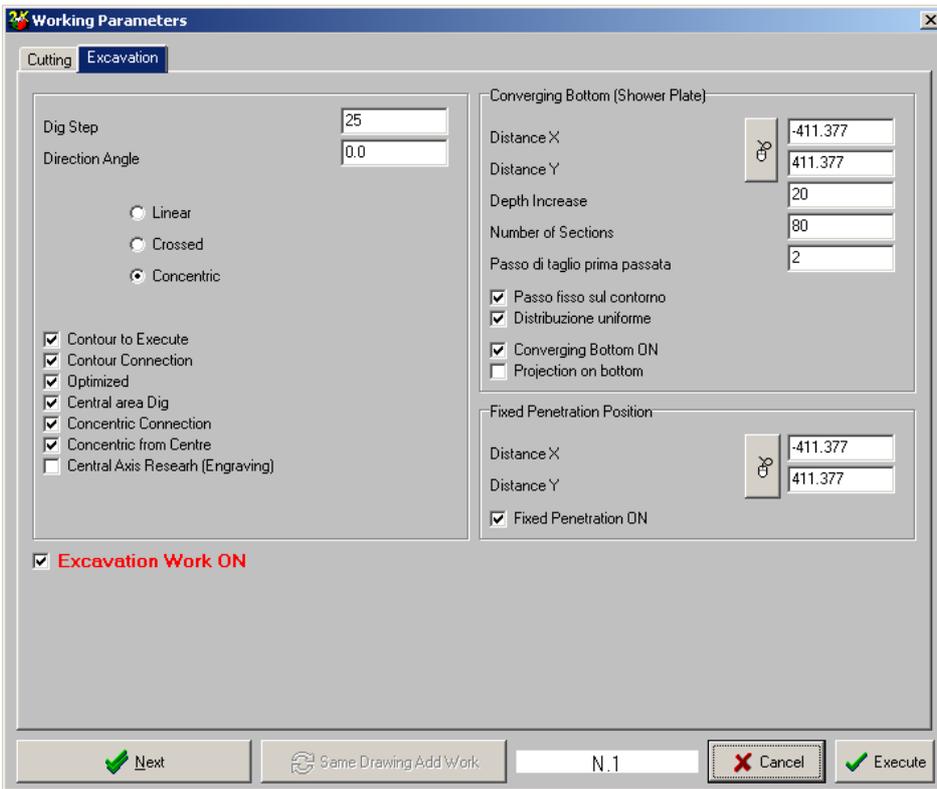


To create the work file: Work→Working→Create Select all lines and press left button and select the side then press right button after this screen appears:



To select and to insert:

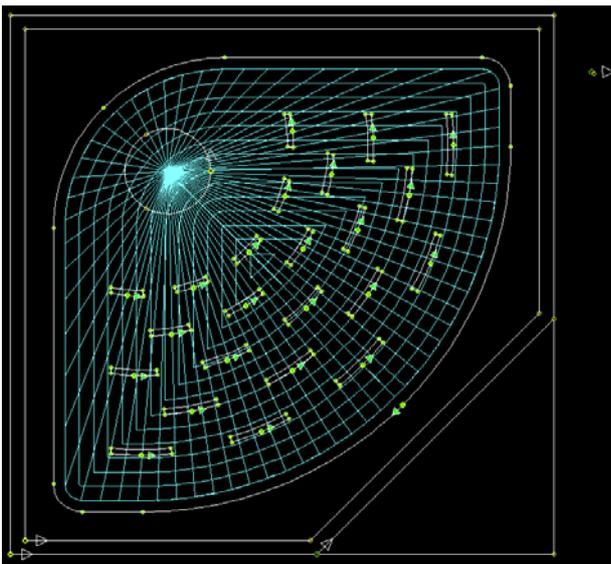
- Right
- Blocks Decomposition
- Connected Cuttings
- Helicoidal Penetration
- Helicoidal step(1)
- Movement
- Diameter(40)
- Cutting Depth(7)
- Penetration step(3.5)



To select and to insert:

- Dig step(25)
- Concentric
- Contour to Execute
- Contour Connection
- Optimized
- Central Area Dig
- Concentric Connection
- Concentric from Center

- Excavation Work ON



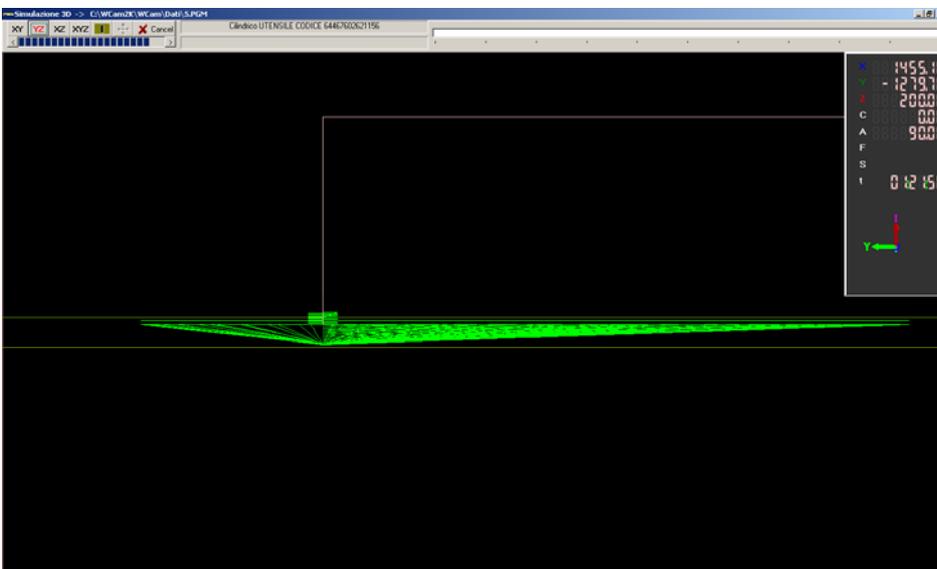
Converging Bottom

- Select the point
- Depth increase(20)

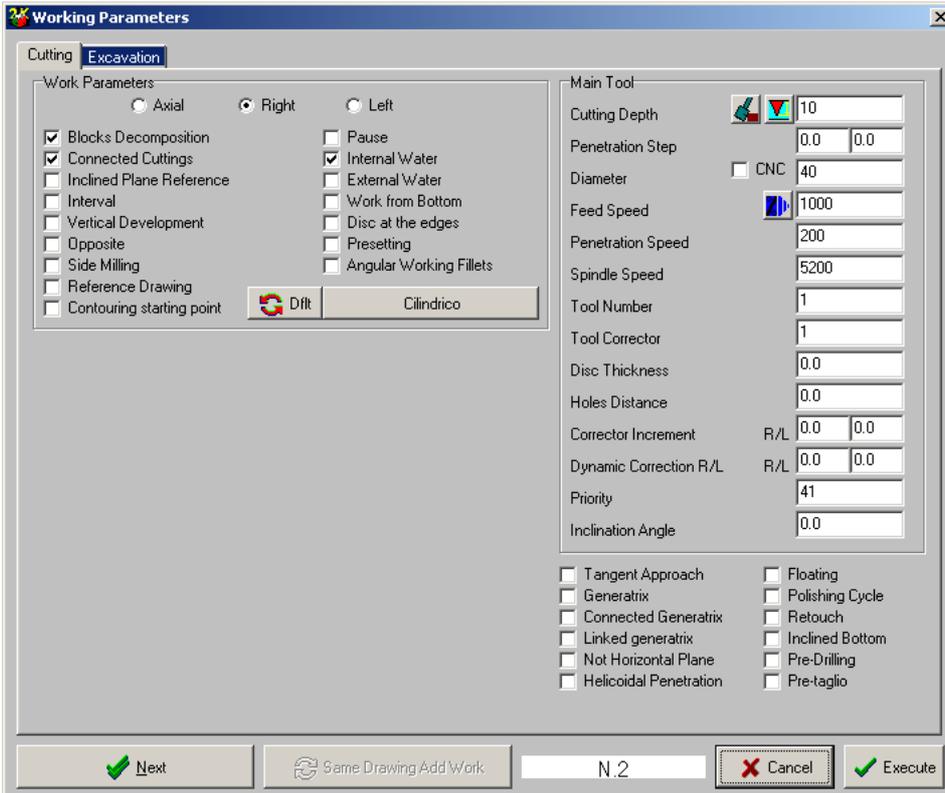
- Number of section(80)
- Cutting Step for the converging bottom(2)

Fixed penetration position

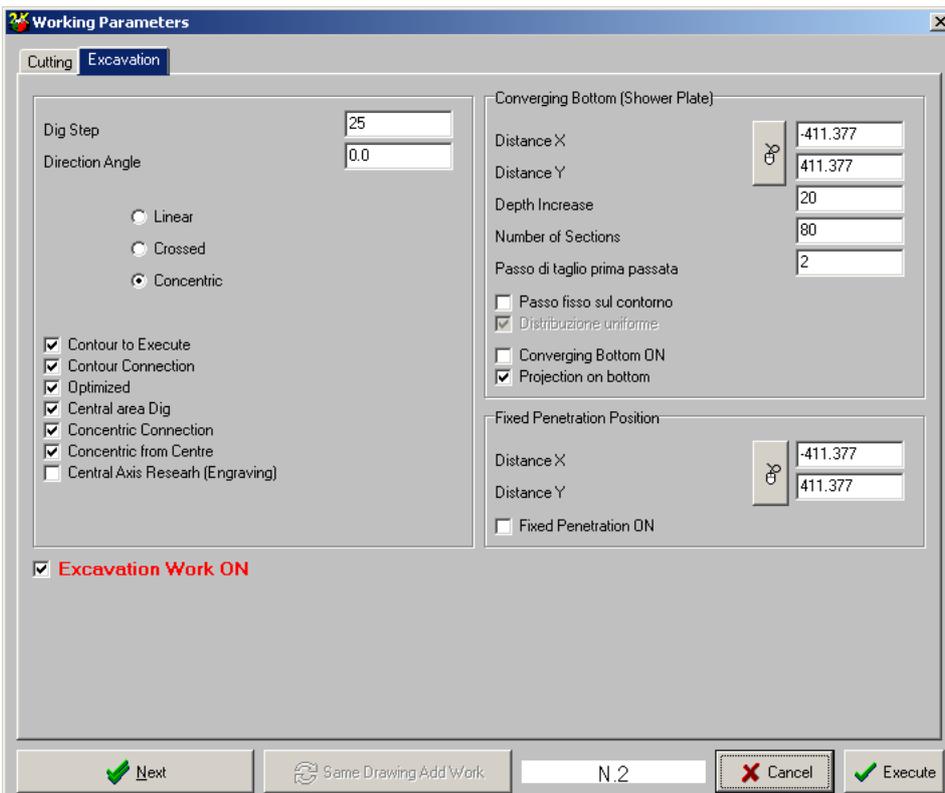
- Select the point
- Fixed Penetration ON



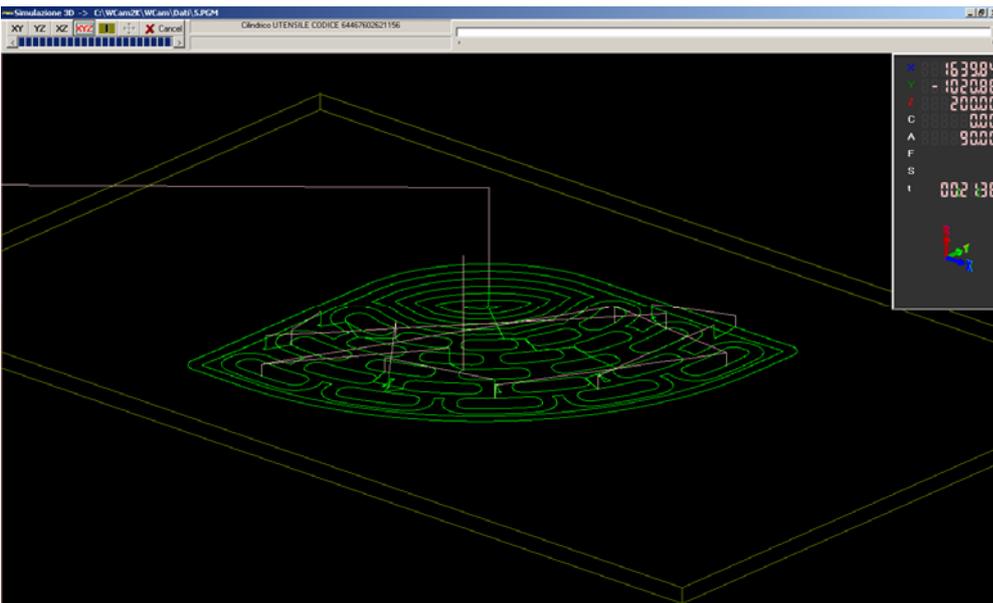
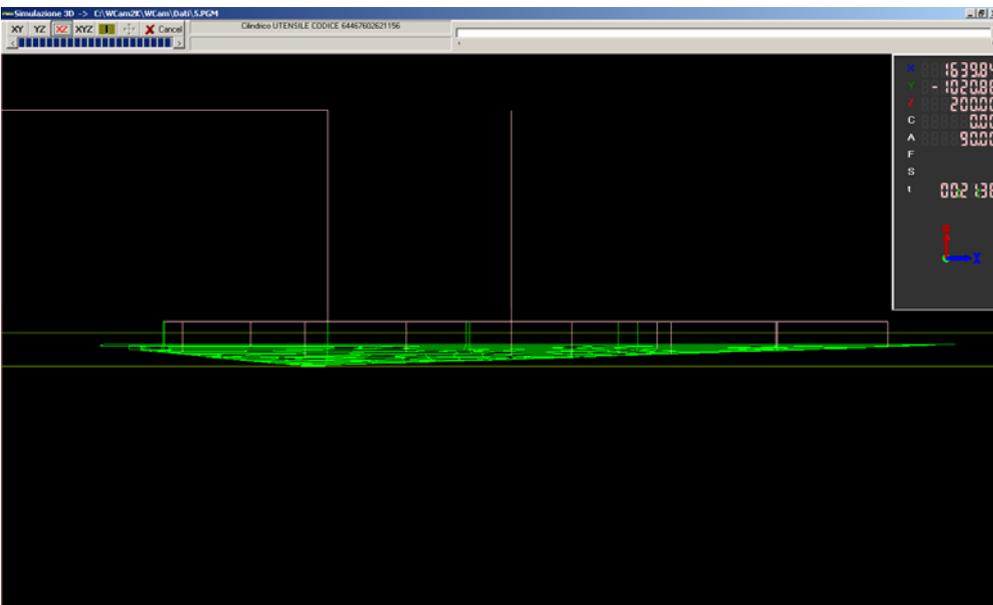
Work→Working→Add Select the shower and the details:



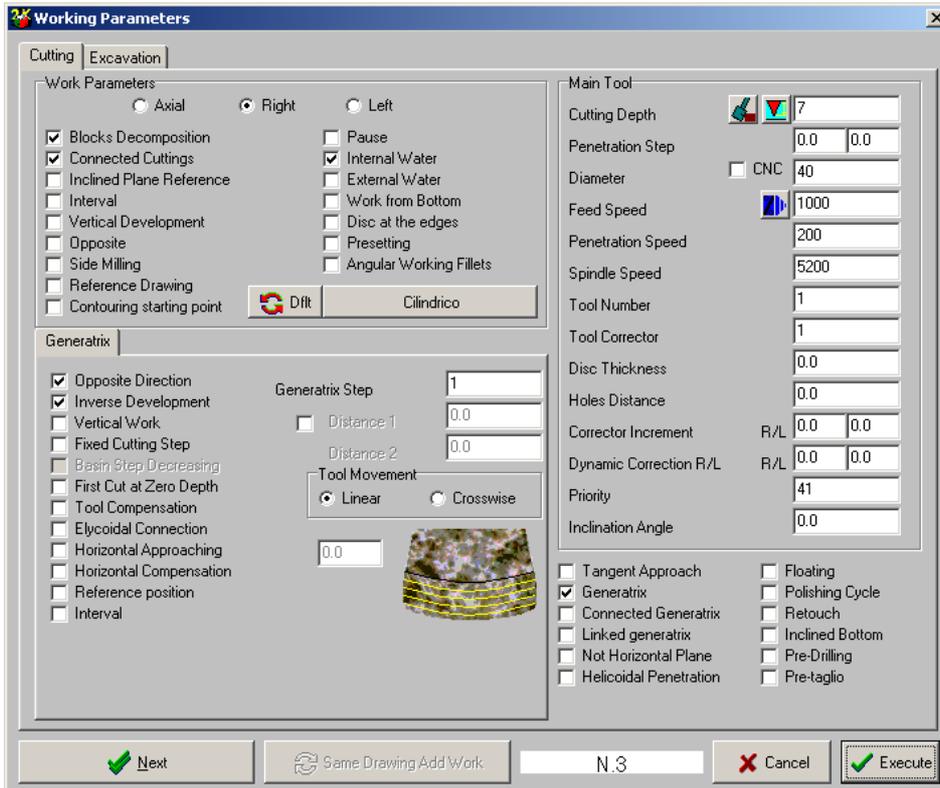
- To select and to insert:
- Right
 - Blocks Decomposition
 - Connected Cuttings
 - Cutting Depth(10)



- To select and to insert:
- Dig step(25)
 - Concentric
 - Contour to Execute
 - Contour Connection
 - Optimized
 - Central Area Dig
 - Concentric Connection
 - Concentric from Center
 - Excavation Work ON
 - Projection on bottom
- Select the Shower



Work→Working→Add Select the the details:



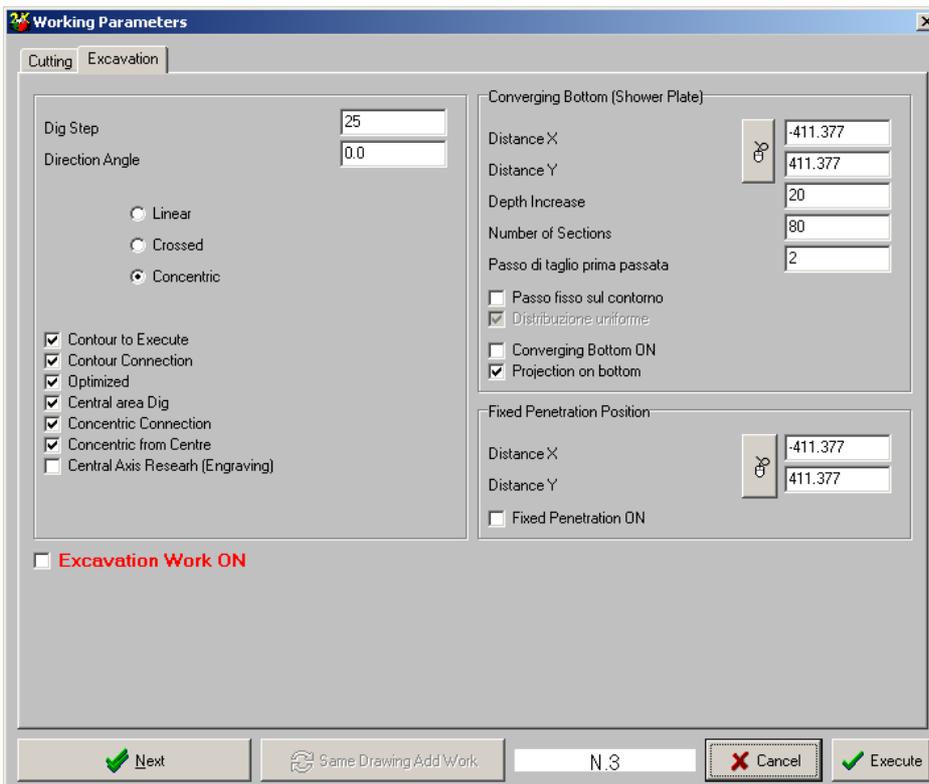
To select and to insert:

- Right
- Blocks Decomposition
- Connected Cuttings
- Generatrix
- Opposite Direction
- Increase development
- Generatrix Step (1)

Tool Movement

- Linear

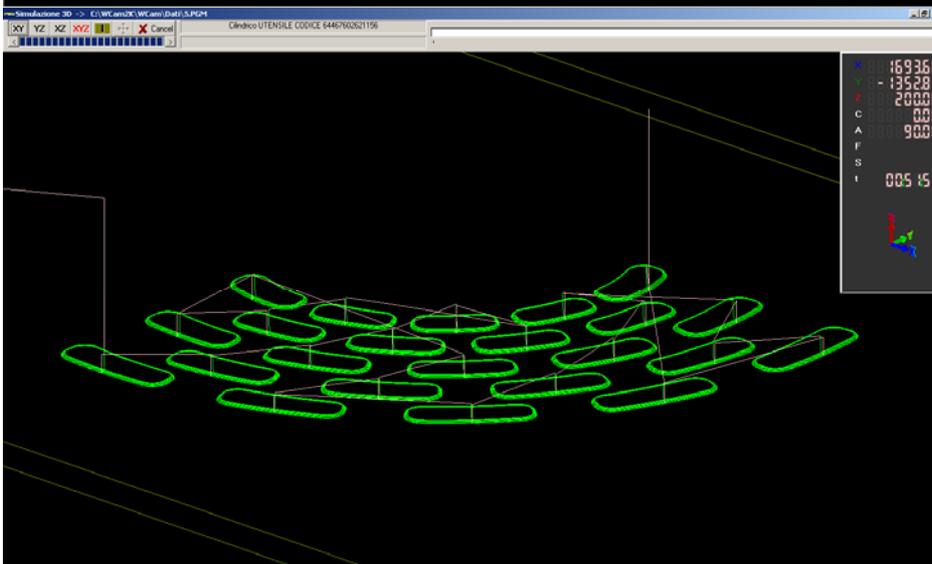
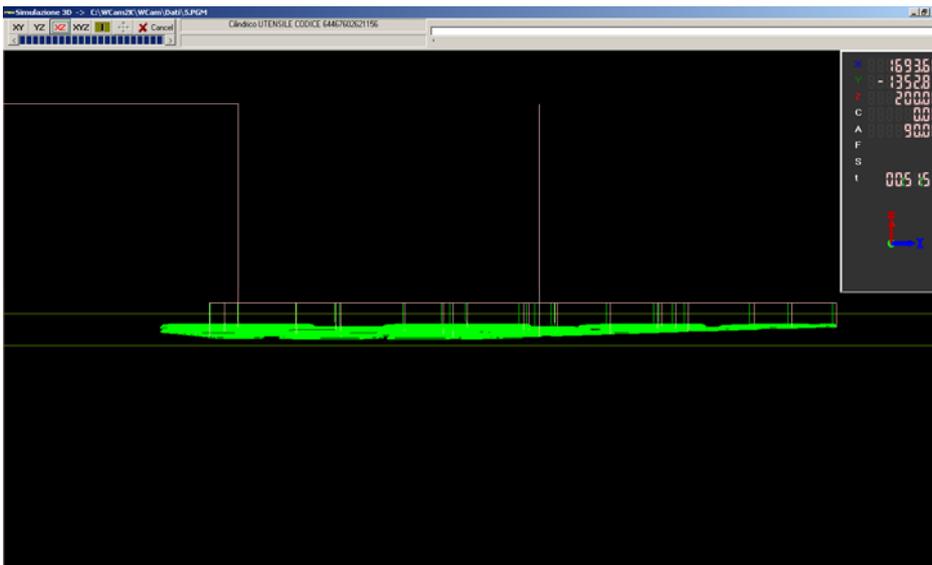
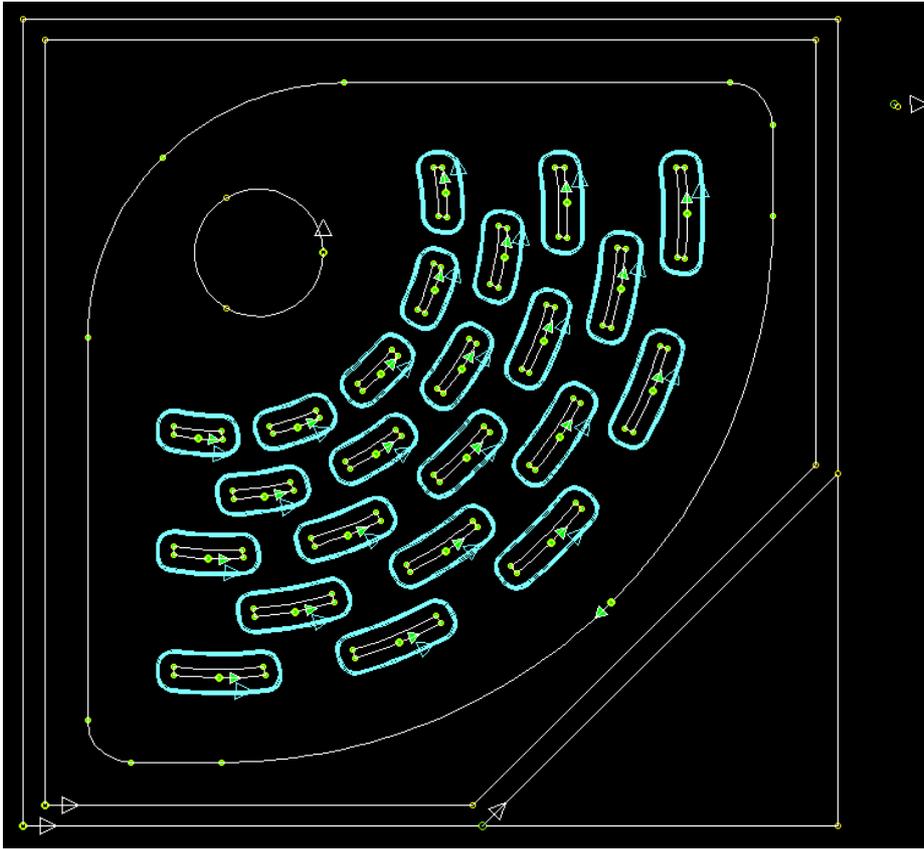
- Cutting depth(7)

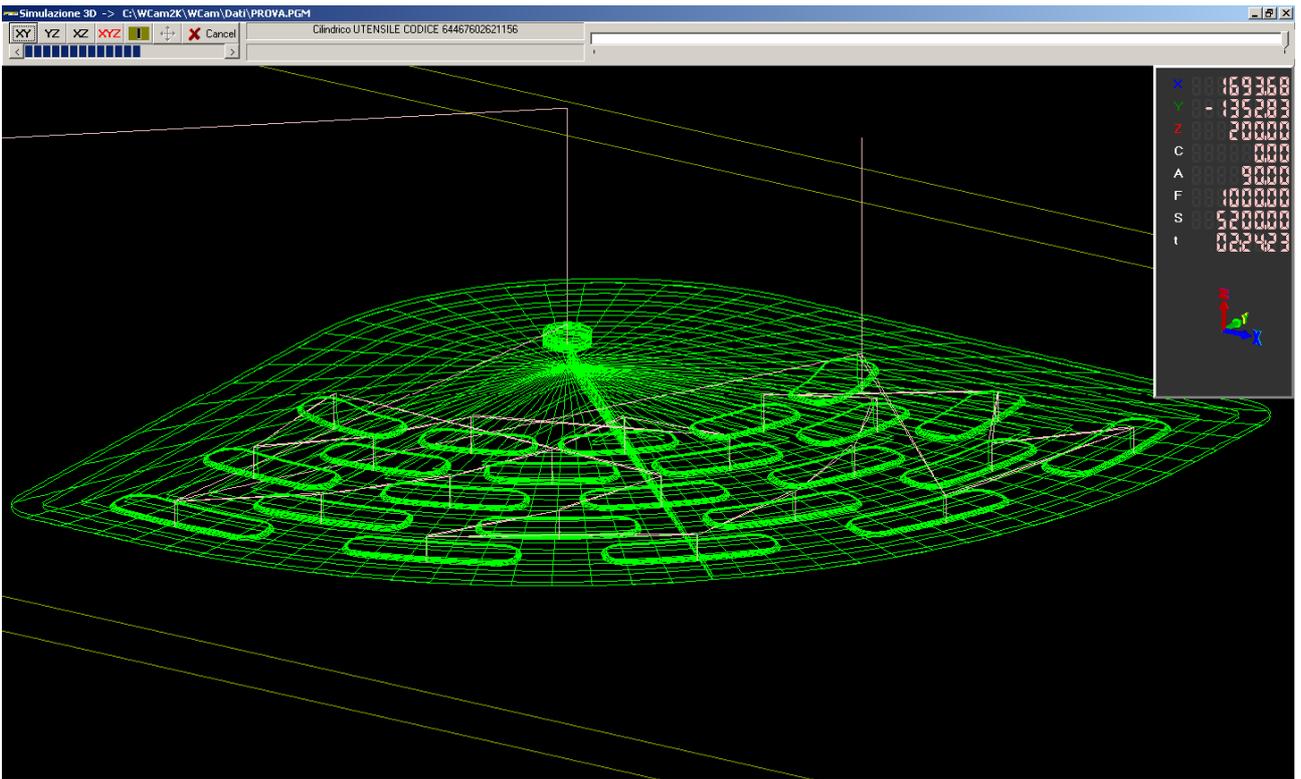
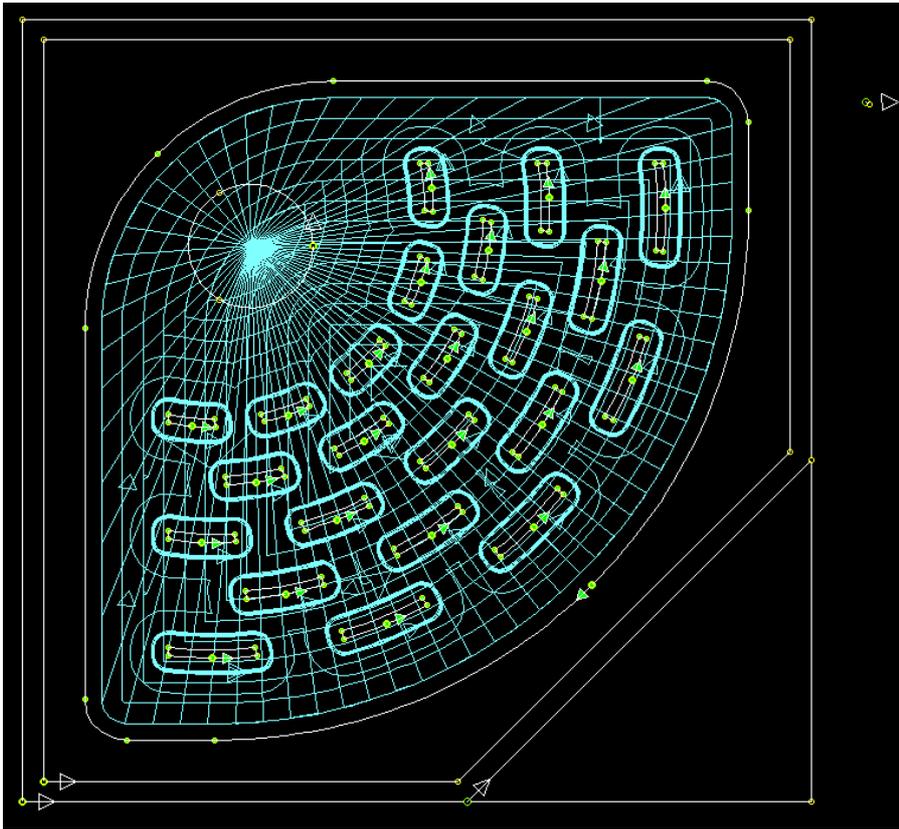


To select and to insert:

- Projection on bottom

Select the Shower



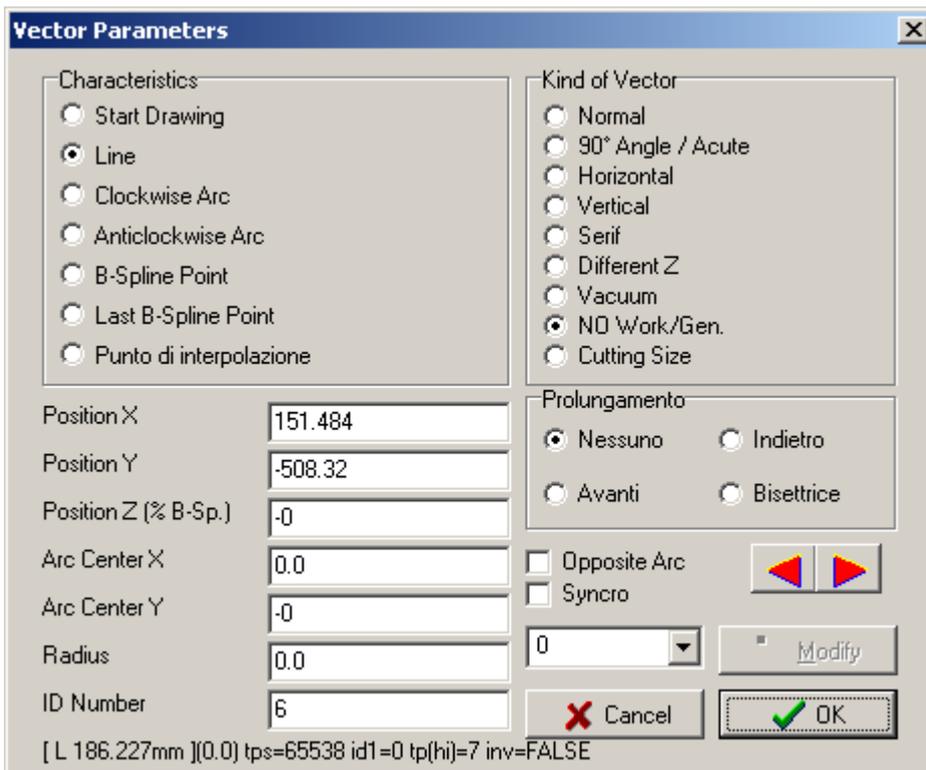


6.10 Connected generatrix

We want to realize a basin with different profile. In WCam2K there is a function, CONNECTED GENERATRIX, that permit to apply different profile to the same base line. The generatrix must be drawn from the point where we want to start the profile, from this point to the other point where is applied the next generatrix is the software that modify the curve for to have in position of the second generatrix his profile.

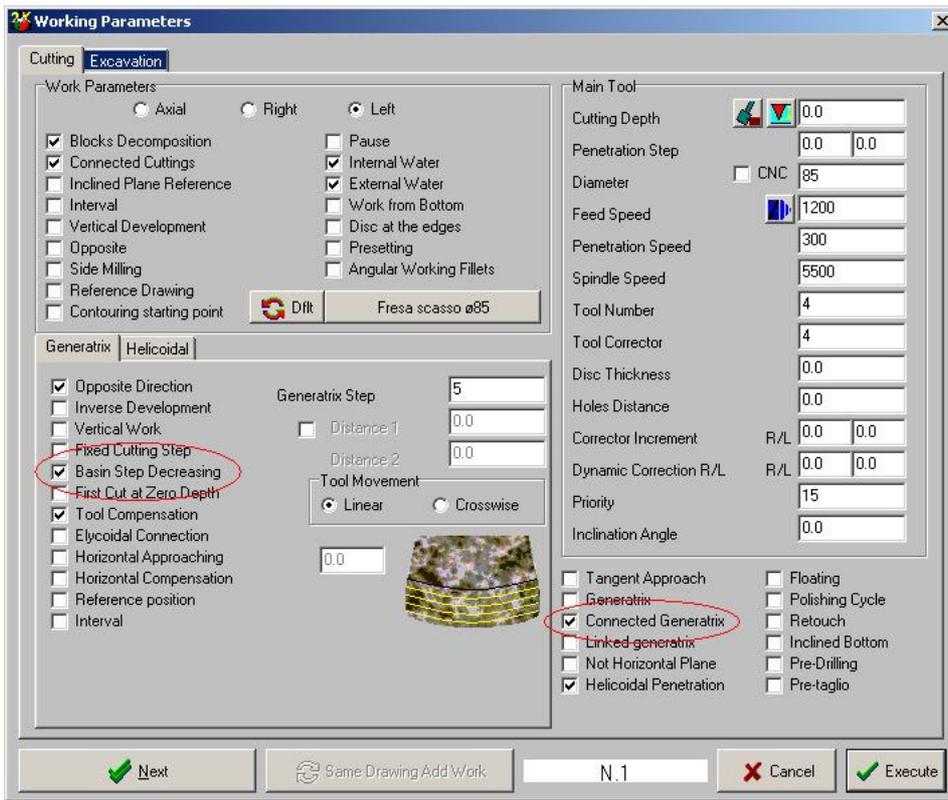


With EDIT VECTOR we must change the proprieties of all generatrix in NO Work/Gen so the color of the lines appears green.

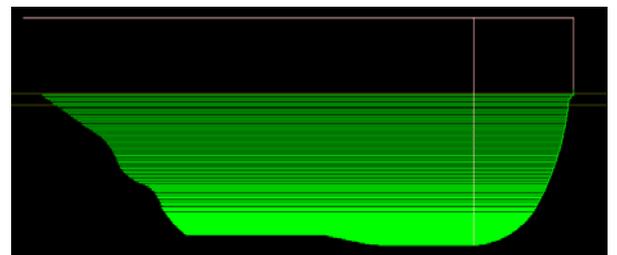
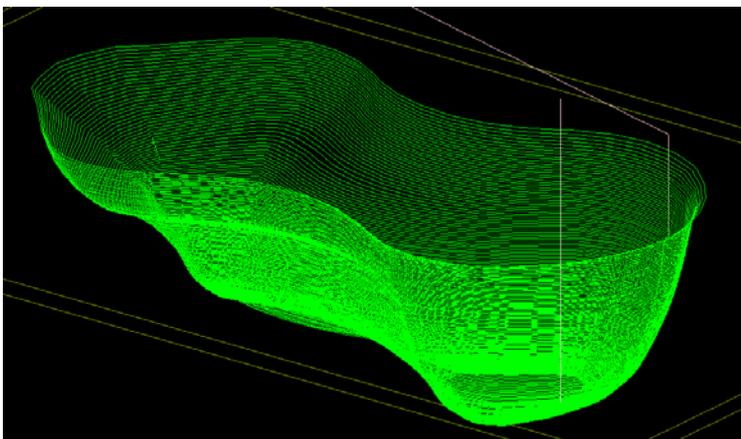
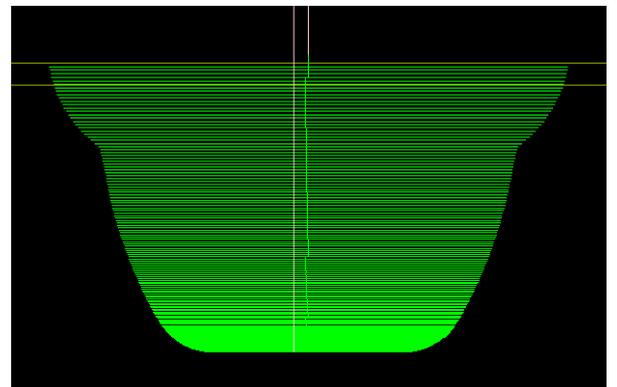
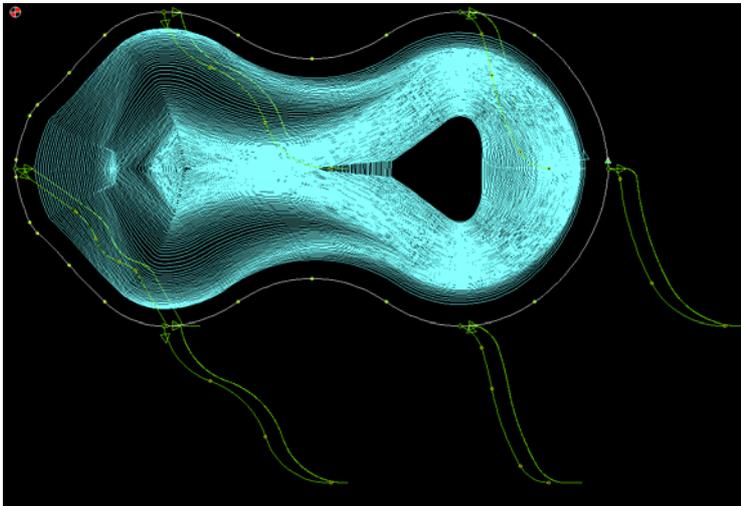


This is important for to make to know to the software the kind of vector; now when we create the work and we apply CONNECTED GENERATRIX in the parameters page, we will not select the generatrix.

To create the work file: Work→Working→Create Select the base lines with left button and press right button, this screen appears:

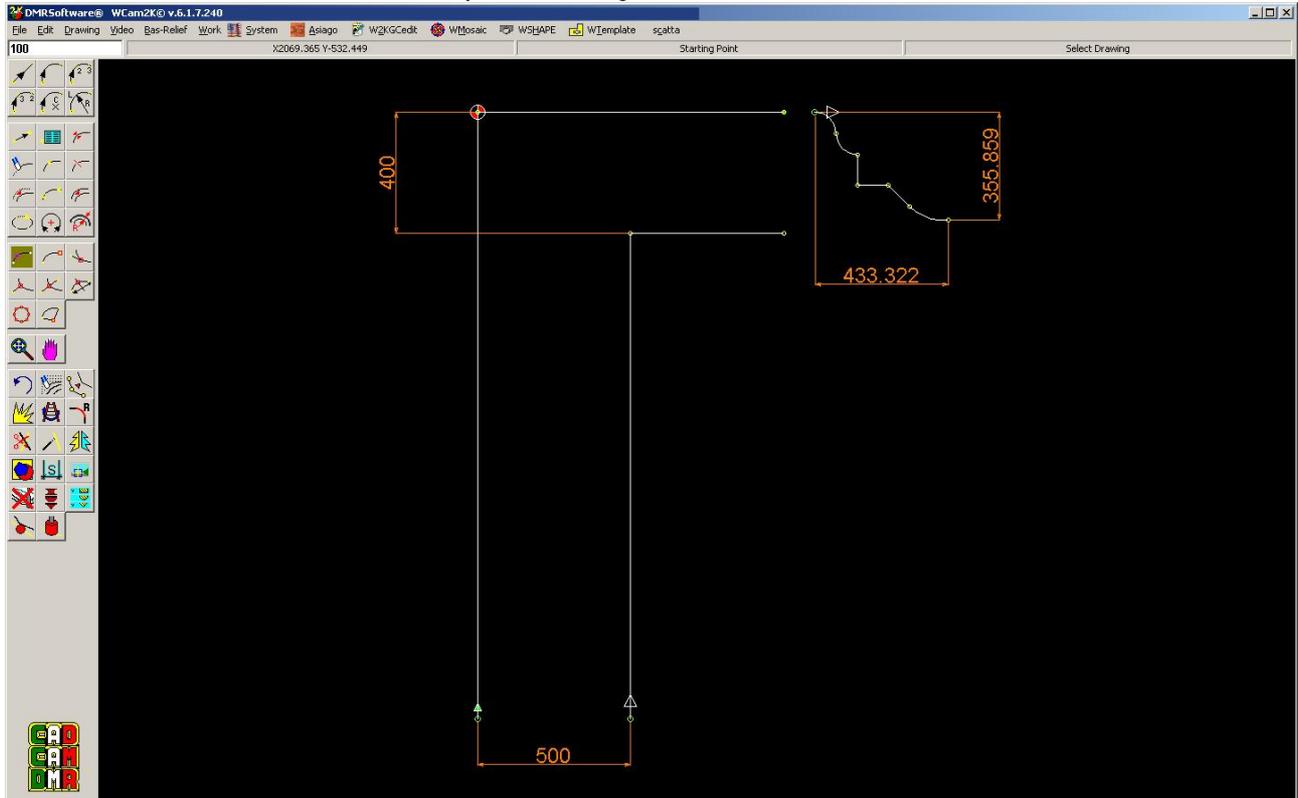


To select and to insert: the flags that are selected are the same of the work programming for the normal basin, change only the selection **CONNECTED GENERATRIX** and is possible to select **BASIN STEP DECREASING** for decreasing the steps in the bottom of basin when the profile have a path about horizontal. So the bottom will become more homogeneous.



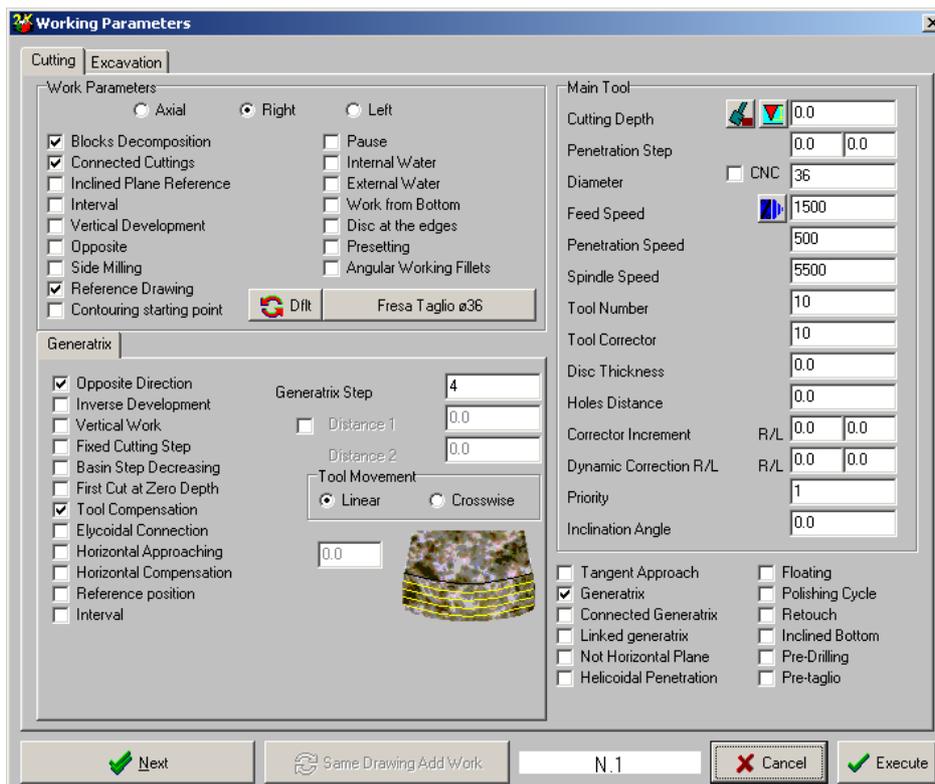
6.11 Reference drawing for profile

We want to realize a profile that follow two different lines. In WCam2K is possible to use a second reference where to connect the lower point of the generatrix.



The dimension of the generatrix and the distance between the two lines they can be different, it is the software that respectively modifies in this case the profile and colleague the tallest point and the lowest point of the generatrix one to the basic line and the second line of reference selected.

To create the work file: Work→Working→Create Select the base line with left button and select right button, this screen appears:



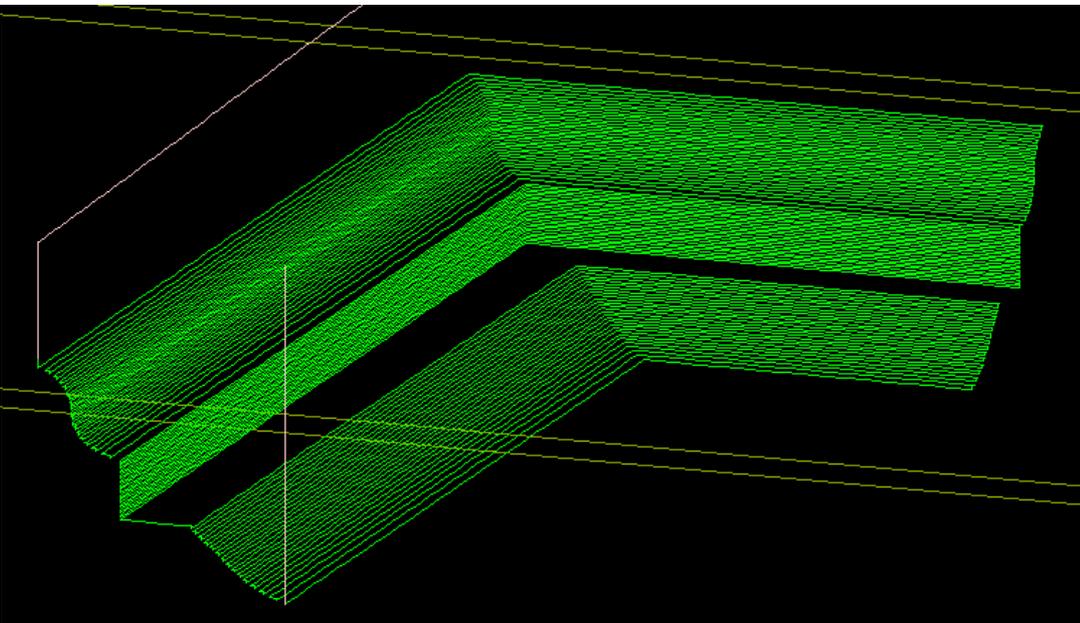
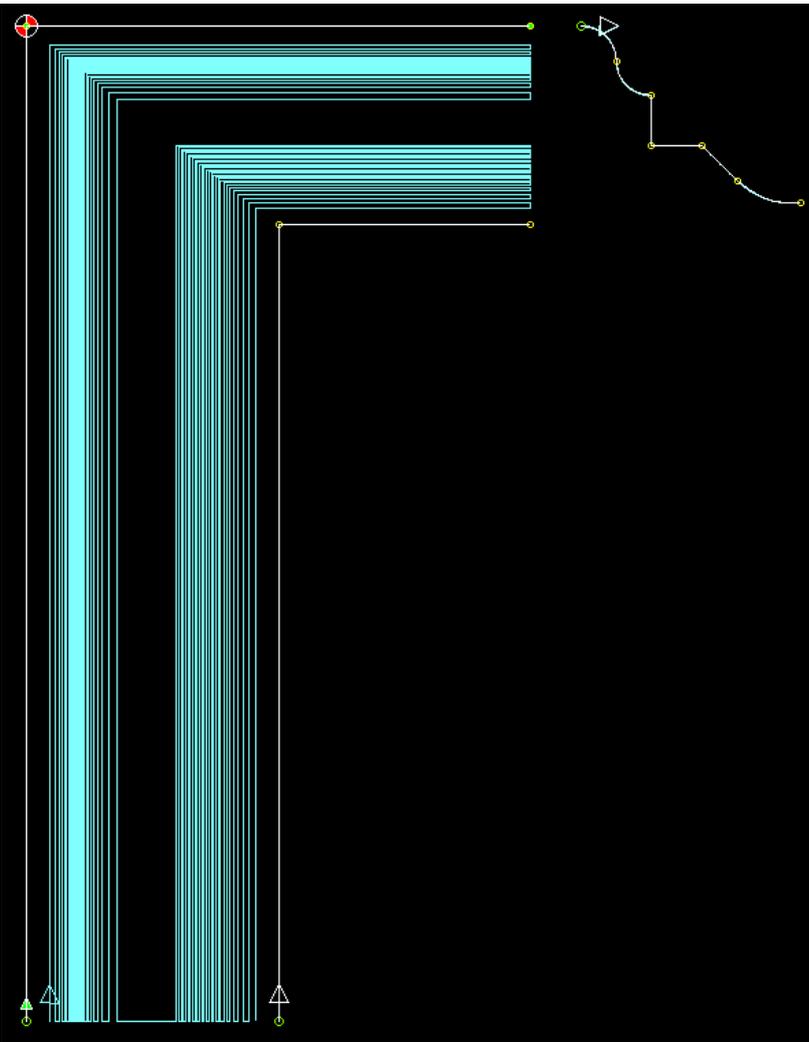
To select and to insert:

- Right
- Blocks Decomposition
- Connected Cuttings
- Reference Drawing

Generatrix

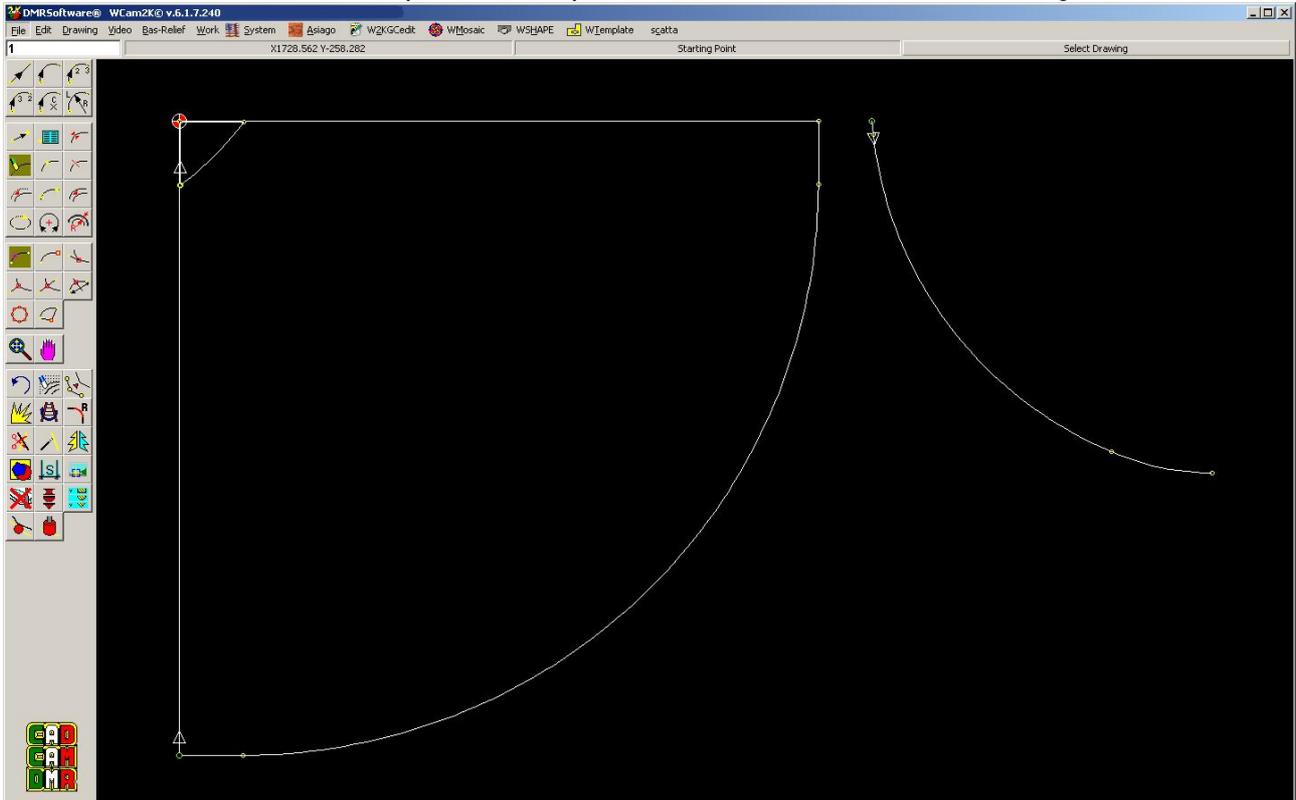
- Opposite Direction
- Increase development
- Generatrix Step (4)

it is possible to also insert a step of penetration to do first the roughing in PENETRATION STEP

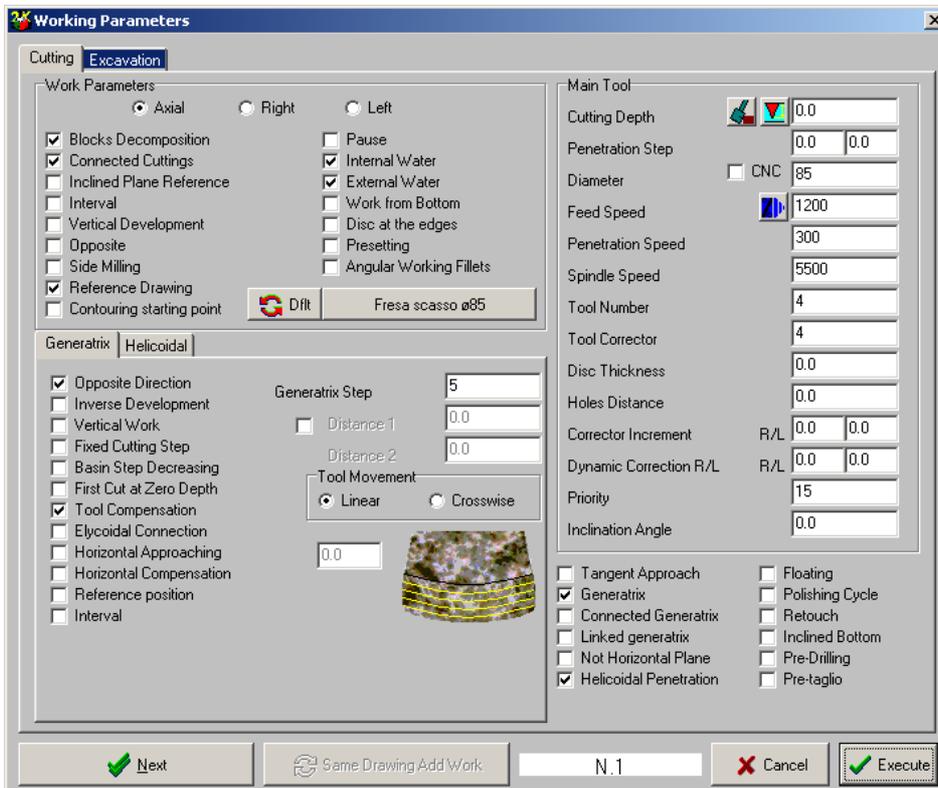


6.12 Reference drawing for basin

We want to realize a basin that have two sides vertical and a profile in the front view. We have to draw a second reference and to position it very next to the two sides that we want to get vertical.



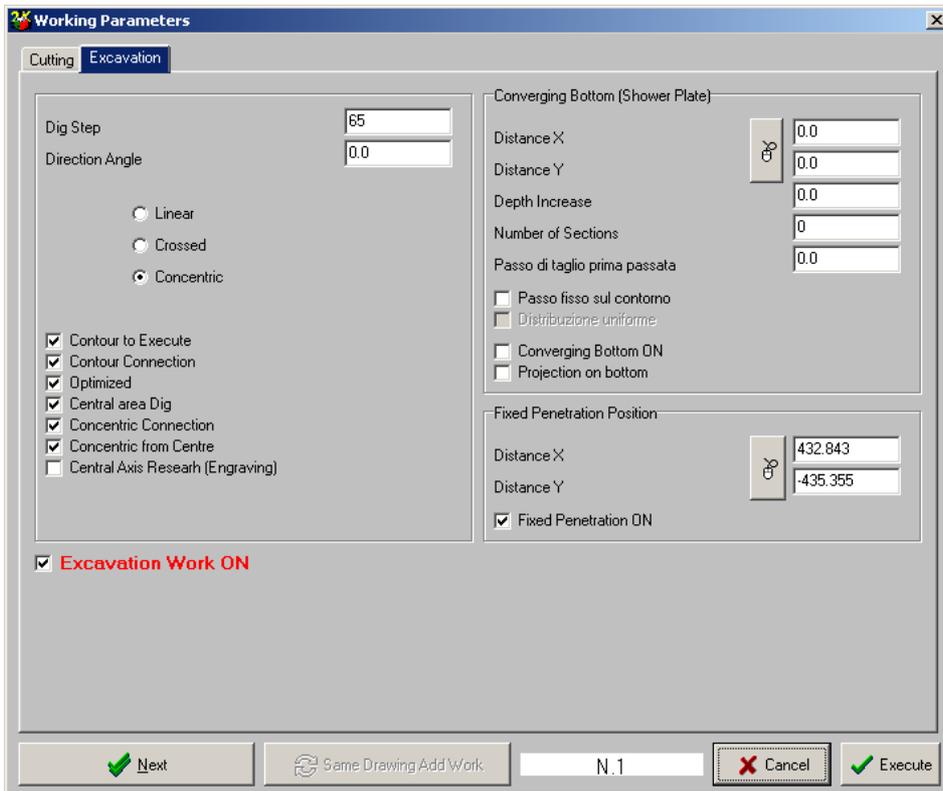
To create the work file: Work→Working→Create Select the base lines with left button and press right button, this screen appears:



To select and to insert:
 Right
 Blocks Decomposition
 Connected Cuttings
 Reference Drawing,
 select the second drawn

Generatrix
 Opposite Direction
 Generatrix Step (5)
 Tool compensation

Helicoidal Penetration
 Helicoidal step(5)
 Movement
 Diameter(30)

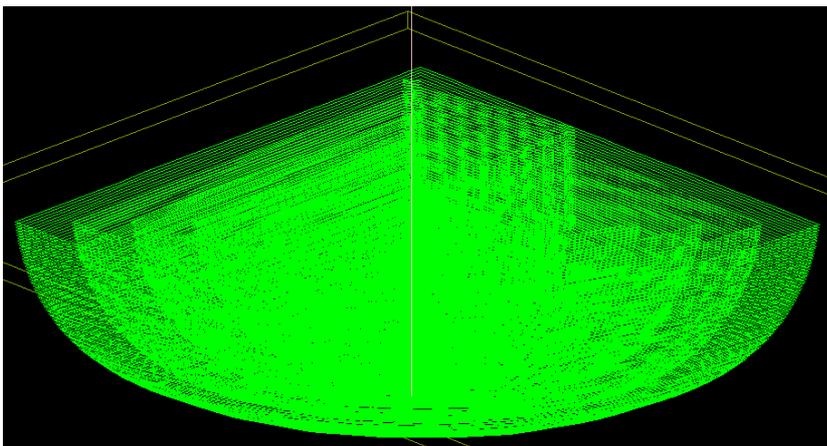
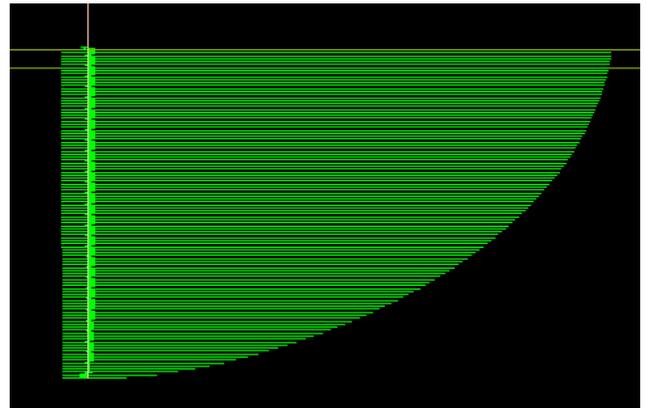
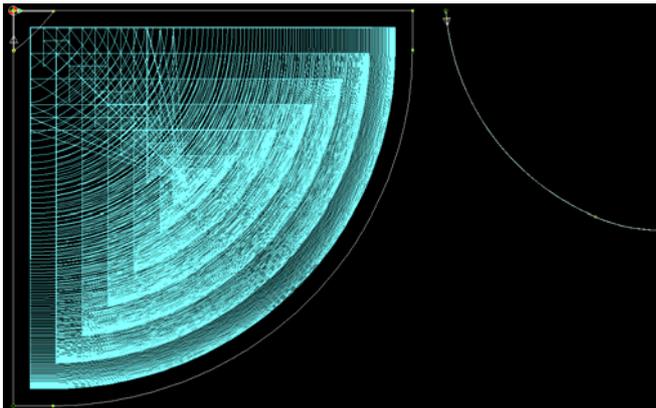


To select and to insert:

- Dig step(65)
- Concentric
- Contour to Execute
- Contour Connection
- Optimized
- Central Area Dig
- Concentric Connection
- Concentric from Center

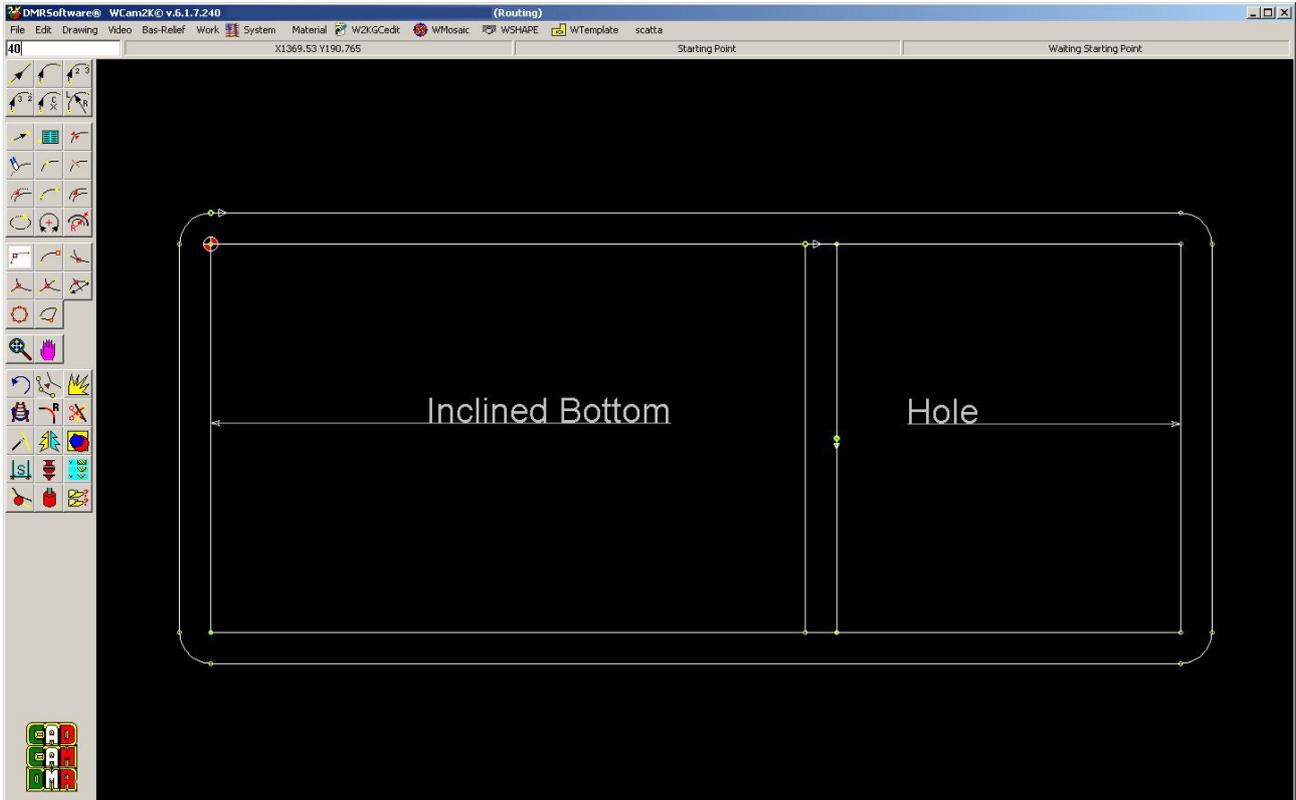
- Excavation Work ON

- Fixed Penetration ON

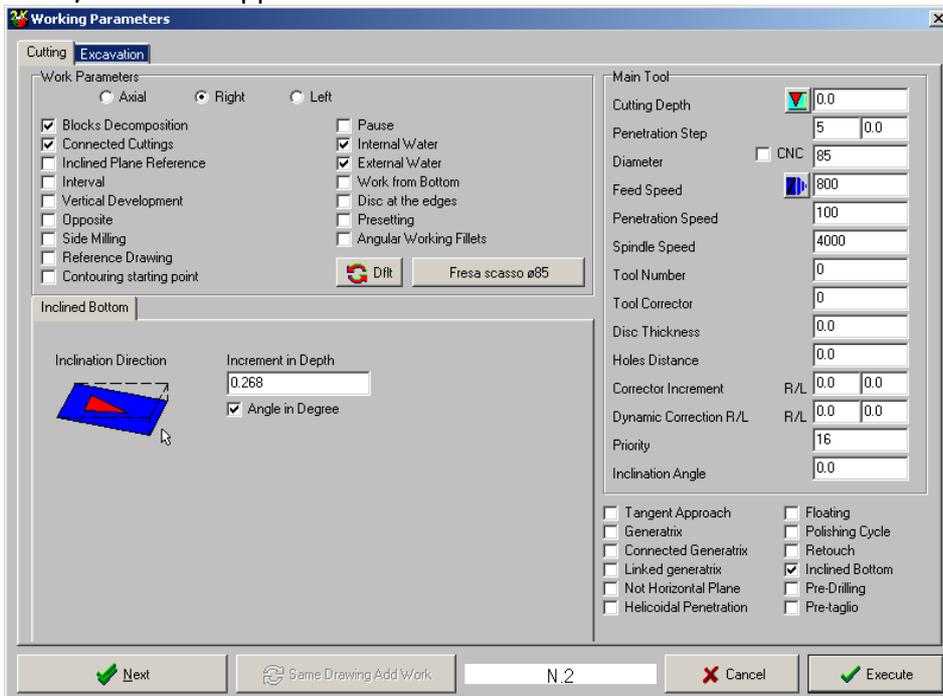


6.13 Inclined bottom

We wanted to mill Kitchen-Top with inclined surface.

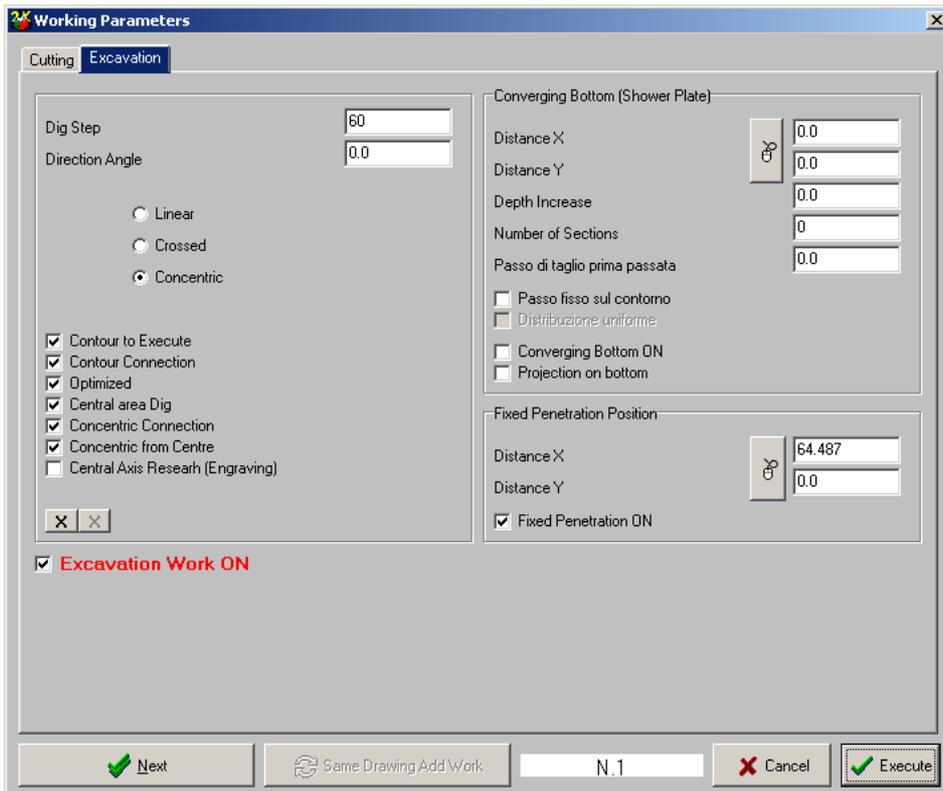


To create the work file: Work→Working→Create Select the base lines with left button and press right button, this screen appears:



To select and to insert:
 Right
 Blocks Decomposition
 Connected Cuttings
 Reference Drawing,
 select the second drawn

Inclined Bottom
 Opposite Direction
 Generatrix Step (5)



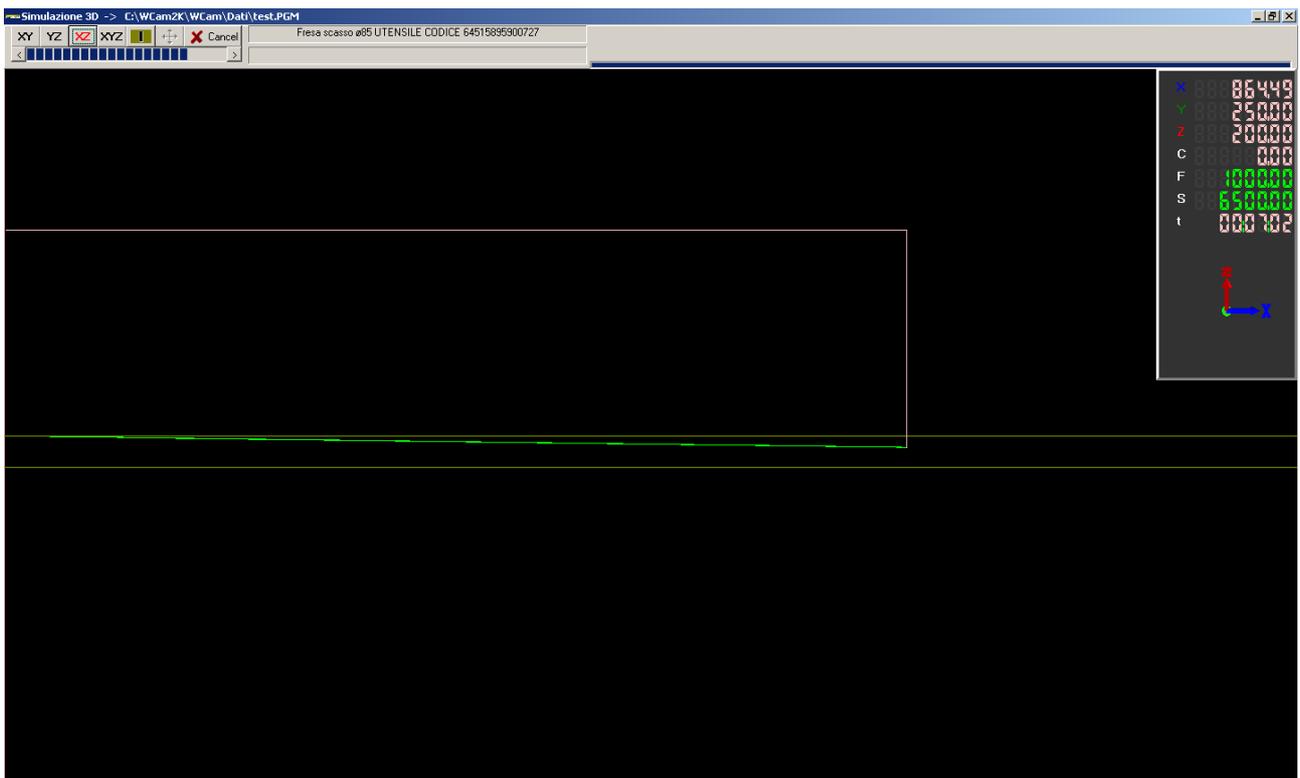
To select and to insert:

- Dig step(60)
- Concentric
- Contour to Execute
- Contour Connection
- Optimized
- Central Area Dig
- Concentric Connection
- Concentric from Center

- Excavation Work ON

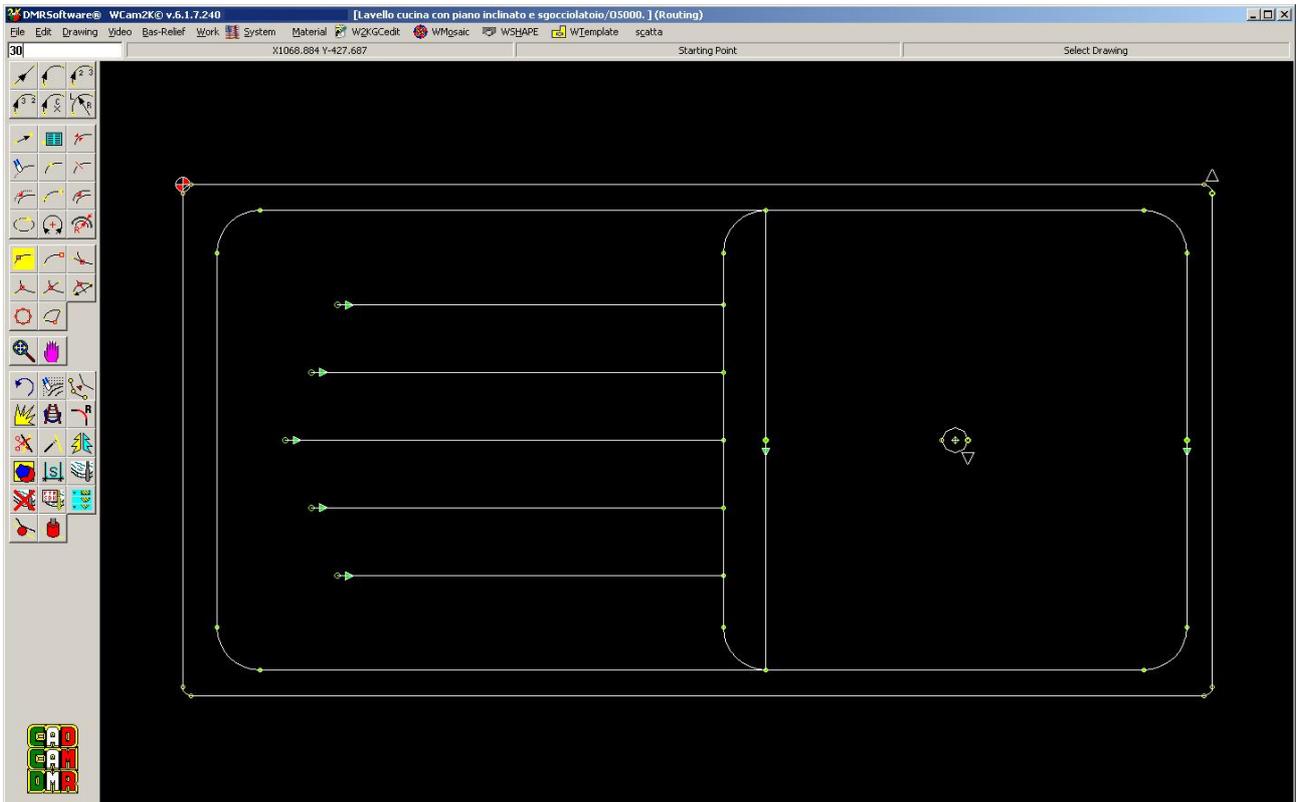
- Fixed Penetration ON

3D Simulation:

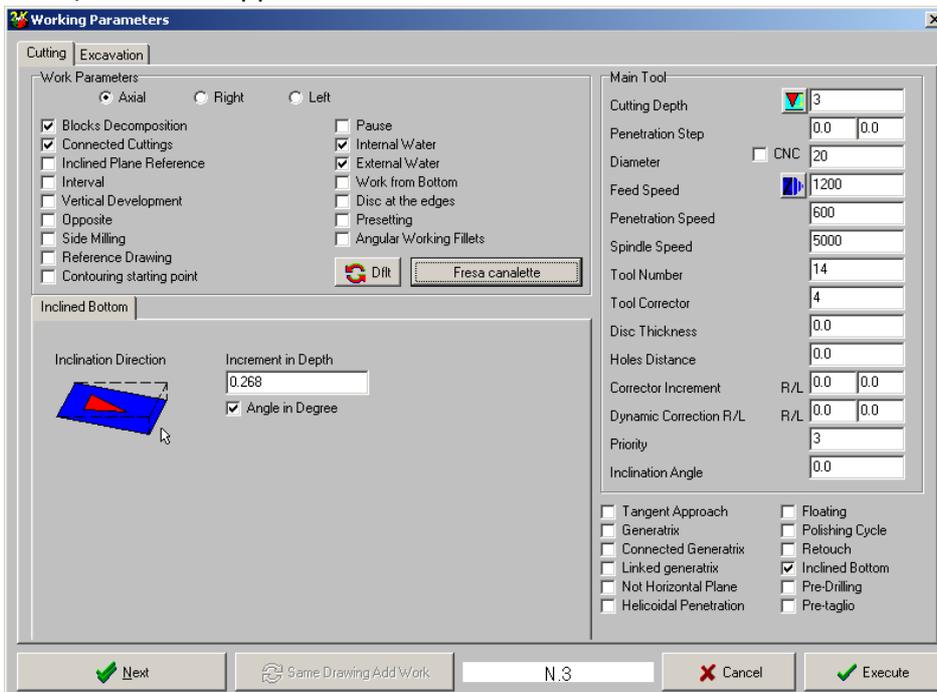


6.13.1 Incisions for the water

We now want to create some incisions for the water. If we think to use a proper spherical utensil for to create the incisions with an only trail, we must to draw only the lines in the correct positions.



To create the work file: Work→Working→Create Select the base lines with left button and press right button, this screen appears:



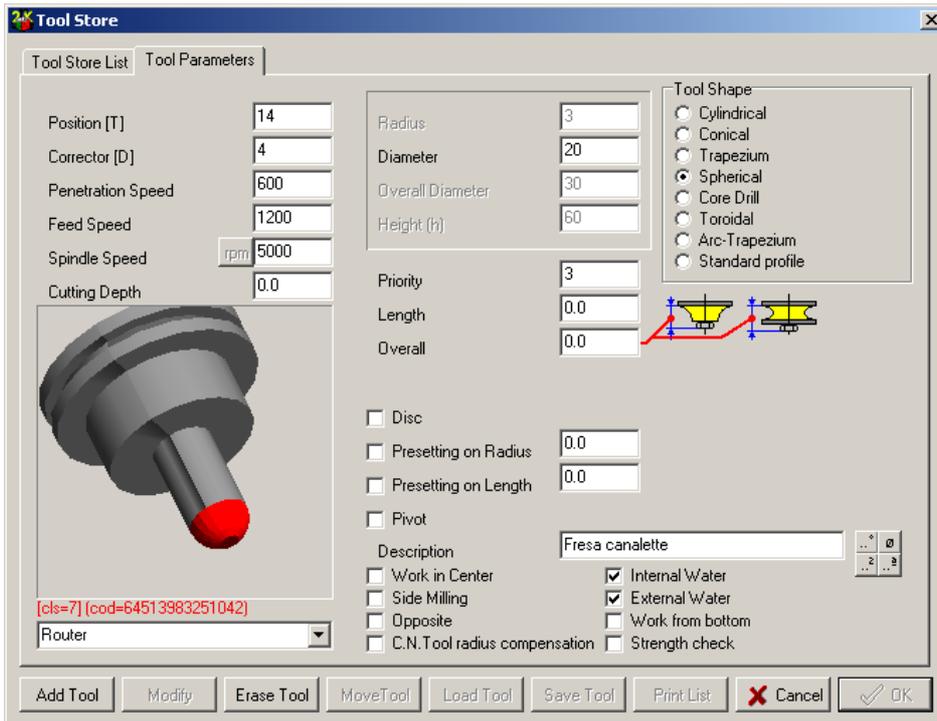
To select and to insert:

- Axial
- Blocks Decomposition
- Connected Cuttings
- Internal and External water if the machine need of these
- Cutting Depth(3)

Inclined Bottom

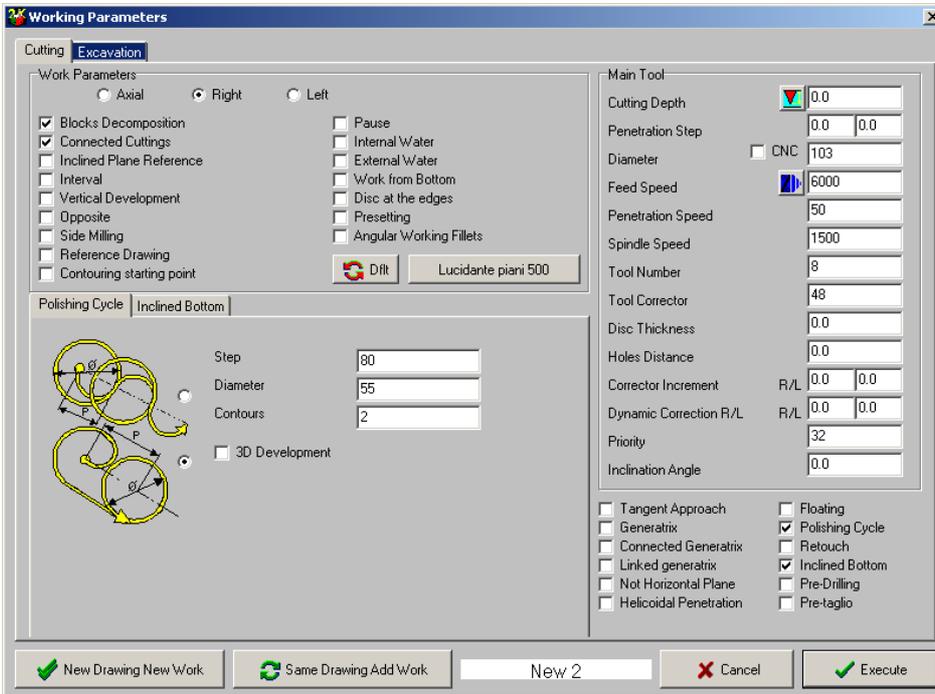
- Opposite Direction
- The value 0.268 is for to have 5mm depth per 1 meter

Spherical tool:



6.14 How to create a sequence of tools

For first thing we have to create the workmanship in normal way. The sequence can be created by the menu **Work**→**Sequences**→**Save** and he can directly be applied to any similar work, with a saving of time from the menu **Work**→**Sequences**→**Apply**



We can for instance create the sequence of utensils to create the tilted plan and to polish it

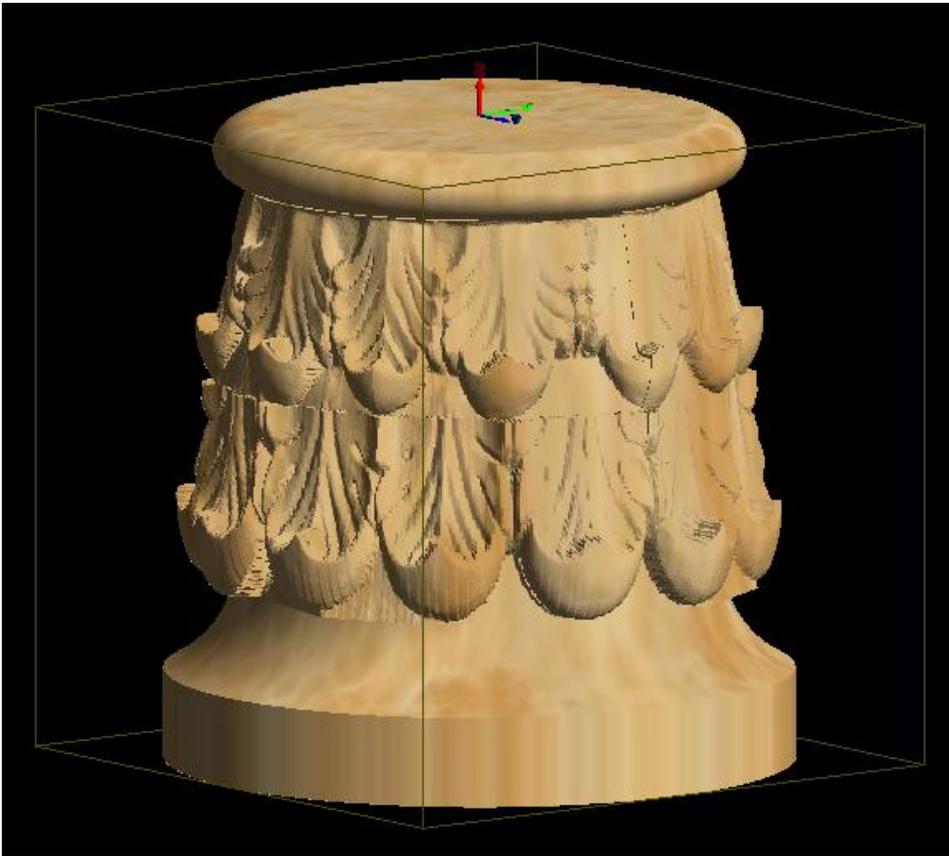
V	Description	Number	Corrector	Diameter	Lowering Speed	Feed Speed	Spindle Speed	Priority	Depth	Incremento Co	Usura Utensile	n
✓	Fresa scasso ø85	0	0	85	100	800	4,000	15	0.0	0.0/0.0	0.0/0.0	1
✓	Lucidante piani 500	8	48	103	50	6,000	1,500	32	0.0	0.0/0.0	0.0/0.0	2
✓	Lucidante piani 1000	8	49	103	50	6,000	1,500	33	0.0	0.0/0.0	0.0/0.0	3
✓	Lucidante piani 2000	8	50	103	50	6,000	1,500	34	0.0	0.0/0.0	0.0/0.0	4
✓	Lucidante piani 3000	8	51	103	50	6,000	1,500	35	0.0	0.0/0.0	0.0/0.0	5

In this way we can create and to personalize different sequences of tools. This method allows not to fall in easy errors during the creation of programs

7 FIVE AXIS MACHINE

7.1 Realization a Capitol from model

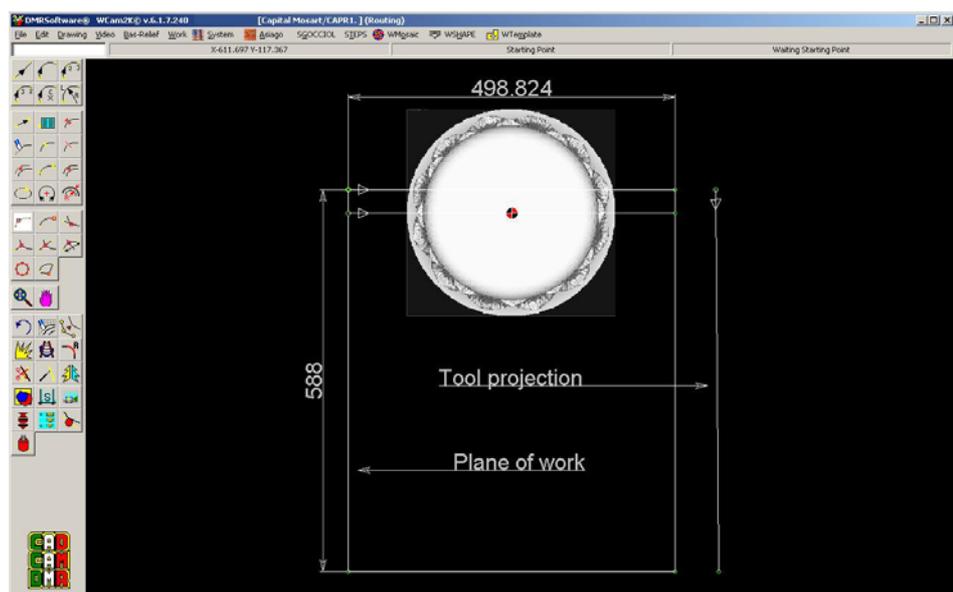
We suppose we want to realize this capital:



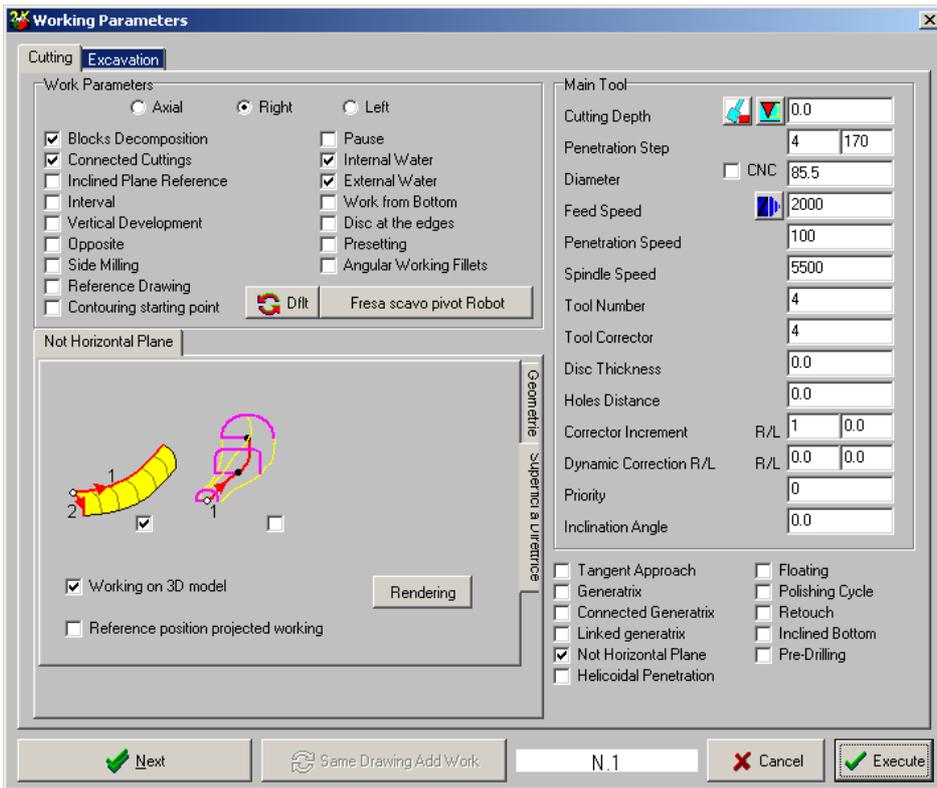
First its important to know the dimintions of the model in this case we have X 444 Z 407 with the maximal radius 188 and minimal radius 60 for 5 axis machine its important to load the model in the correct position as shown. To start the work we need to prepare a plane for the software to know the area of working projected in X and Z.

X represent the lengh of the model plus two times to diameter of the tool to start out of material and Z represent the height of the model plus two times the diameter of the tool.

Then we need to draw two lines one in the model to divide it so the machine can know the part to work and the other line outside the plane to precise the direction of tool projection in the model this can be straight or inclined in case we need the tool work with angle $>0^\circ$



Now when we have all the references we need we can start creating the work.



To crate the work:
 Work→Working→Create
 and select the rectangle
 then press right button
 after this screen appears

To select and to insert:
 Right
 Blocks Decomposition
 Connected Cuttings
 Penetration step (the
 mm that the tool enters in
 the material in every step)
 In the next case we put
 the maximal distance
 chosen before when cut
 the drawing with the
 reference line

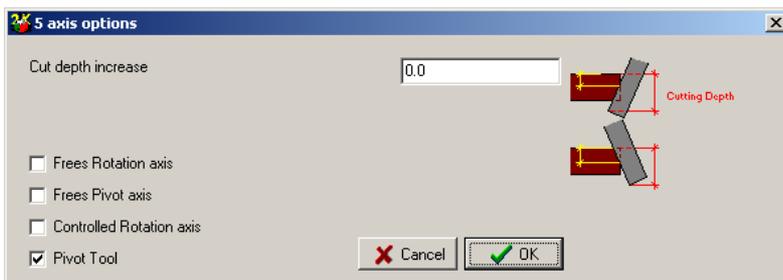
Not Horizontal plane:

- Working 3D model
- Choose 1 and 2 box the 1 is for the line for dividing the model and 2 for the projection line.

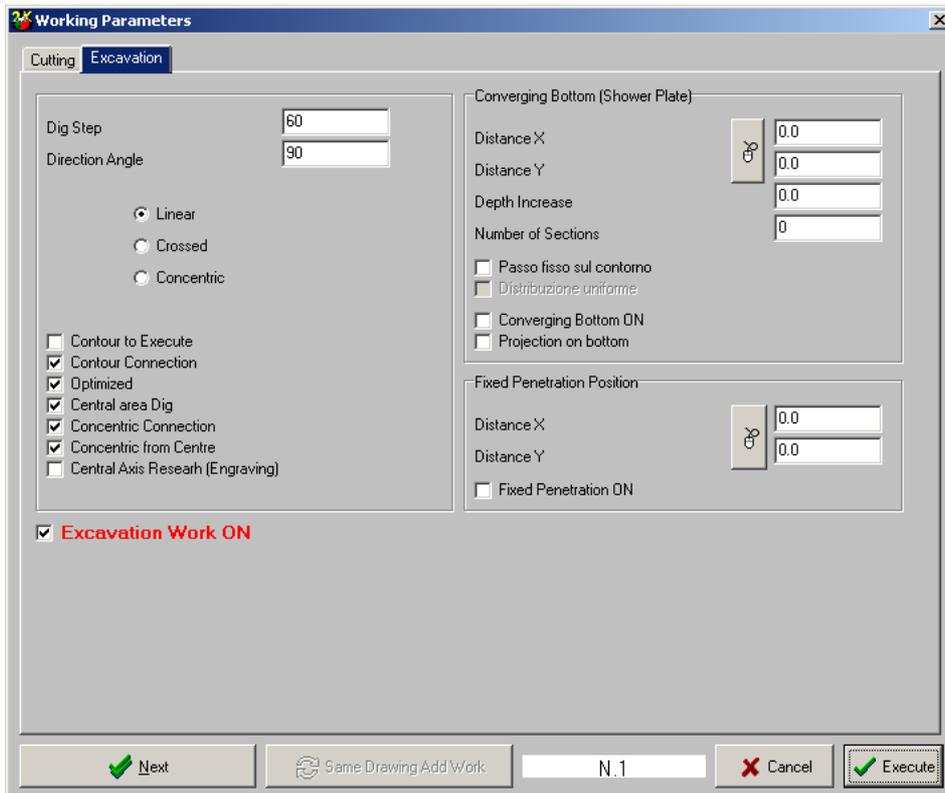


After choosing plane references 1 and 2
 select rendering to check the plane of
 work if in correct position with the
 model it is possible to adjust the plan
 using the cursor keys on the up of the
 screen. Ex: in this case the yellow box is
 the plane of work we can see it is
 proportional in the centre of the model.

Near the cutting depth menu click on
 the box (with inclined tool image) this 5 axis options window will appear select the final box (pivot
 Tool) this will allow the tool to incline automaticly when needed in the model

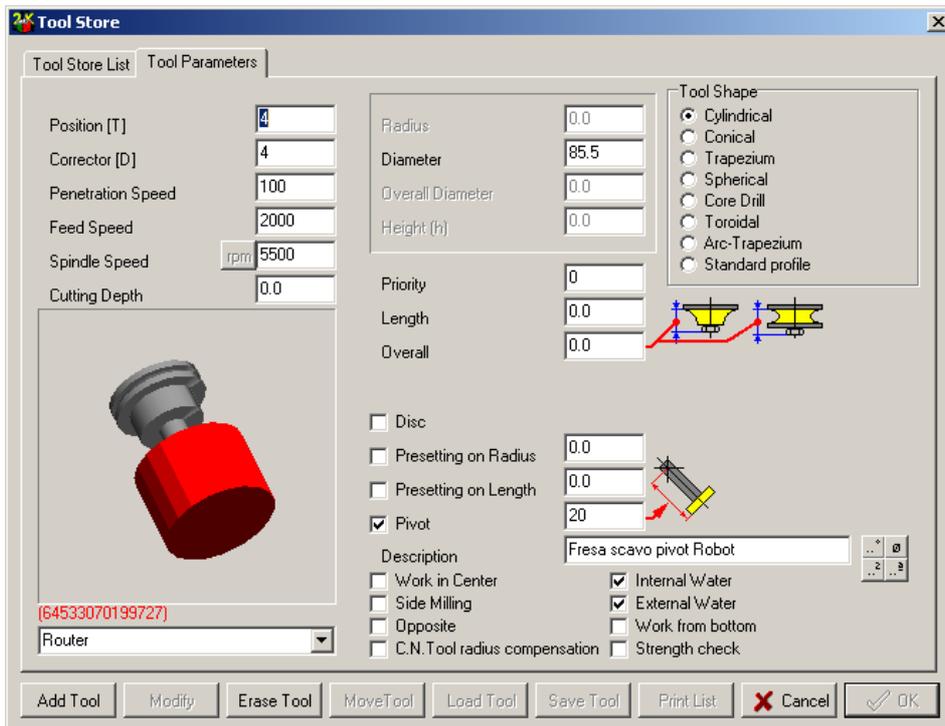


Now select excavation:

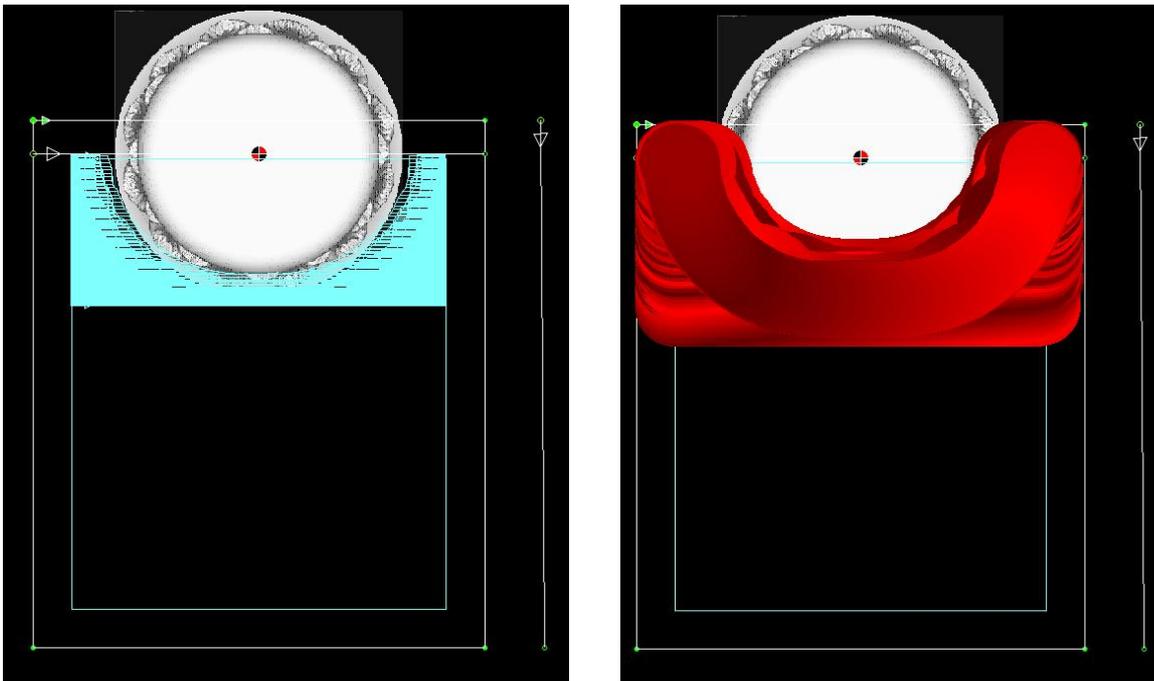


- To select and to insert:
- Dig step (is the step between the tool movements usually you elect 60% of the tool diameter)
 - Direction angle (0° for vertical steps 90° for horizontal)
 - Linear
 - Contour Connection
 - Optimized
 - Central Area Dig
 - Concentric Connection
 - Concentric from Center

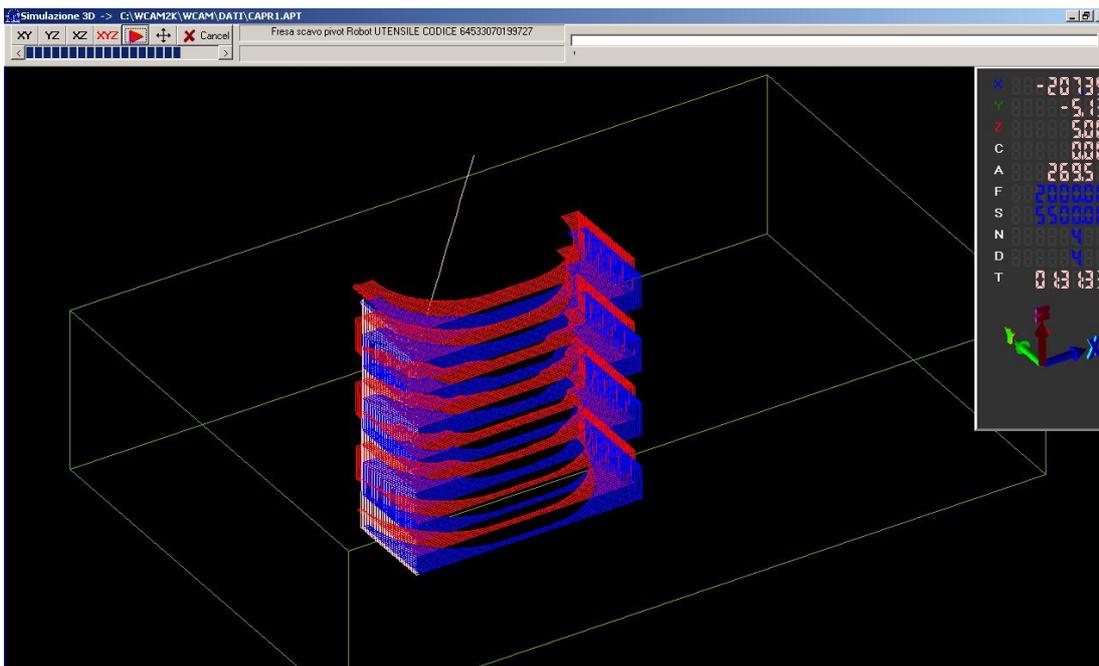
 - Excavation Work ON



In the tool parameters its important in the five axis machine to inset pivot and the measyre between the diamond of the tool and the center of rotation in the machine spindle motor.



After choosing the options of the work we can see in the plane the movement of the tool in the work represented in blue and the 2D simulation in the red color. After checking this we can move into 3D simulation to see closer how the work goes.



7.2 Realization a bust

We suppose we want to realize this buddah:

