

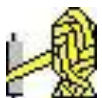
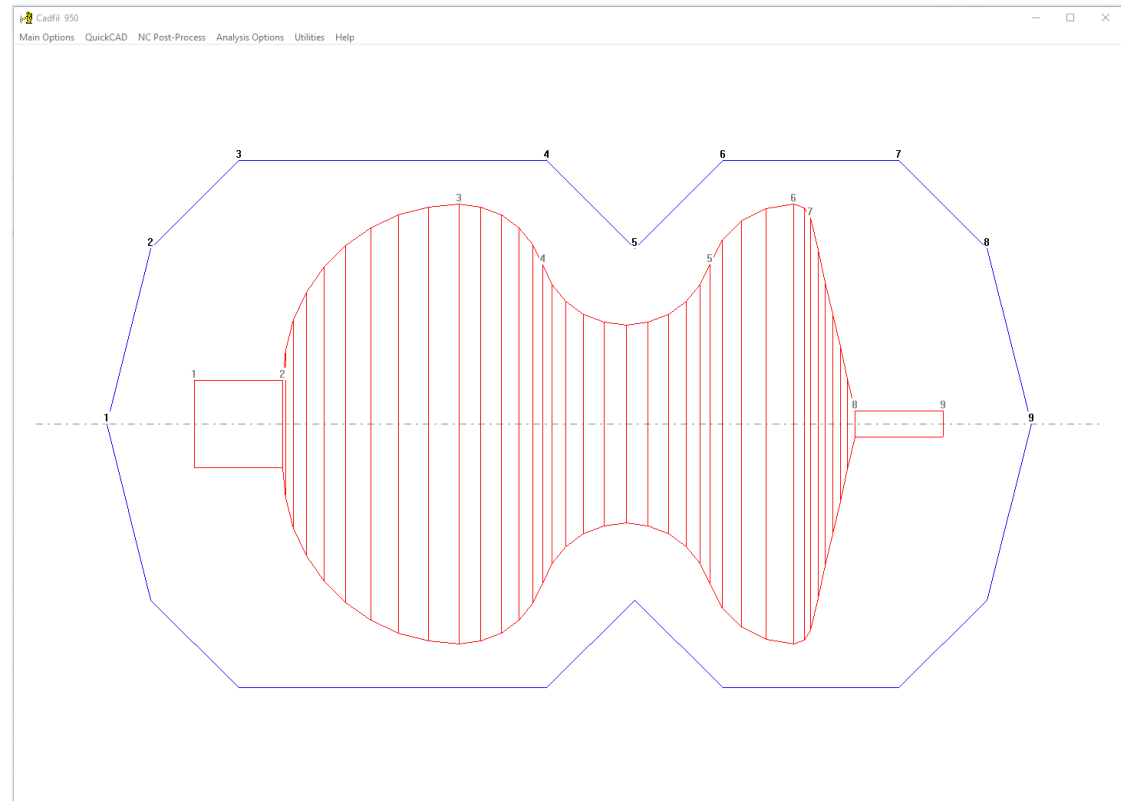
# CADFIL-Axsym

The **CADFIL®-Axsym** package can generate winding programs for all rotationally symmetric components including pipes, spheres, gas bottles, golf shafts, storage tanks... the possibilities are endless. The following information briefly describes the basic stages of program generation and shows some of the many features of the system. Other software options exist for more complex parts such as pipe bends, Ts, and elliptical sections to name but a few of the options. Cadfil software operates on standard PC hardware using Windows.

The Mandrel Geometry and winding machine clearance envelope can be quickly entered and modified from a single easy to use dialogue box. The graphics and text windows are automatically updated.

Convex and concave arcs can be fitted between data positions and edited as required.

The clearance envelope allows close control whilst preventing machine collision with the mandrel. For simple shapes an envelope can be automatically created.



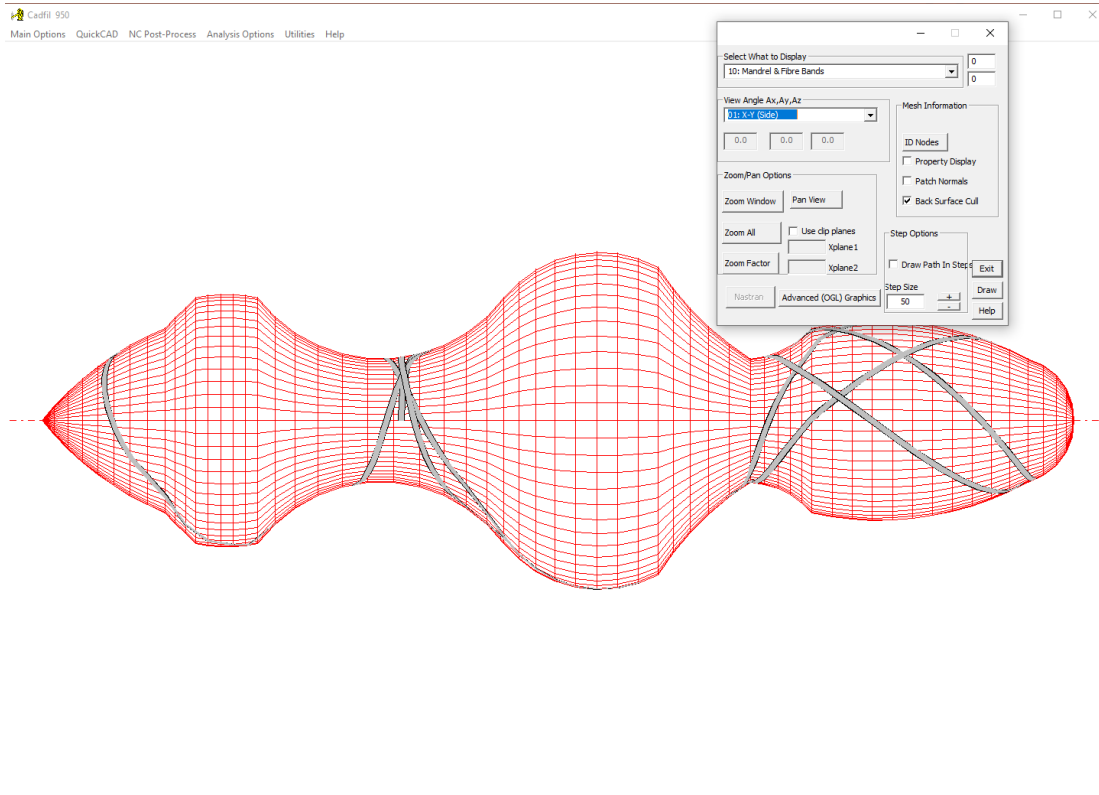
**Cadfil is a registered trade mark of Crescent Consultants Ltd**

Email: [sales@cadfil.com](mailto:sales@cadfil.com)

Web: <https://www.cadfil.com>

**Cadfil-Axsym**

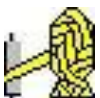
Page 1 of 6



Having created the mandrel geometry the user can interactively create non-slip geodesic fibre paths. Non-geodesic paths can be created using the friction facilities. In this way the user can control wind angles and turning diameters.

The 3D geometry and paths can be viewed from pre-set viewpoints or from any user-defined viewpoint.

For parts such as gradually tapered shafts (e.g. golf shafts) the user can generate constant wind angle (non-geodesic) paths using the constant angle option.



**Cadfil is a registered trade mark of Crescent Consultants Ltd**

Email: [sales@cadfil.com](mailto:sales@cadfil.com)

Web: <https://www.cadfil.com>

Cadfil-Axsym

Page 2 of 6

Having created fibre path with two turning points the software calculates the number of circuits required to cover the mandrel based on material parameters such as the fibre band width and the number and type of rovings to be used.

A band pattern table is created (see across) and the user can select the band structure required. If required the number of cycles can be adjusted to give alternative patterns.

The selected band structure can be viewed in the 3D viewing system (see below).

The user is given important data such as a thickness graph of the part and the amount of fibre used. Neutral file interfaces can be supplied to output data for Finite Element Software.

Machine positions are calculated using the envelope and saved to a data file. All CADFIL data files are text files and can be viewed if required.

Band Pattern Selection Table

Number of Cycles: 82 to 82

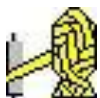
Initial Rotation: 1. Revs(s) 16.1644 Degrees  
376.1644 Degrees

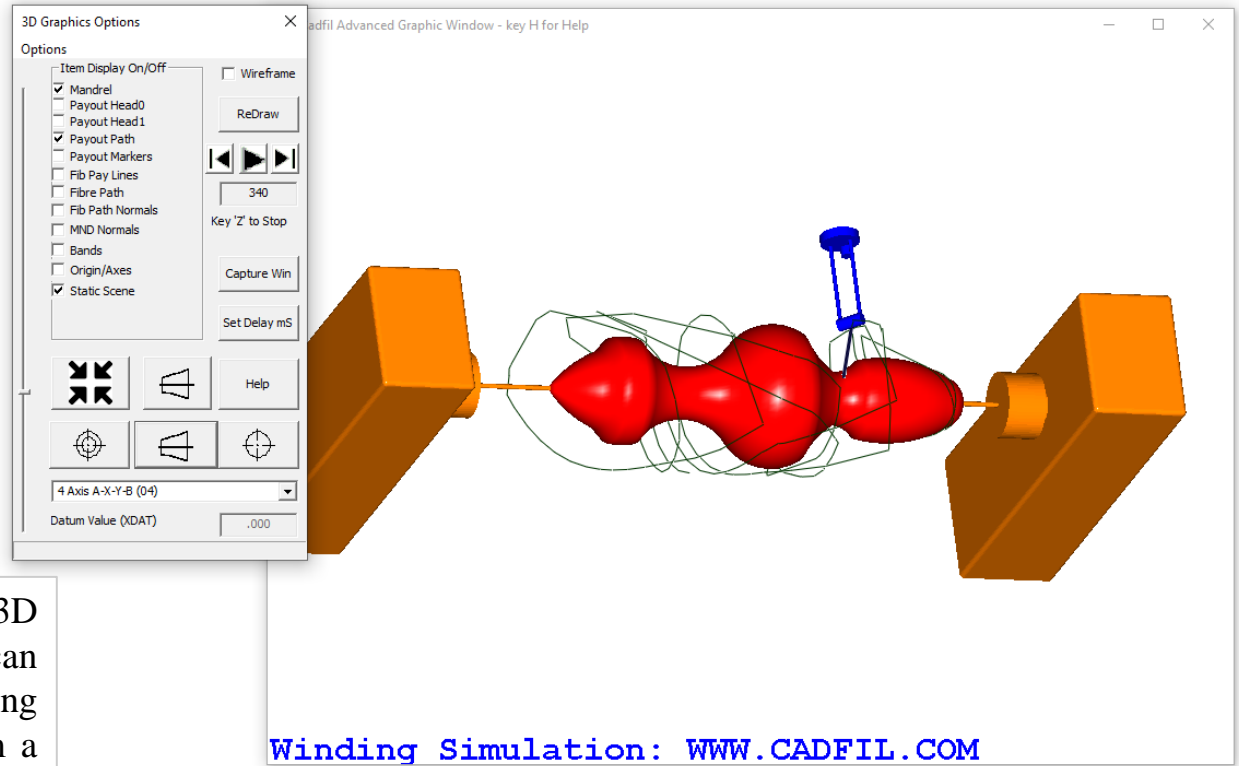
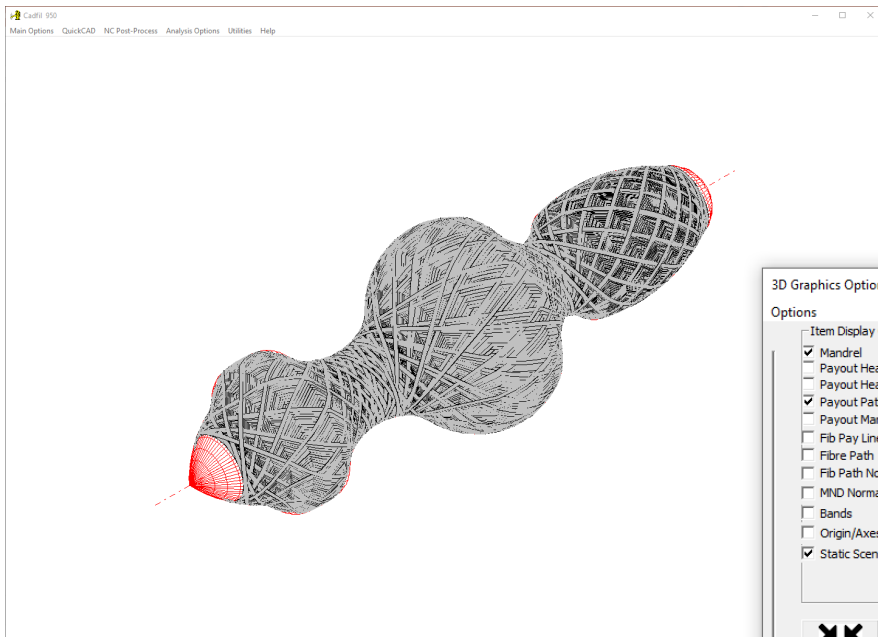
Option	Pattern	Cycles	Target A	Change	ProgF	1-ProgF	
1	27	82	373.17	-2.99	0.9920	0.0080	
2	33	82	381.95	5.79	1.0154	0.0154	
3	1	82	364.39	-11.77	0.9687	0.0313	
4	35	82	390.73	14.57	1.0387	0.0387	
5	1	82	355.61	-20.55	0.9454	0.0546	
6	9	82	399.51	23.35	1.0621	0.0621	
7	27	82	346.83	-29.34	0.9220	0.0780	
8	15	82	408.29	32.13	1.0854	0.0854	
9	33	82	338.05	-38.12	0.8987	0.1013	
10	19	82	417.07	40.91	1.1088	0.1088	
11	35	82	329.27	-46.90	0.8753	0.1247	
12	11	82	425.85	49.69	1.1321	0.1321	
13	9	82	320.49	-55.68	0.8520	0.1480	
14	29	82	434.63	58.47	1.1554	0.1554	
15	15	82	311.71	-64.46	0.8286	0.1714	
16	13	82	443.41	67.25	1.1788	0.1788	

Dwell 50.0 50.0  
 Progression %Dwell Split Hoop 1-2  
 Extra dwell (deg) .0

Click on pattern, then OK or Set new cycle range and click Re-calculate Cancel sets no pattern

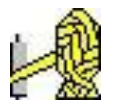
OK Cancel Re-calc Help





The machine positions can be displayed in 3D around the mandrel or if required the user can define the machine fibre dispensing head using brick and cylinder solid shapes and perform a full 3D animation including all machine motions such as eye roll and eye yaw. An example of this is shown opposite.

Winding Simulation: [WWW.CADFIL.COM](http://WWW.CADFIL.COM)



**Cadfil is a registered trade mark of Crescent Consultants Ltd**

Email: [sales@cadfil.com](mailto:sales@cadfil.com)

Web: <https://www.cadfil.com>

Cadfil-Axsym

The last stage of program generation is post-processing where the path is converted to machine control data. Numerous control options can be set dependant on the axes available on the machine. Different speed control options can be set to reduce winding time or limit axis accelerations. The software calculates the winding time.

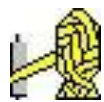
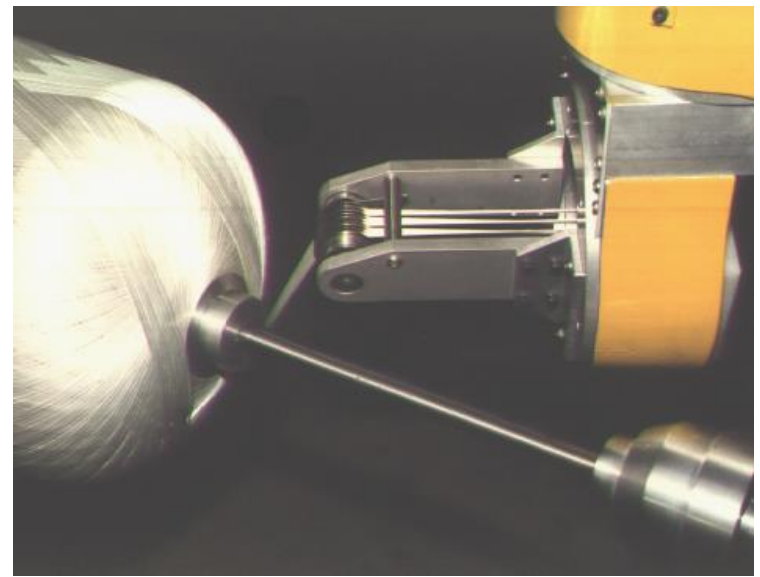
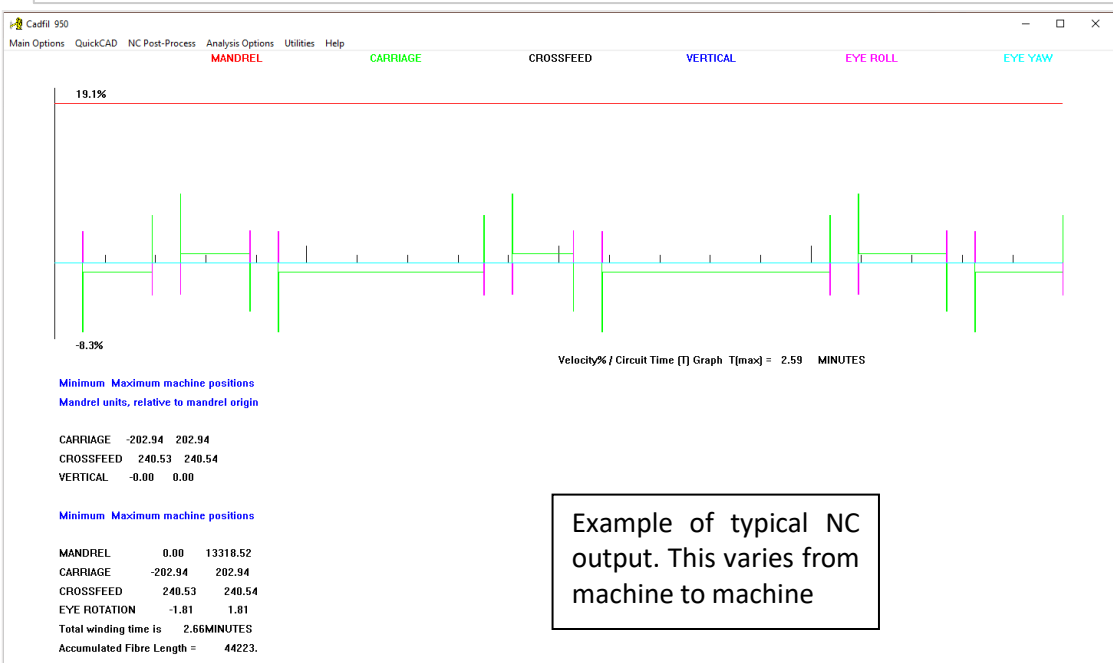
Cadfil is supplied configured for the customers winding machine. Cadfil can be supplied with multiple machine configurations so that the user can select which machine is to be used. Cadfil can be configured for all filament winding machines types and control systems from 2 to 6 axes of control.

The picture opposite shows Cadfil in action on a 6-axis machine. The Cadfil control strategy eliminates band narrowing over the ends of the vessel

```

C2ESMHARC - Notepad
File Edit Format View Help
%_N_C2ESMH_MPF
;SPATH=/_N_WKS_DIR/_N_C2ESMH_WPD
N10 G01 G64 G90 G94 F10000.
N11 ;CADFIL VERSION 9.50
N12 ;DATE 14-SEP-20 08:03:09
N13 ;CONFIG IS: SWS8XX_ARC_01
N14 ;POSTPROCESS OPTION 4
N15 R104=0;layer number
N16 ;C2ESMH.PAY
N17 ;MANDREL RADIUS =190.5356
N18 G90 F 10000. Y 240.54
N19 G90 F 10000. X 200.00
N20 MSG("TIE ON FIBRE AND PRESS START")
N21 M00
N22 MSG("LAC2ESMH.PAY IN PROGRESS")
N23 G01 G91 G64 G94 F 10000.
N24 R4=0 ; circuit counter
N25 R5=1 ; circuits
N26 R104=R104+1;layer number
N27 LAC2ESMH P 1
N41 MSG("WINDING FINISHED")
N28 M30

%_N_LAC2ESMH_SPF
;SPATH=/_N_WKS_DIR/_N_C2ESMH_WPD
N10 FGROU(A)
N11 F 5000.
N12 G01 G641 ADIS=50 G91 G94 A 360.000
N13 A 7.337 X -4.44 B 1.81
N14 A 881.974 X -73.50
N15 A 7.850 X 2.94 B -1.81
N16 A 360.000
N17 A 7.337 X 4.44 B -1.81
N18 A 881.972 X 73.50
    
```



**Cadfil is a registered trade mark of Crescent Consultants Ltd**

Email: [sales@cadfil.com](mailto:sales@cadfil.com)

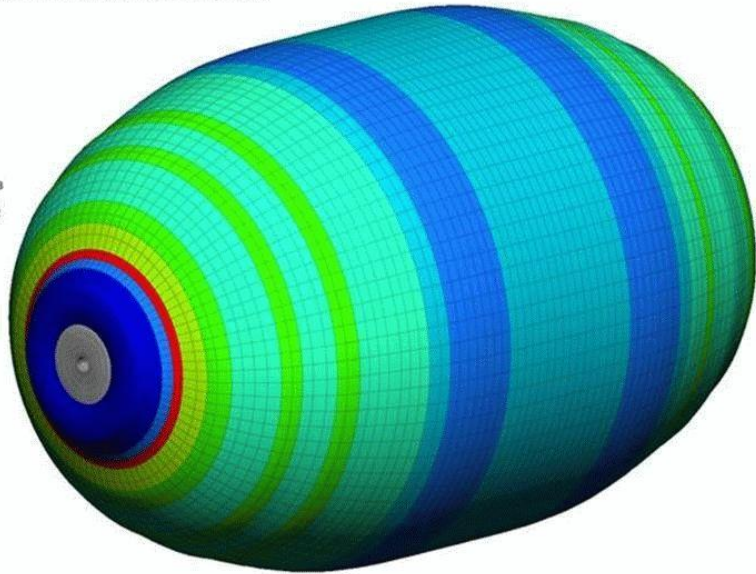
Web: <https://www.cadfil.com>

Cadfil-Axsym

Contour Plot  
Layered Solid Composite Stresses(Normal X Stress (solid), Ply #1\_BOT)

1.743E+03
1.570E+03
1.396E+03
1.222E+03
1.049E+03
8.753E+02
7.018E+02
5.282E+02
3.546E+02
1.811E+02

Max = 1.743E+03  
3D 6849  
Min = 1.811E+02  
3D 121



Cadfil can be used to create finite element geometry and data for import into your analysis package. Finite element interfaces are an add on package to Cadfil Axsym, more details can be found at <https://www.cadfil.com/help/html/cadfil-fea-interface.html> .

On a doubly curved surface such as a dome, the angle and thickness are continuously variable. With multi-layer windings it is difficult and time consuming to create fibre architecture in analysis packages. Cadfil offers a number of solutions, customers successfully produce Cadfil data for use in Nastran, Patran, Femap, Hyperworks, Optistruct, ABAQUS and ANSYS and others.

Cadfil deals with winding geometry and fibre architecture and also for some cases can create boundary conditions and load cases. It is possible to specify Orthotropic material data directly from the Cadfil database which is open for the user to add or remove materials as needed.

All Cadfil software is complete with USB datakey and a comprehensive online or offline help. Telephone support and software upgrades for the first 12 months are also included in the purchase price. Cadfil-Axsym also includes QuickCAD options for simple parametric program generation for pipes and dome ended vessels (Cadfil-Lite).

For further information on CADFIL-Axsym or other filament winding software contact:

Crescent Consultants Ltd  
2 Springfield  
Kegworth  
Derby, DE74 2DP  
England



Tel: +44 (0)7958 647196



Email: sales@cadfil.com

Web: <https://www.cadfil.com>



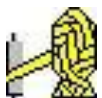
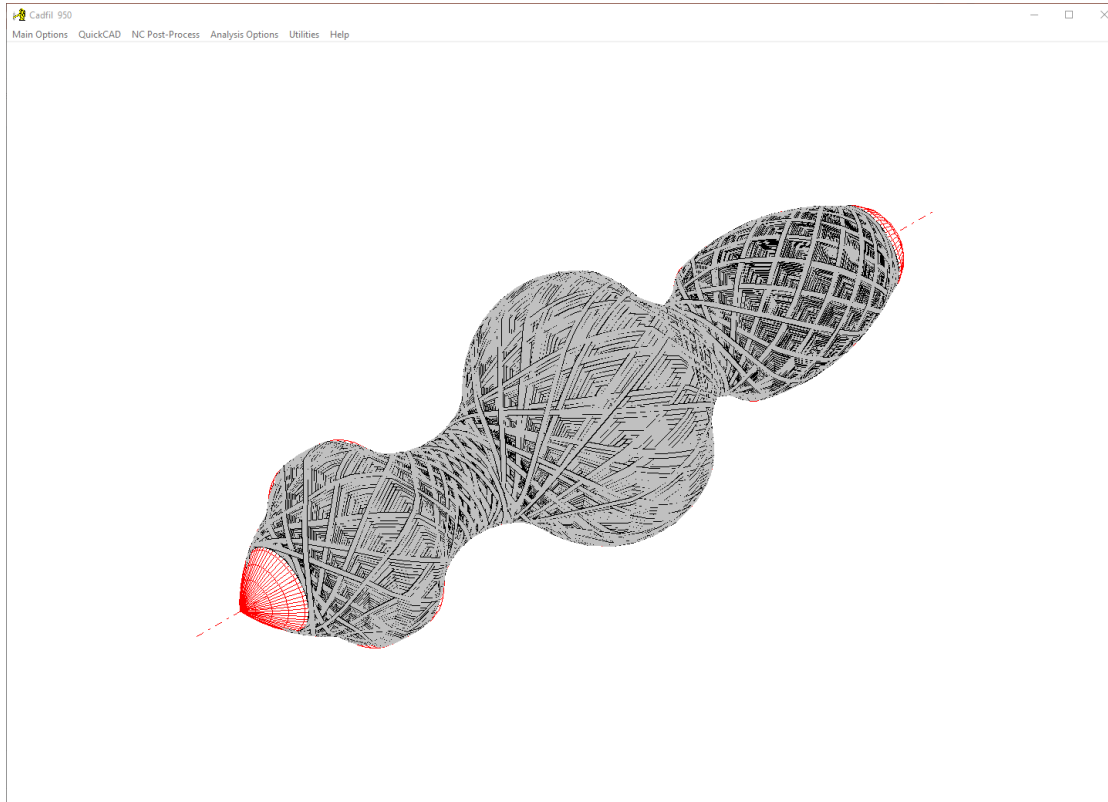
**Cadfil is a registered trade mark of Crescent Consultants Ltd**

Email: [sales@cadfil.com](mailto:sales@cadfil.com)

Web: <https://www.cadfil.com>

**Cadfil-Axsym**

Page 6 of 6



**Cadfil is a registered trade mark of Crescent Consultants Ltd**

Email: [sales@cadfil.com](mailto:sales@cadfil.com)

Web: <https://www.cadfil.com>

**Cadfil-Axsym**

Page 7 of 10