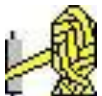


Example Using Cadfil To apply material properties to a Finite Element Mesh created by an External (third Party) Program.

This example uses a Pressure Tank with end and side openings.

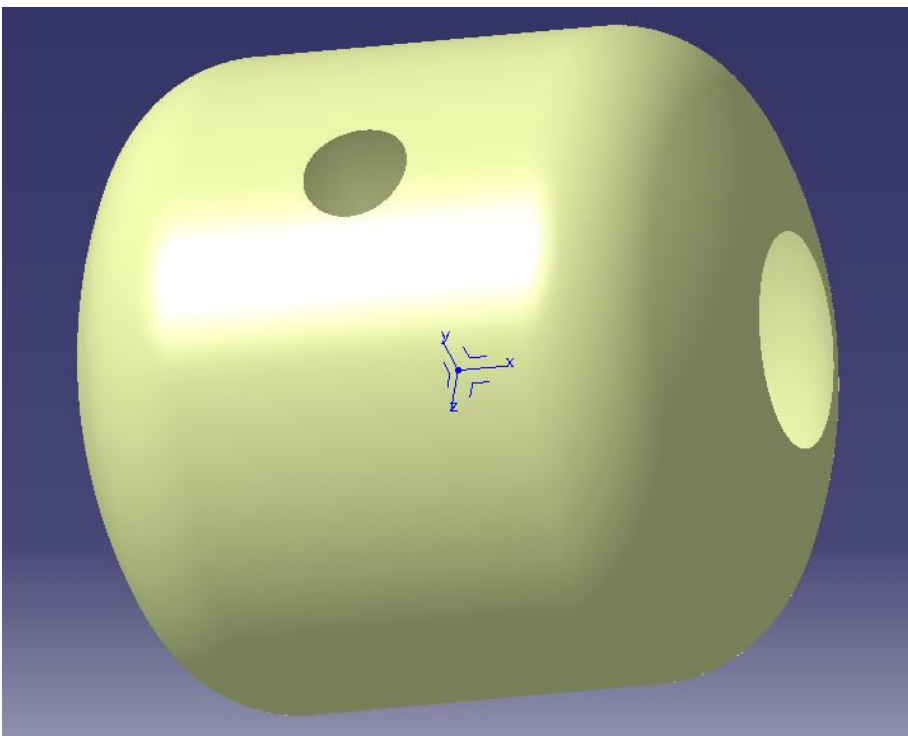


Cadfil is a registered trade mark of Crescent Consultants Ltd

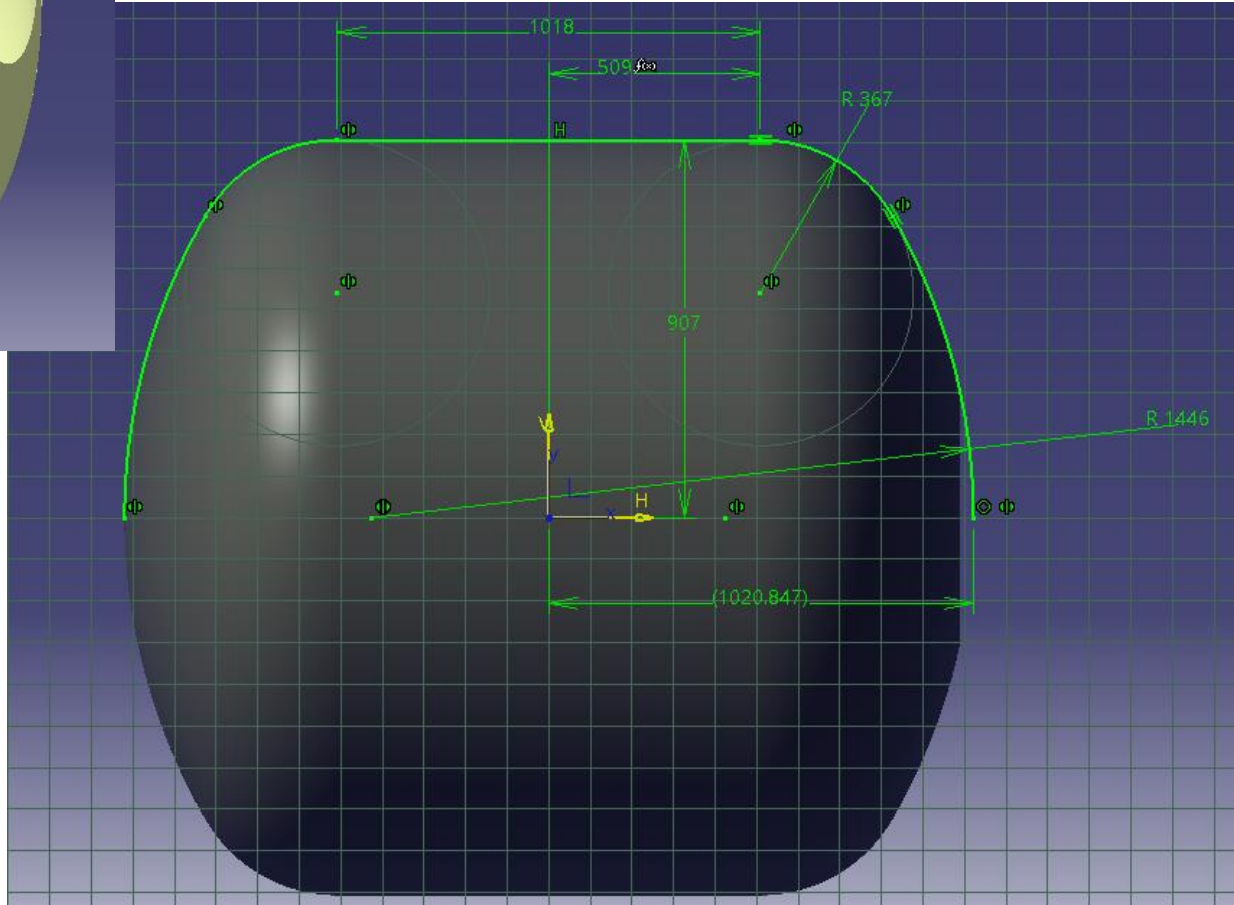
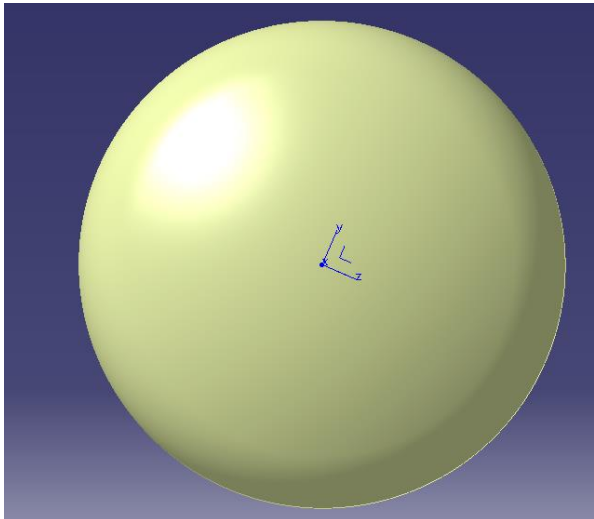
Email: sales@cadfil.com

Web: <http://www.cadfil.com> Technical Doc.

Page 1 of 9



A Cad Model of tank with holes. Note that the X axis is the revolve axis and Origin is the Centre of the Cylinder part. This is important to match with Cadfil-Lite+ axis system

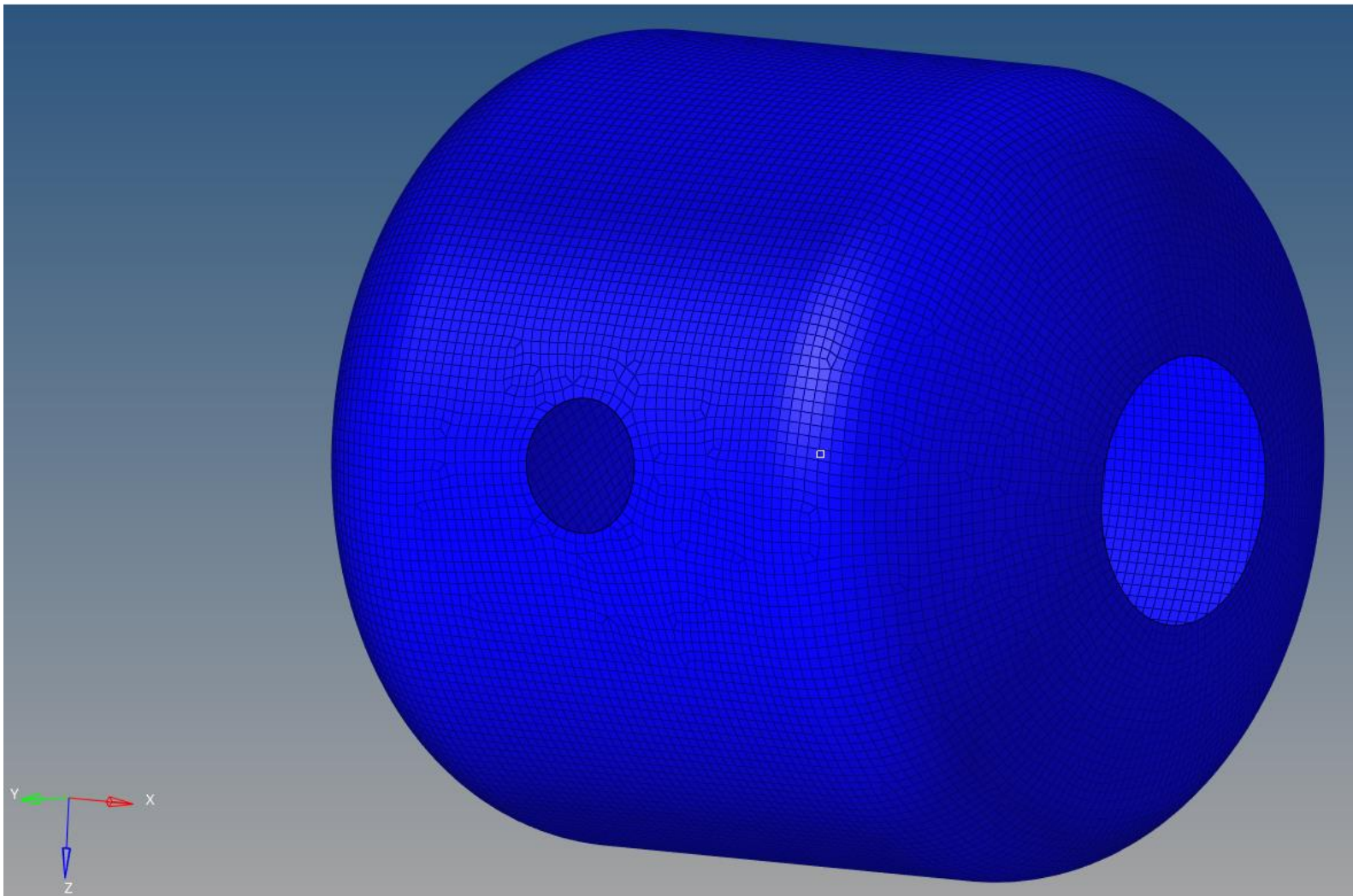


Cadfil is a registered trade mark of Crescent Consultants Ltd

Email: sales@cadfil.com

Web: <http://www.cadfil.com> Technical Doc.

Page 2 of 9



A Simple fixed size auto-mesh of Quads direct from cad data. Export GRID and CQUAD/CTRIA in Nastran Bulk Format (all other Nastran Cards are ignored on Cadfil Import).



Cadfil is a registered trade mark of Crescent Consultants Ltd

Email: sales@cadfil.com

Web: <http://www.cadfil.com> Technical Doc.

Page 3 of 9

Vessel with endcaps

UNITS [mm] Zero Wind Mode

Mandrel Geometry

Help

Cylinder Radius (R1) 907.000

Cylinder Length (L) 1018.000

Left End Cap Right End Cap

1: Torispherical 1: Torispherical

R2 367.000 367.000

R3 1446.000 1446.000

Envelope Geometry

Help

2 Axis Mode

Cylinder Clearance (C1) 50.000

Axial clearance (C2) 200.000

Left Shaft clearance(SL) 200.000

Right Shaft clearance(SR) 200.000

Winding Parameters

Material Data Start RH End Cap Help

Wind Angle (A 0-90) 20.000

Band Width 50.000

Non-Geodesic

End Opening Radius Left 295.000

End Opening Radius Right 115.000

Friction Coefficient 0.200

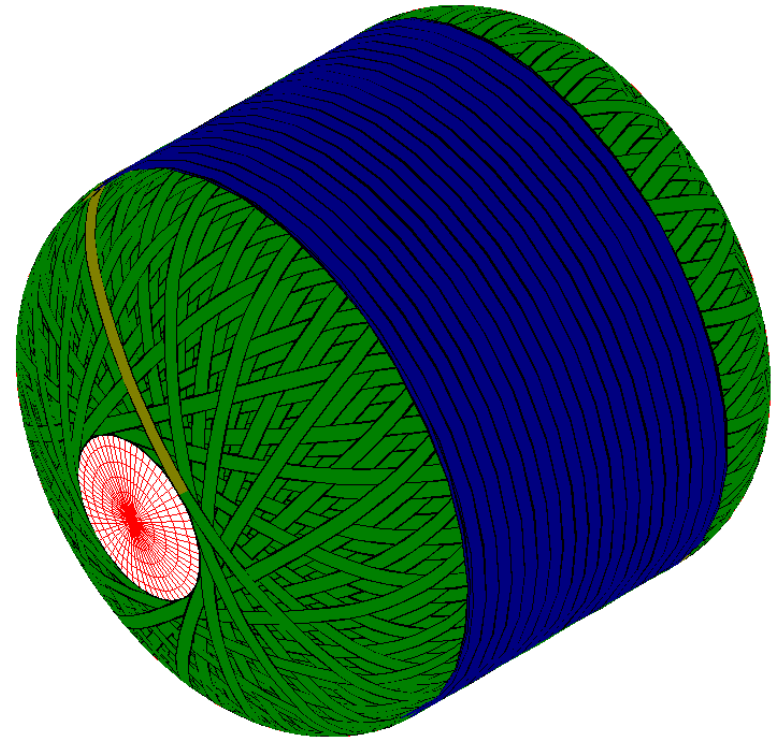
Mandrel Direction +1/-1 1.000

Joining Path

Joining Path End Position 0.000

Joining Path Start Position 0.000

Exit Open Save Create Multi-Hoop Calculate



Multi-Hoop

	Position Number	Position	Initial Dwell (Deg)	UNITS [mm]
Cylinder Radius	001	-484.000	360.000	Pipe Datum X Position
Clearance Radius	002	-484.000	360.000	Pipe Datum Y Position
Fibre Band Width	003	-484.000	0.000	Pipe Datum Z Position
Angular Point Spacing(Deg.)	004	-484.000	0.000	Pipe X Rotation
Mandrel Direction +1/-1	005	-484.000	0.000	Pipe Y Rotation
No. of X positions	006			Pipe Z Rotation
Band Thickness	007			
	008			
	009			
	010			

Open Pg Up Pg Dn Save Calculate Cancel Help

Create the hoop and helical winding layers in Cadfil, there is no limit to the number of layers.



Cadfil is a registered trade mark of Crescent Consultants Ltd

Email: sales@cadfil.com

Web: <http://www.cadfil.com> Technical Doc.

Page 4 of 9

X	R	Angle	t/t0	Slope
-1500.00	0.00000	0.00000	5.00000	89.06143
-509.25000	906.99182	0.00000	5.00000	1.87434
-509.00000	907.00000	0.00000	6.00000	1.87434
509.00000	907.00000	0.00000	6.00000	0.00000
509.25000	906.99182	0.00000	10.00000	-1.87404
1500.000	0.00000	0.00000	10.00000	-89.06159

Minimum Thickness= 6
 Maximum Thickness= 10
 Max/Min Ratio= 1.4
 T0 (Ply Thickness)= 1.0
 MATL_NO=2

If a liner is needed make a thickness table of the liner, this is interpolated by axial position and needs 2 or more data positions to be defined, in this case we have 6 positions as the two domes and cylinder all have difference thicknesses.

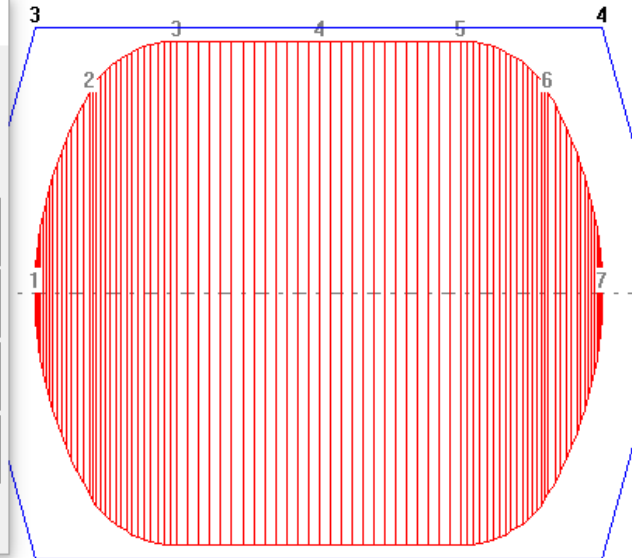
Mandrel (X,R) Data Entry

UNITS [mm]

Mandrel Data No symmetry Point Labels
 Envelope Data X+ End Symmetry Draw Expanded
 X- End Symmetry Spine Mandrel

N	X	R	POINTS	RADIUS
1	-1020.847	0.000	15	1446.000
2	-826.733	723.670	15	367.000
3	-509.000	907.000	12	0.000
4	0.000	907.000	12	0.000
5	509.000	907.000	15	367.000
6	826.733	723.670	15	1446.000
7	1020.847	0.000	0	0.000

Click on line of data to edit



Use the mandrel editor to refine the 'divisions' of the mandrel to create a "master" mandrel for the analysis output. Laminate stacks will be created for each master mandrel slice and then these will be applied to the imported mesh according to the position of the element centre positions.



Cadfil is a registered trade mark of Crescent Consultants Ltd

Email: sales@cadfil.com

Web: <http://www.cadfil.com> Technical Doc.

Page 5 of 9

Cadfil FEA Export Options

Cadfil FEA Export Options

- Nastran BDF Shell/laminates PCOMP
- Nastran BDF 2D Axisymmetric'
- Grid Point/Laminate Table (_PLAM.csv)
- Users Pts/Laminate Table (_PLAM.csv)
- TH2 files Refactored to master mandrel
- Refactored thickness/angle table
- Refactored 2D profiles/angle table
- ESACOMP Full Shell/laminates
- Nastran BDF MAT8 angle-ply table
- Nastran BDF Shell/laminates PCOMPG
- Full SOLID model Nastran BDF (Beta)
- Full SOLID model UNV file (Beta)
- OptiStruct .FEM Full Shell/laminates

FEA Data Output Name: test1fea.par

Master Mandrel Name: xxx01mster.mnd

Thickness File List File: th2files.txt

Output Axis P1: 0.000, 0.000, 0.000

Output Axis P2: 1.000, 0.000, 0.000

Output Axis P3: 0.000, 0.000, 1.000

Output System Scale: 1.000

Elements Per 360: 60

Wind Angle Bin Size: 1.000

Output QUAD4 node Order: 1, 2, 3, 4

Output TRIA3 node Order: 1, 2, 3

4 Plys per layer: YES

Design Pressure: 20.00

SB Allow. Interlam Shear: 10.00

FT Failure Theory:

Open a template with the settings pre-defined for the analysis output required. Define the job name, master mandrel name and the layers list.

Change other parameters as requires to changes units, axes etc.

Click save and then calculate, Pick the name of the mesh to import when asked,

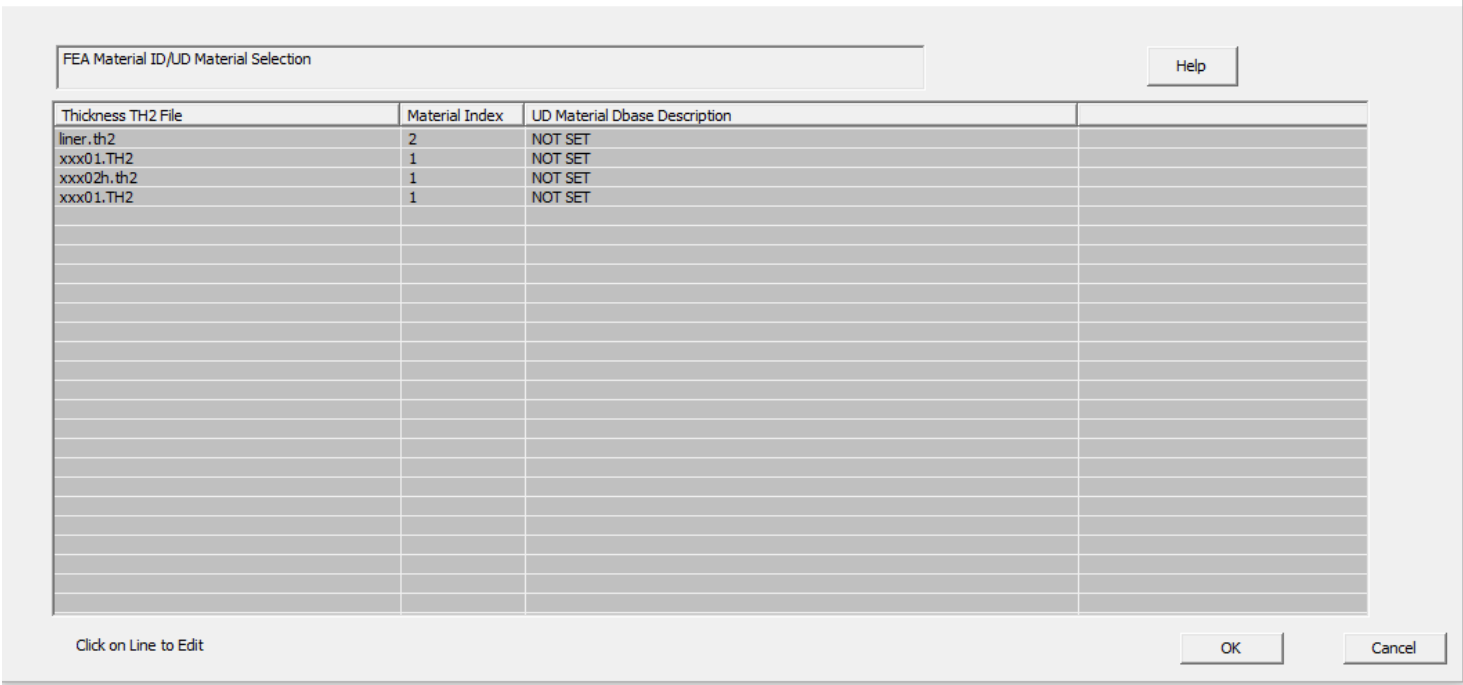


Cadfil is a registered trade mark of Crescent Consultants Ltd

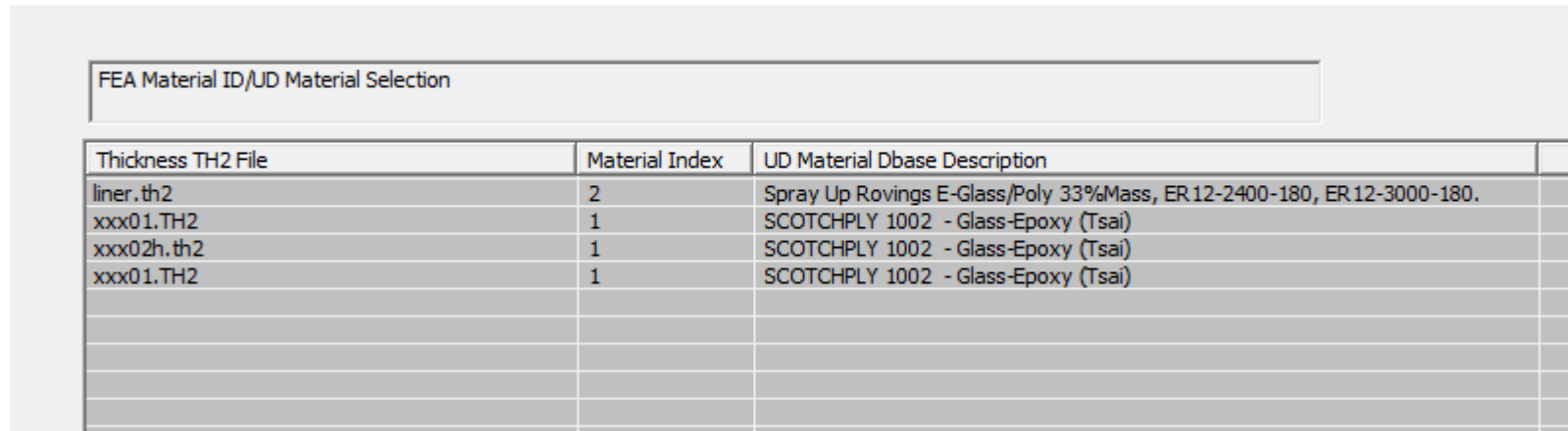
Email: sales@cadfil.com

Web: <http://www.cadfil.com> Technical Doc.

Page 6 of 9



Optionally for each material number defined in the layers you can pick a material from the Cadfil database to set the MAT cards in the output. In this example we have 2 materials an isotropic liner and winding with rovings (a Unidirectional orthotropic material property)

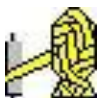
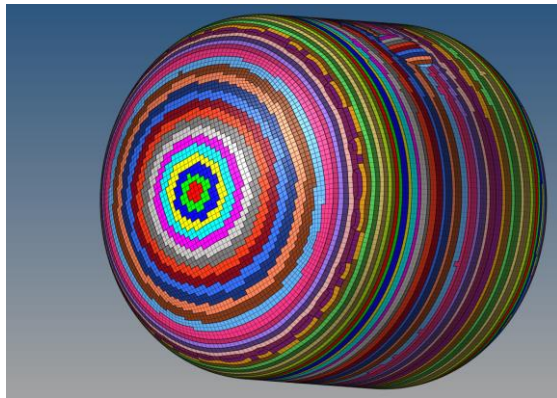
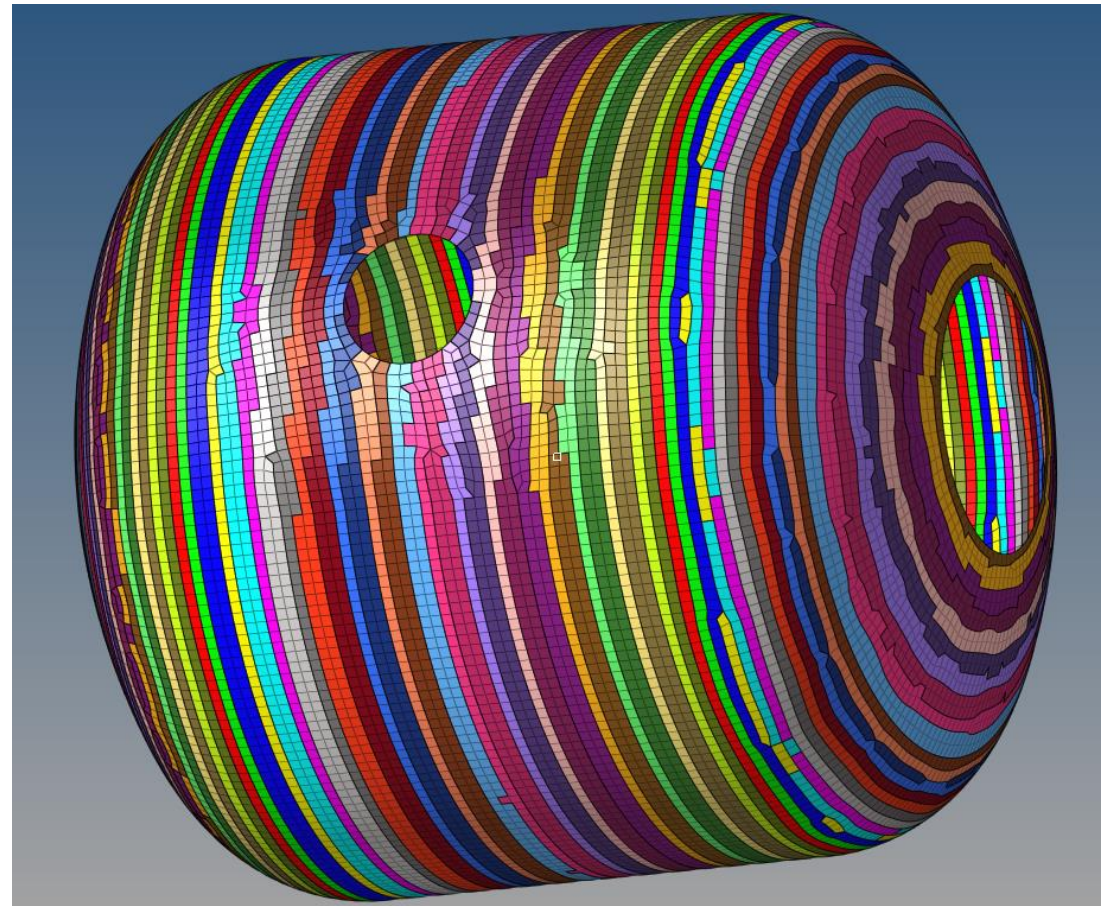


Cadfil is a registered trade mark of Crescent Consultants Ltd

Email: sales@cadfil.com Web: <http://www.cadfil.com> Technical Doc.

Cadfil then Adds Laminate data (material, direction, thickness) and exports Nastran Bulk data. The Pictures show the model coloured by laminate property index after import back into the FE Pre-processor.

The user needs to added loads, boundary conditions and solver/analysis control information to complete the analysis data deck.



Cadfil is a registered trade mark of Crescent Consultants Ltd

Email: sales@cadfil.com

Web: <http://www.cadfil.com> Technical Doc.

Page 8 of 9

PCOMPG_146	146	0
PCOMPG_147	147	0
PCOMPG_148	148	0
PCOMPG_149	149	0
PCOMPG_150	150	0
PCOMPG_151	151	0
PCOMPG_152	152	0
PCOMPG_153	153	0
PCOMPG_154	154	0
PCOMPG_155	155	0
PCOMPG_156	156	0
PCOMPG_157	157	0
PCOMPG_158	158	0
PCOMPG_159	159	0
PCOMPG_160	160	0
PCOMPG_161	161	0
PCOMPG_162	162	0
PCOMPG_163	163	0
PCOMPG_164	164	0
PCOMPG_165	165	0
PCOMPG_166	166	0
PCOMPG_167	167	0
PCOMPG_168	168	0
PCOMPG_169	169	0

GPLYID	MID	T	THETA	SOUT
1	(2) MAT8_2	1.5	0.0	YES
2	(2) MAT8_2	1.5	0.0	YES
3	(2) MAT8_2	1.5	0.0	YES
4	(2) MAT8_2	1.5	0.0	YES
5	(1) MAT8_1	0.302315	19.9283	YES
6	(1) MAT8_1	0.302315	-19.9283	YES
7	(1) MAT8_1	0.302315	-19.9283	YES
8	(1) MAT8_1	0.302315	19.9283	YES
9	(1) MAT8_1	0.6	89.4974	YES
10	(1) MAT8_1	0.6	-89.4974	YES
11	(1) MAT8_1	0.6	-89.4974	YES
12	(1) MAT8_1	0.6	89.4974	YES
13	(1) MAT8_1	0.302315	19.9283	YES
14	(1) MAT8_1	0.302315	-19.9283	YES
15	(1) MAT8_1	0.302315	-19.9283	YES
16	(1) MAT8_1	0.302315	19.9283	YES

This shows a laminate entry on the cylinder part (PCOMPG). Note that the winding has 4 'layers' from Cadfil but for FEA output this is divided into either 2 or 4 plies (+/- angle or +---+ wind angle) per layer.

In this example case plies 1-4 are the liner with material 2, an in-plane isotropic material by chop spray (projection) moulding, plies 5-8 are a low angle helical winding, plies 9-12 are a high angle (hoop/circ wind) and plies 13-16 are again a helical wind. These last three layers are material 1 an orthotropic material with orientation.



Cadfil is a registered trade mark of Crescent Consultants Ltd

Email: sales@cadfil.com Web: <http://www.cadfil.com> Technical Doc.