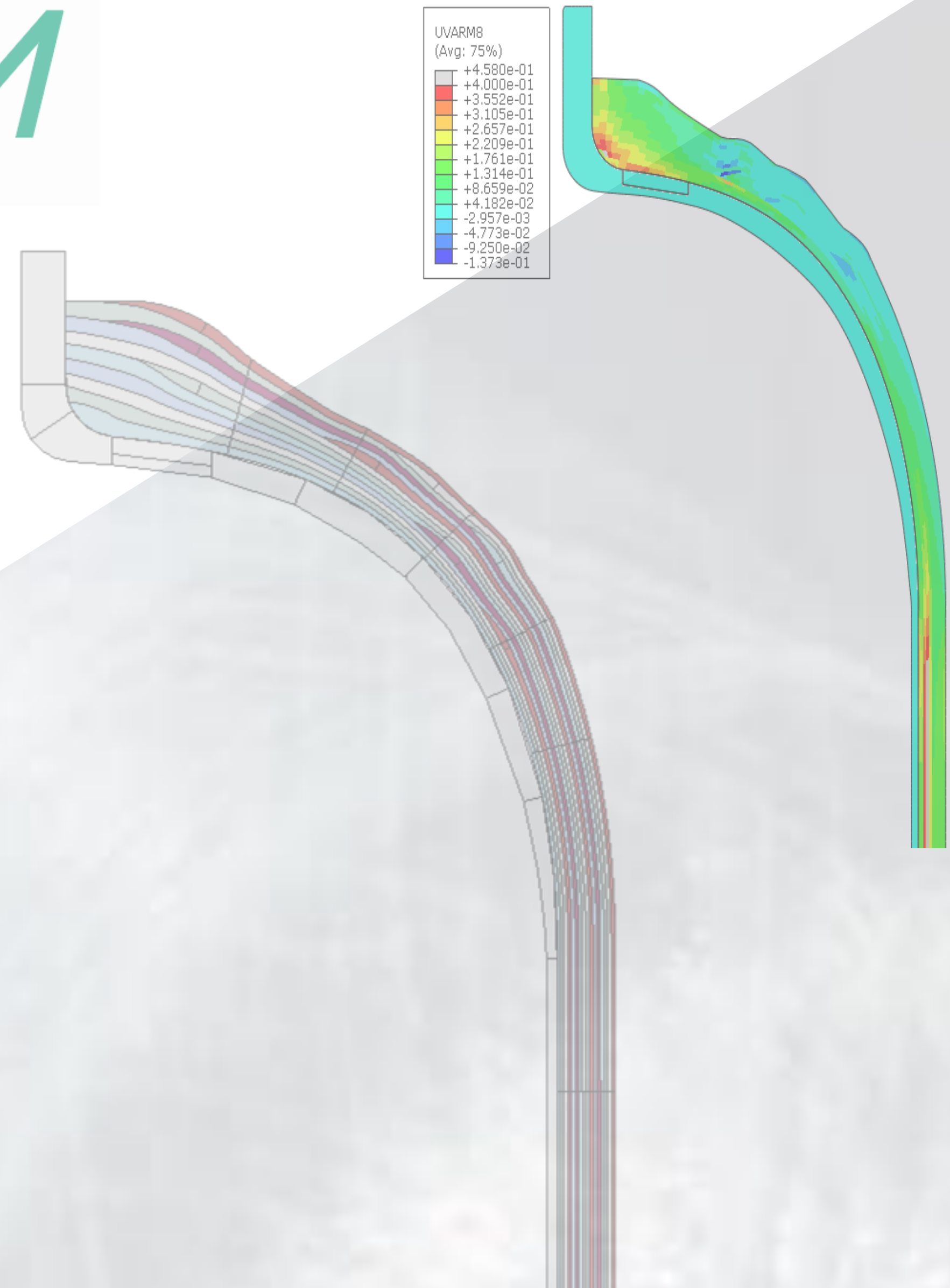
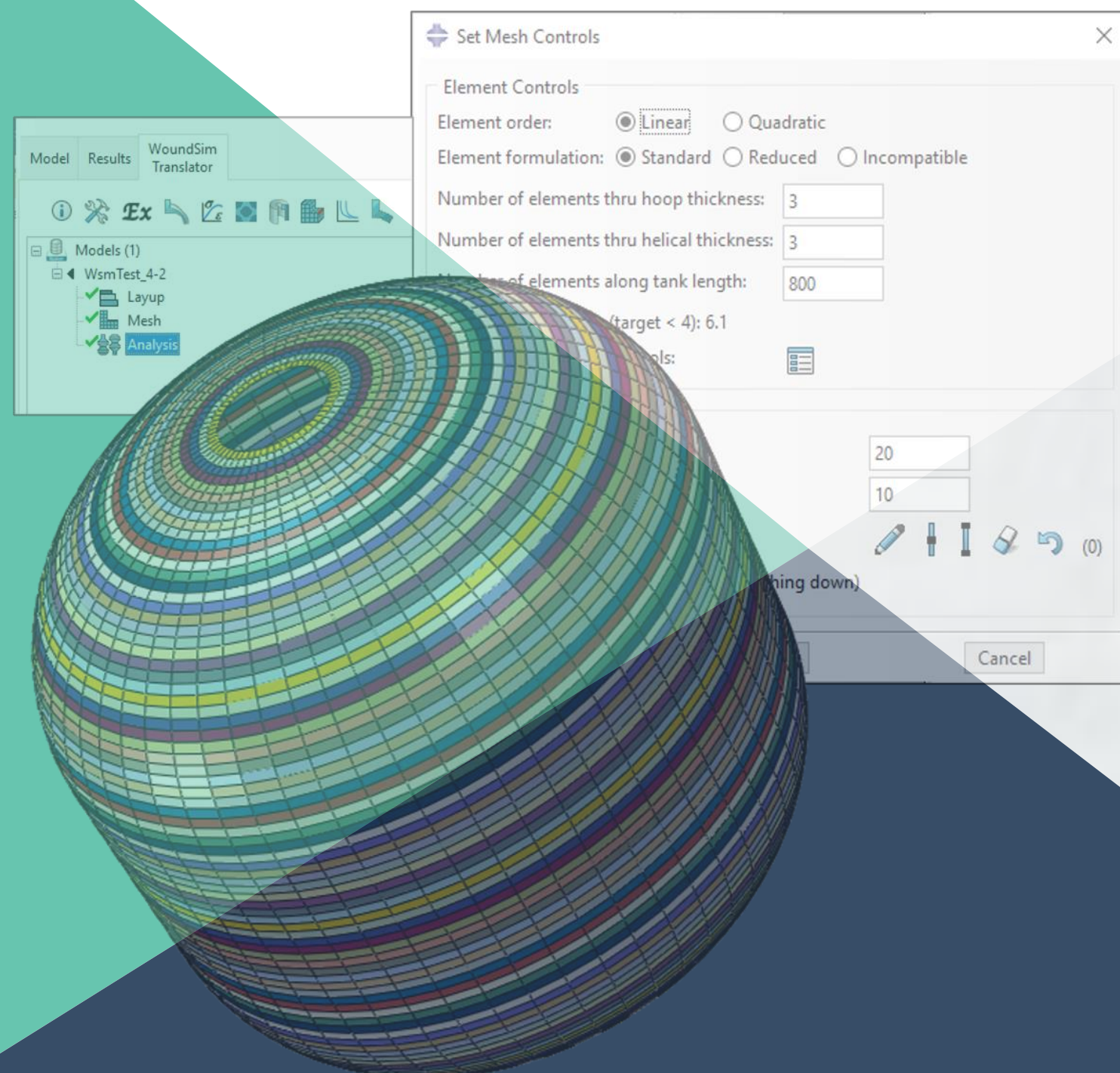


WoundSIM

THE integrated intelligence for composite pressure vessels design and simulation

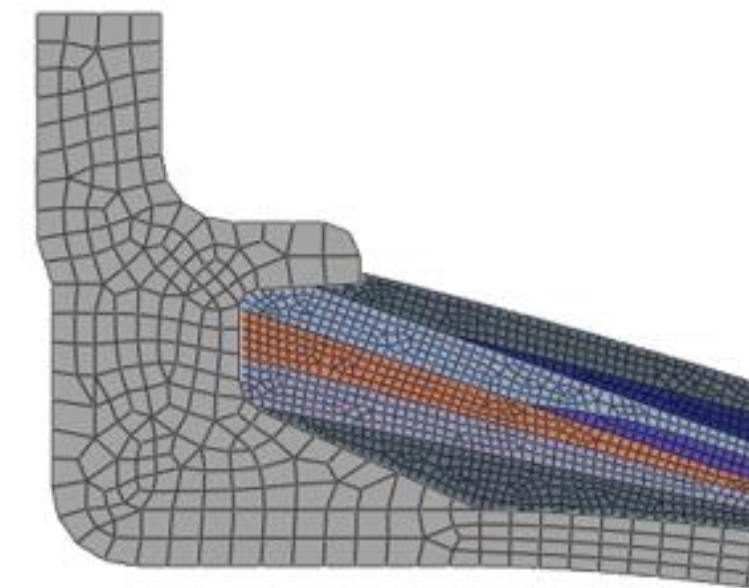
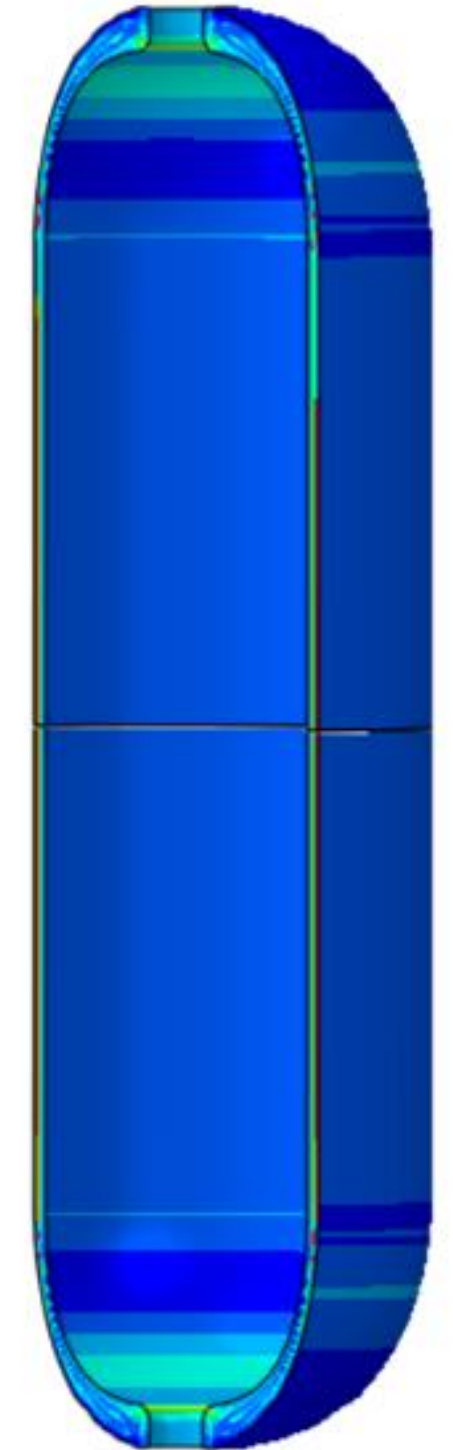
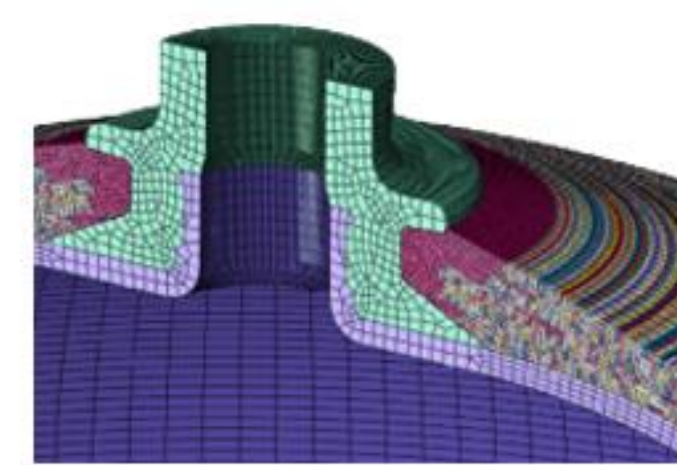
Major Release: WoundSim 2023

Release Notes



WoundSim-2022 Major Release Main New Features

- ✓ New user-friendly **GUI**,
- ✓ Flexible layup construction with advanced **LAYER-BY-LAYER** controls,
- ✓ Support for **DOILIES**,
- ✓ Geometry **SMOOTHING** parameters and tapered layer endcaps,
- ✓ Enhancements to **WIND ANGLES** computation near layer turn-around positions,
- ✓ Abaqus/**EXPLICIT** solver support to model drop tests and high-speed impacts,
- ✓ Enhanced **MESHING** parameters including automatic mesh possibility,



WoundSim Application 2022 R1

File Tools Help

COPV Model * FEA Model Optimization / Correlation

Model Attributes
 Model Name: Model-1
 Working Directory: q_Methodology-Validation\01-Proof-1-Layer

Model Type
☒ Half Model
☐ Full Model

Mandrel

Material

Tank Layers

On	Type	Angle Def	Angle Cylinder	Thickness Cylinder
2	<input checked="" type="checkbox"/>	Helical	Direct	10
3	<input checked="" type="checkbox"/>	Hoop	Direct	90
4	<input checked="" type="checkbox"/>	Helical	Direct	10
5	<input checked="" type="checkbox"/>	Hoop	Direct	90
6	<input checked="" type="checkbox"/>	Helical	Direct	30
7	<input checked="" type="checkbox"/>	Hoop	Direct	90
8	<input checked="" type="checkbox"/>	Helical	Direct	50
9	<input checked="" type="checkbox"/>	Hoop	Direct	90
10	<input checked="" type="checkbox"/>	Helical	Direct	40
11	<input checked="" type="checkbox"/>	Hoop	Direct	90
12	<input checked="" type="checkbox"/>	Helical	Direct	11

Viewer

pan/zoom Legend: Show Hide

Layer Attributes

Material	Roving Width	Roving Thickness	N Rovings	Band Width	Band Thickness	Boss Auto-Connect	Auto-Connect Tol	Boss Connect	Connect Factor	Endcap Def
Material-1	1	0.5	10	10	0.5	<input checked="" type="checkbox"/>	0.5	<input type="checkbox"/>	1.2	By-BW-Fact

Composite Material Outputs

	Total Mass	Resin Mass	Fiber Mass	Roving Length	Band Length
11	150470.52269816666	10532.936588871658	139937.586109295		
	Total Composite Mass	Resin Mass	Fiber Mass	Total Roving Length	Total Band Length
	4759303.865544	333151.270588	4426152.594956		

WoundSIM
 THE Integrated COPV Design,
 Simulation, Optimization and Manufacturing

Explicit Solver Support

Build Composite Part

Tank Geometry (editable)

Space: ☐ Axisymmetric ☒ 3D

Sweep Angle: 180

Axis Point a: (0.0, 0.0, 0.0)

Axis Point b: (0.0, 1.0, 0.0)

Geometry Type: ☒ Continuum ☐ Shell

Analysis Controls (editable)

Analysis Procedure:

☐ Static

☐ Heat-Transfer

☐ Coupled Temp-Displacement

☒ Dynamic, Explicit

☐ Dynamic, Temp-Displacement

Composite Layout (not editable)

Tank shape: ☒ Full tank ☐ Half tank

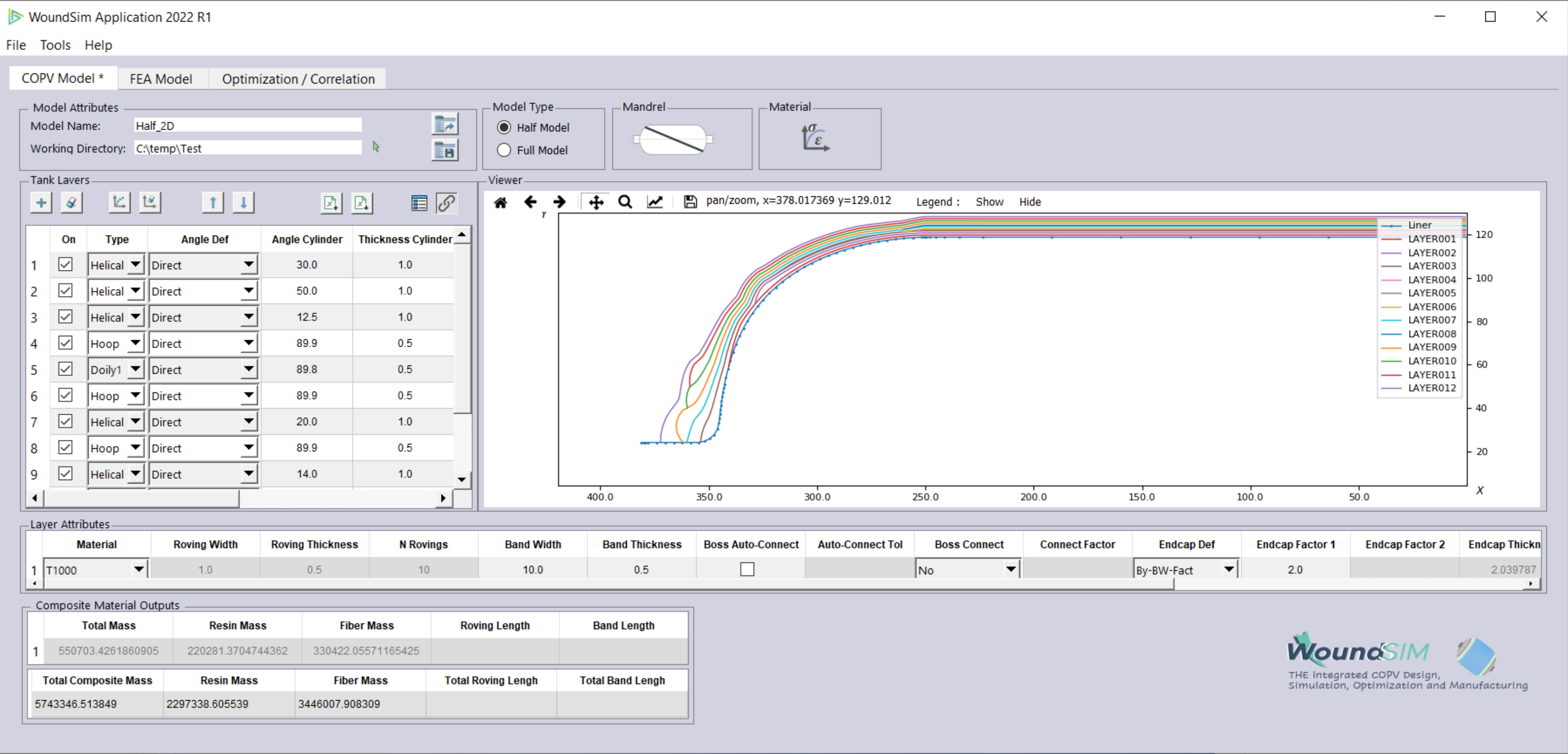
Import...

Active	Layer Num	Layer Type	Material	Thick	Band Width	Top Wind Angle	Bottom Wind Angle
✓	1	Helical	Kevlar	0.2	5.0	8.0	8.0
✓	2	Helical	Kevlar	0.2	5.0	8.0	8.0
✓	3	Helical	Kevlar	0.2	5.0	8.0	8.0
✓	4	Helical	Kevlar	0.2	5.0	8.0	8.0
✓	5	Helical	Kevlar	0.2	5.0	8.0	8.0
✓	6	Helical	Kevlar	0.2	5.0	15.0	15.0
✓	7	Helical	Kevlar	0.2	5.0	15.0	15.0
✓	8	Helical	Kevlar	0.2	5.0	20.0	20.0
✓	9	Helical	Kevlar	0.2	5.0	20.0	20.0
✓	10	Helical	Kevlar	0.2	5.0	25.0	25.0
✓	11	Helical	Kevlar	0.2	5.0	25.0	25.0
✓	12	Helical	Kevlar	0.2	5.0	30.0	30.0
✓	13	Helical	Kevlar	0.2	5.0	30.0	30.0
✓	14	Helical	Kevlar	0.2	5.0	35.0	35.0
✓	15	Helical	Kevlar	0.2	5.0	35.0	35.0

OK Apply Cancel

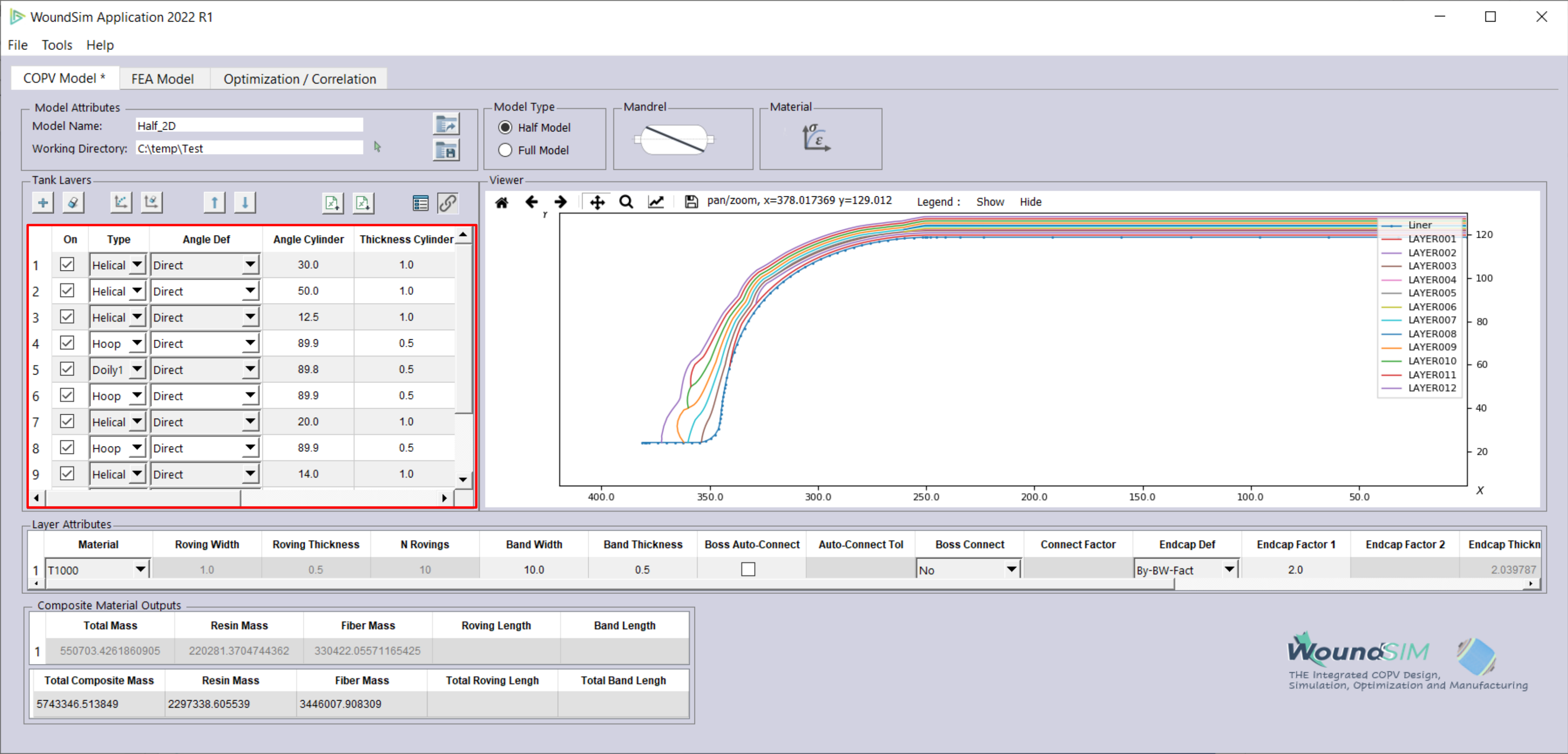
What's New In WoundSim 2022

✓ New user-friendly **USER INTERFACE**



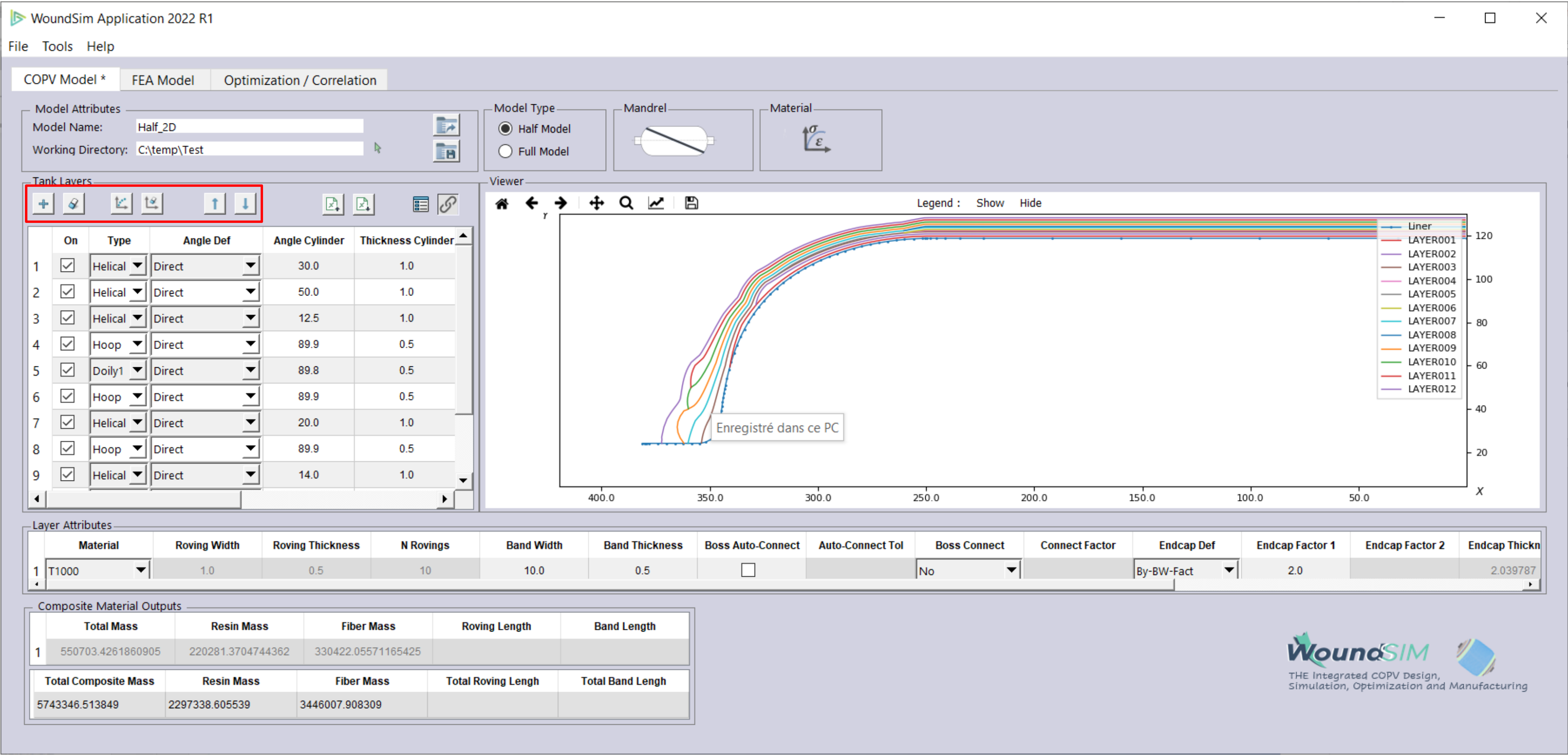
What's New In WoundSim 2022

✓ New **LAYOUT-TABLE** with additional features



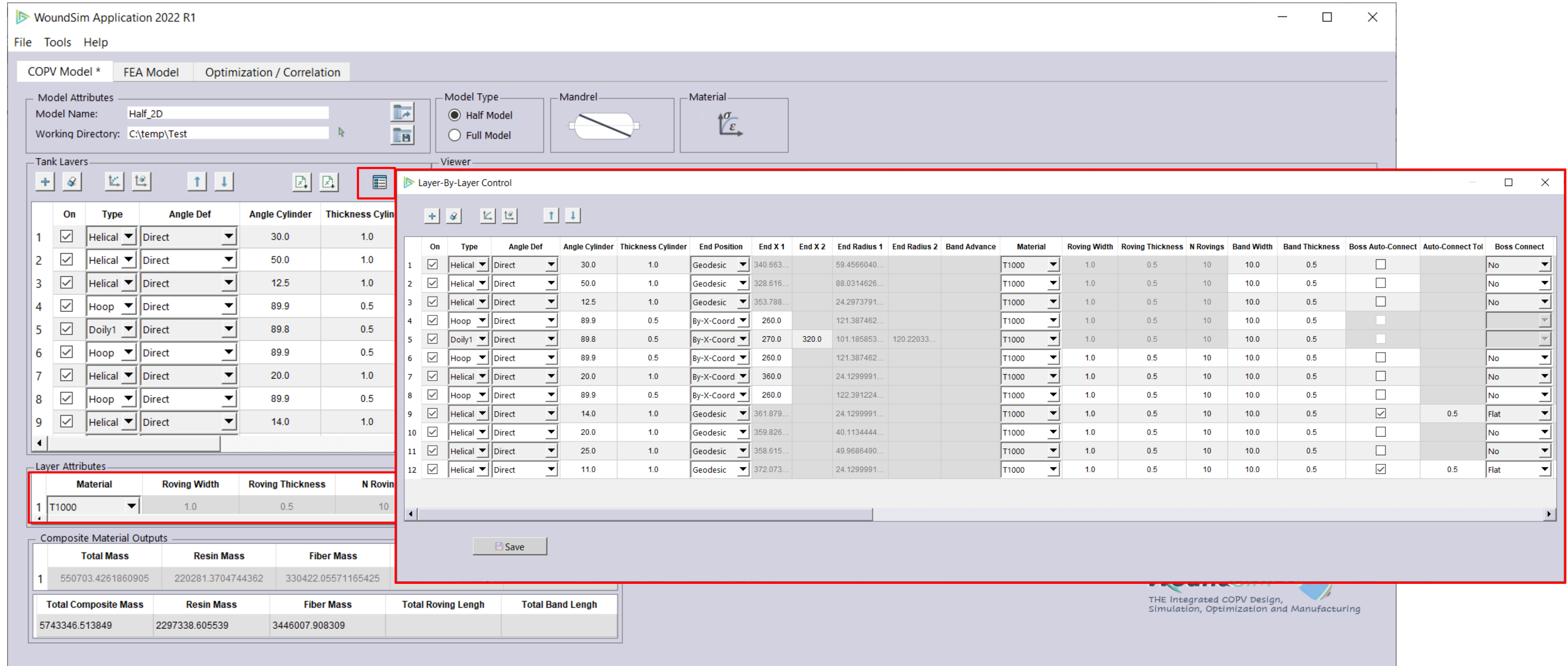
What's New In WoundSim 2022

✓ New **LAYERS CONTROLS**



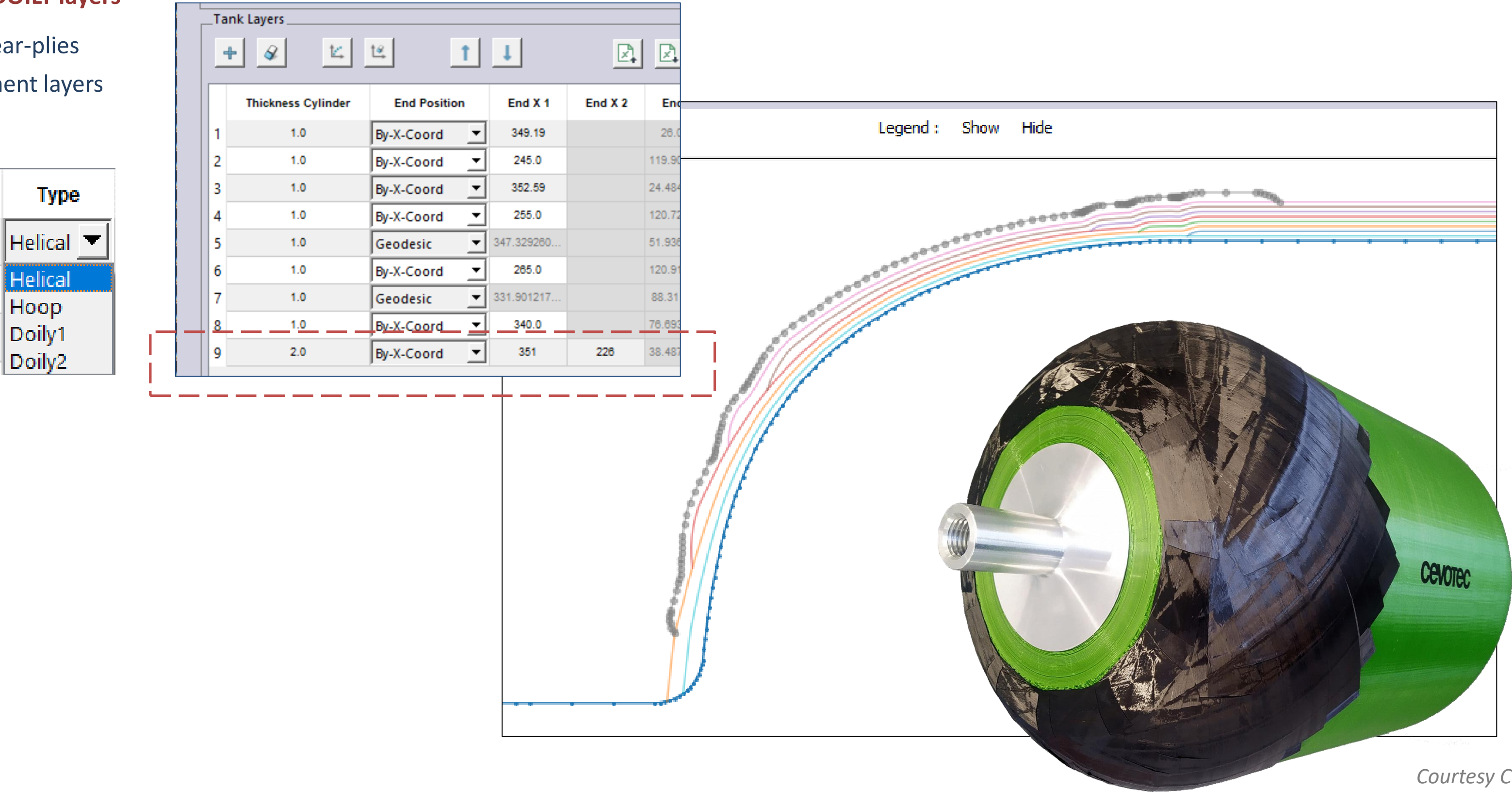
What's New In WoundSim 2022

- ✓ Flexible layup construction with advanced **LAYER-BY-LAYER** controls



What's New In WoundSim 2022

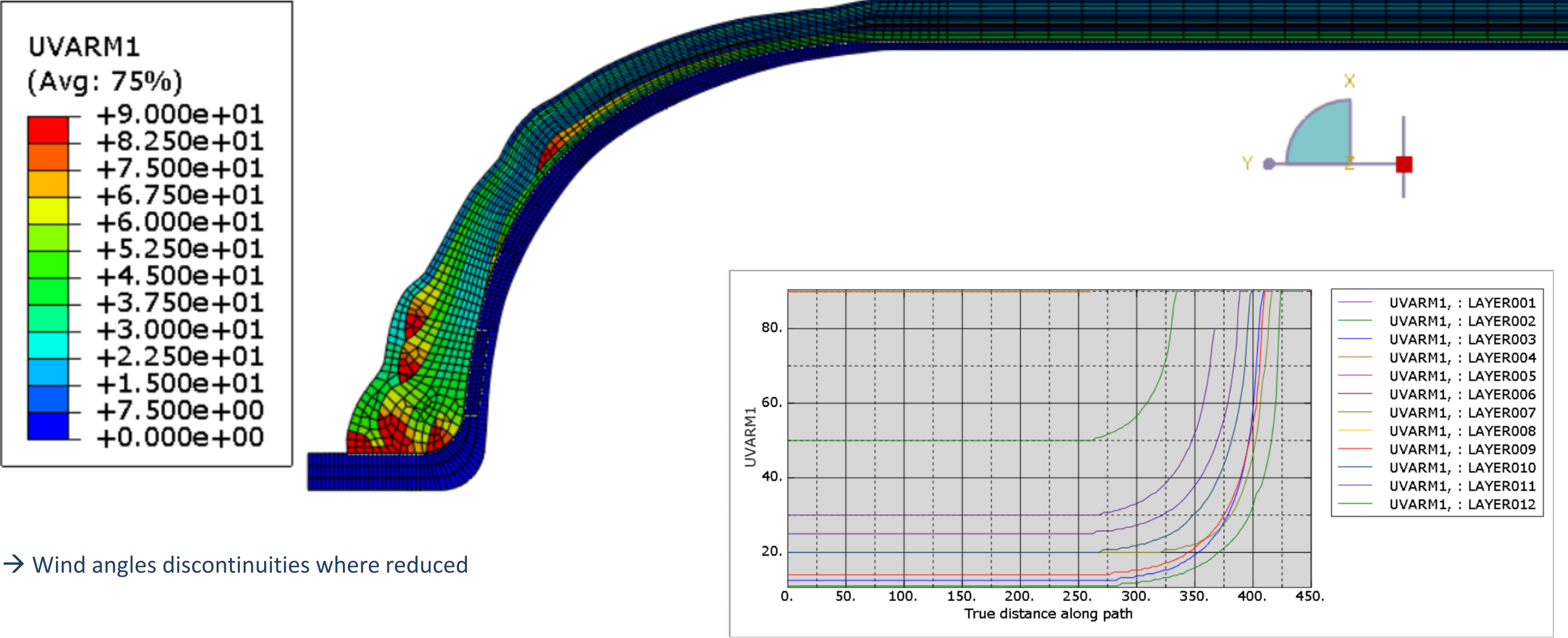
- ✓ Support for **DOILY** layers
 - Rubber shear-plies
 - Reinforcement layers



Courtesy Cevotec

What's New In WoundSim 2022

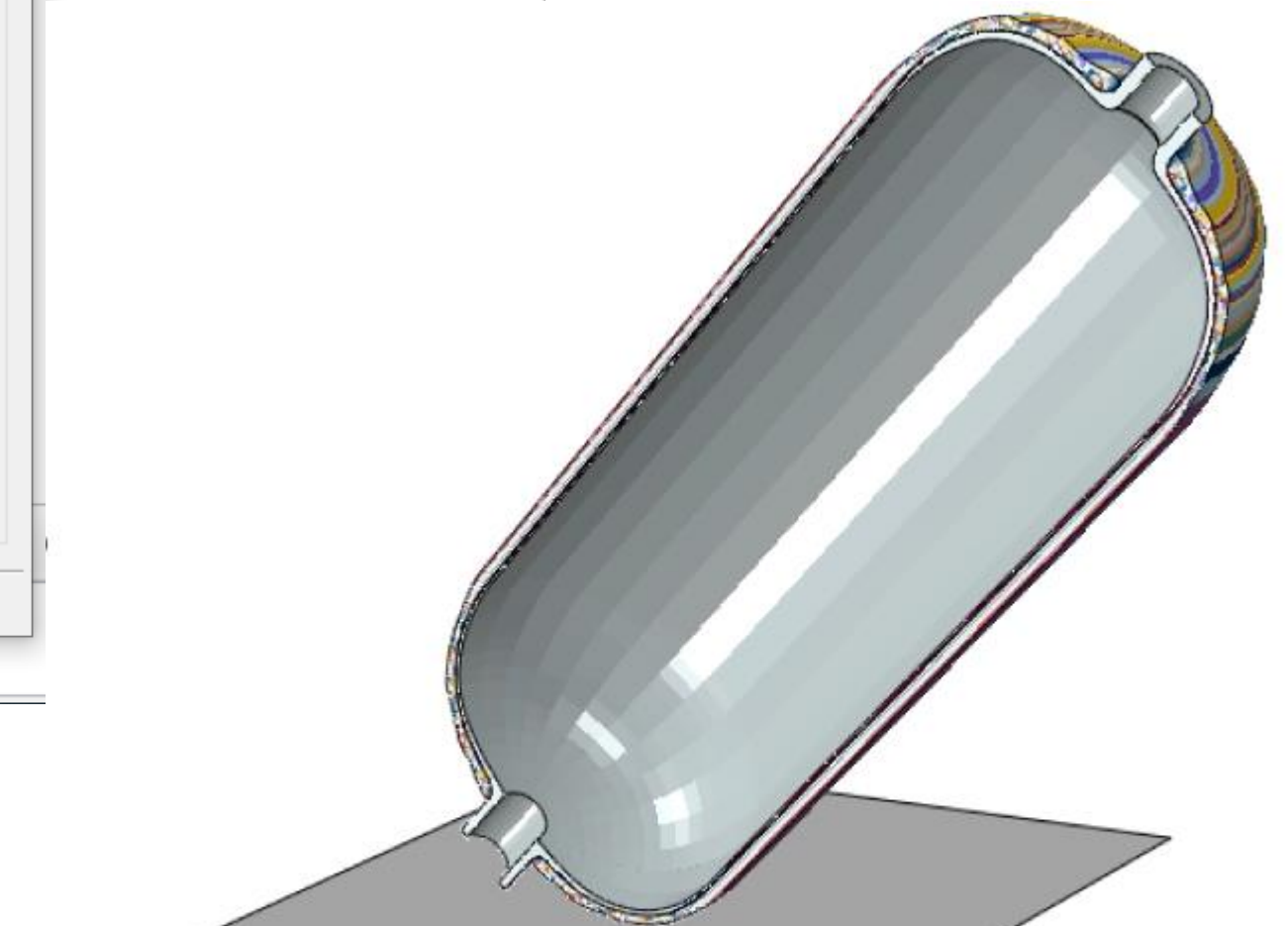
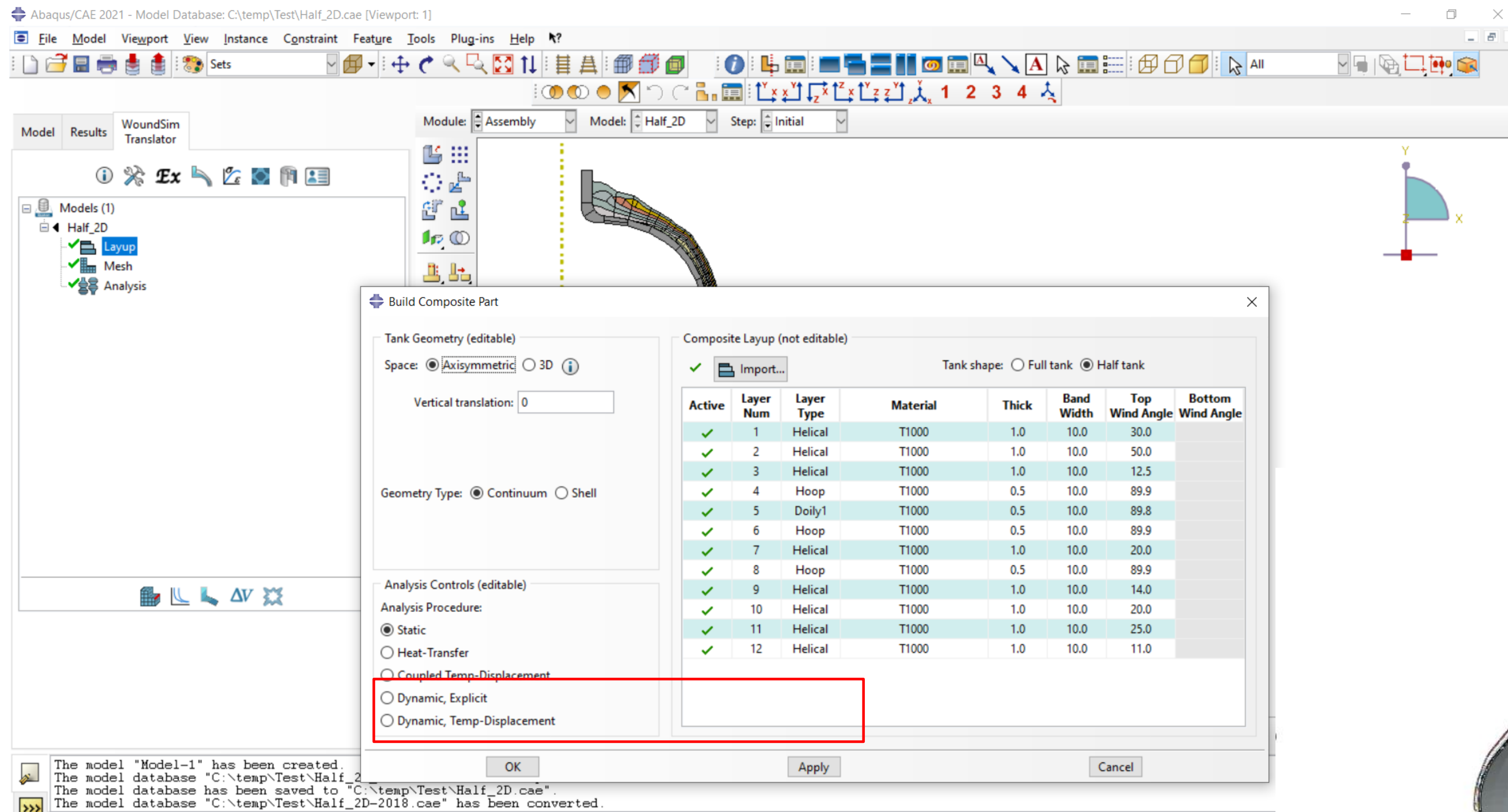
- ✓ Enhancements to **WIND ANGLES** computation near layer turn-around positions



→ Wind angles discontinuities where reduced

What's New In WoundSim 2022

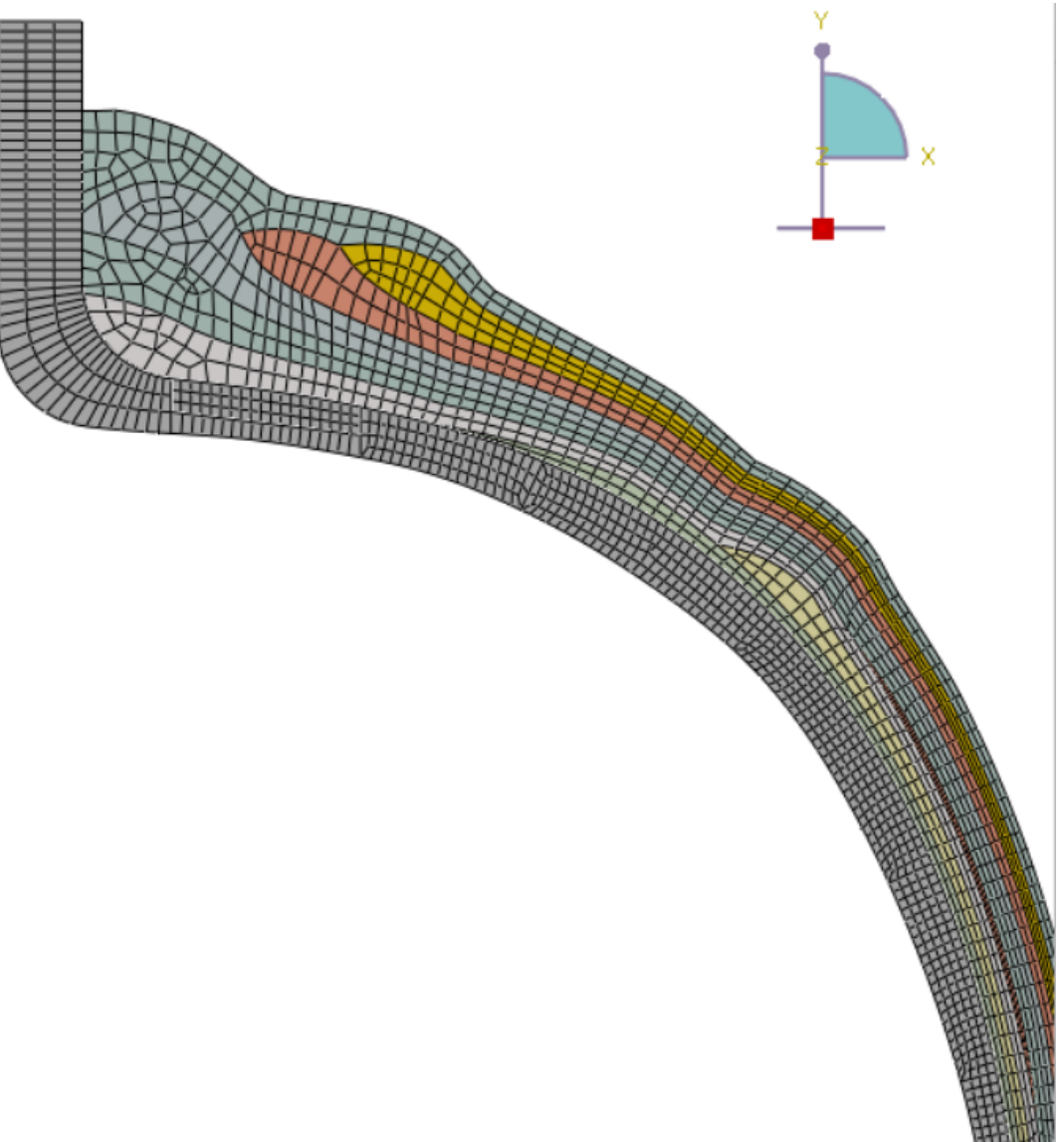
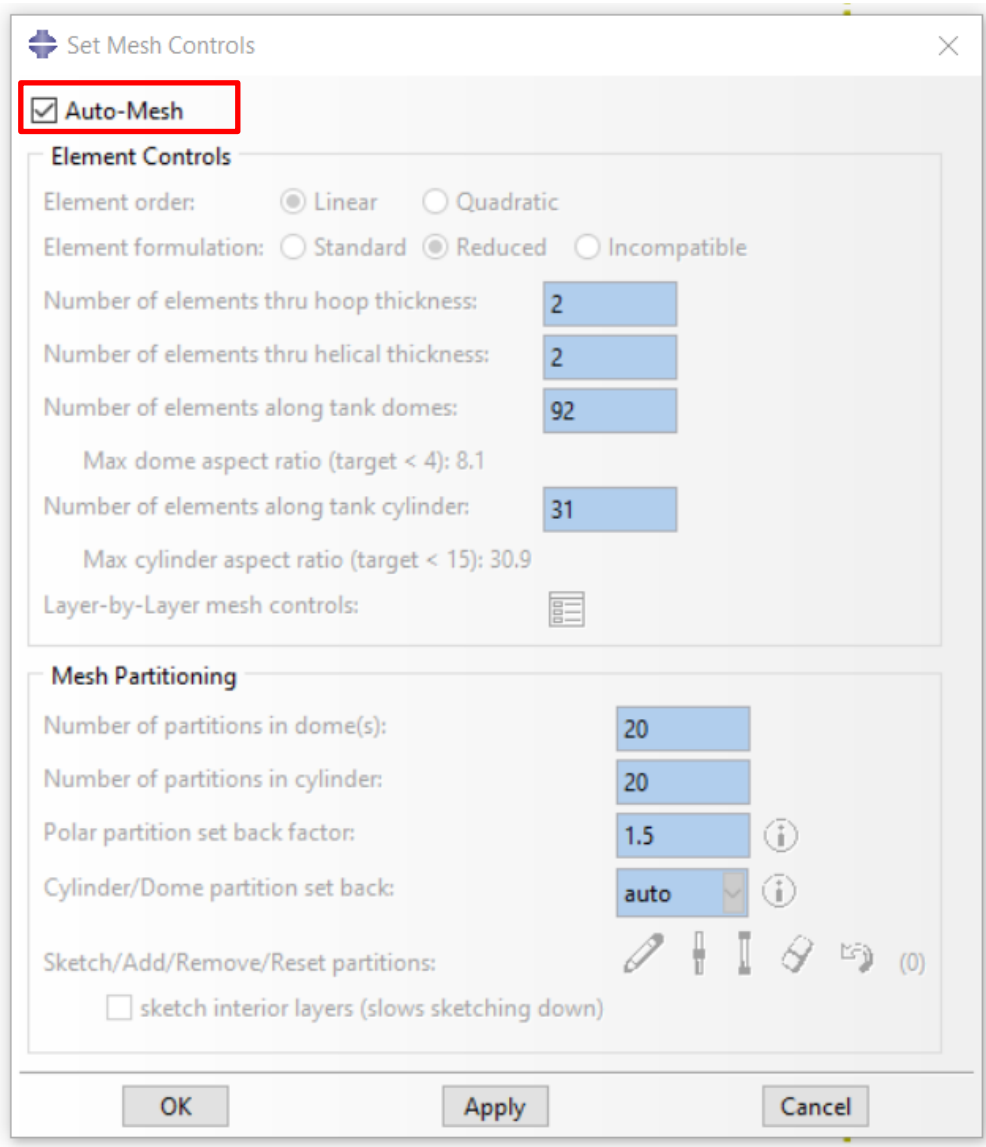
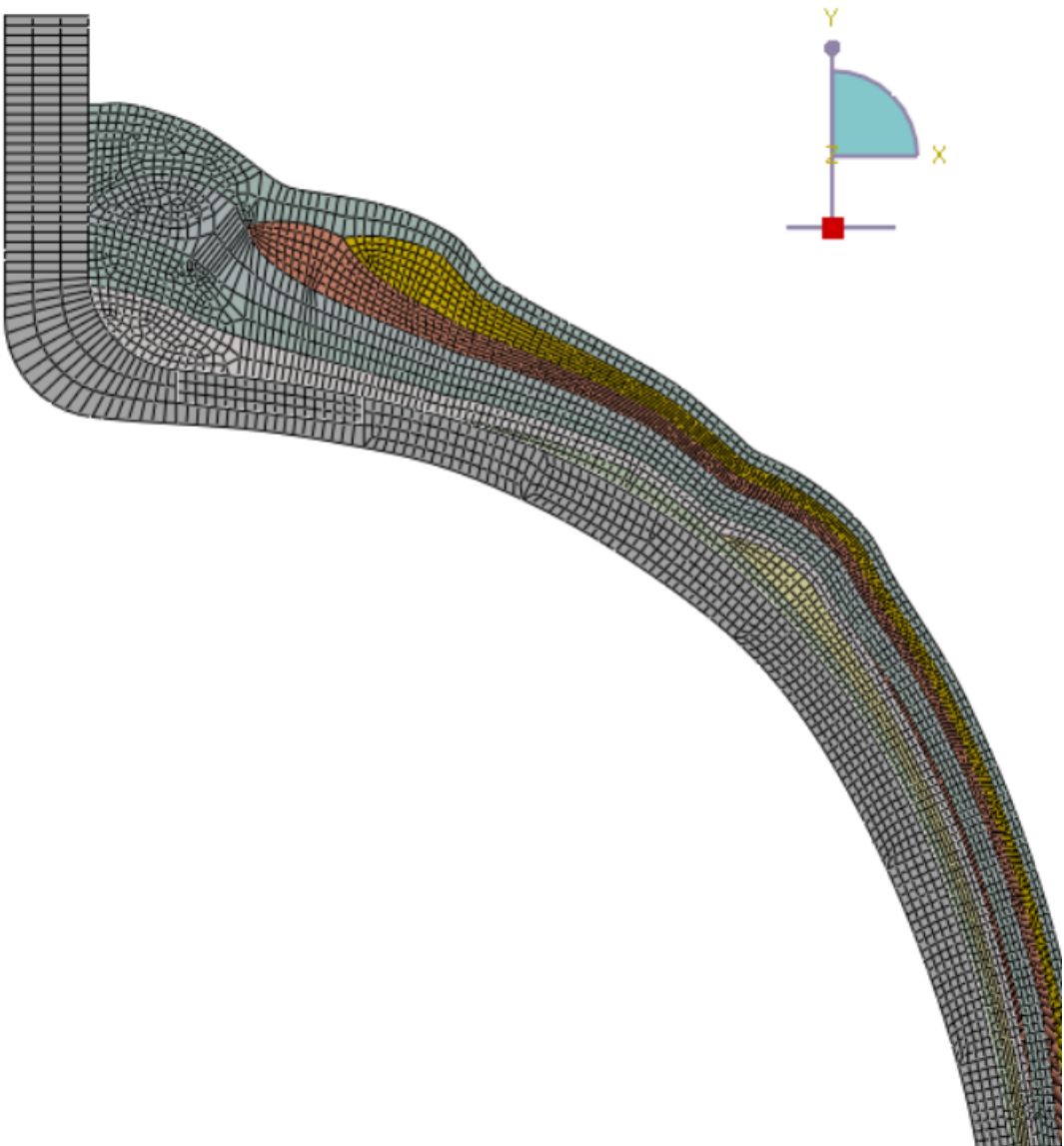
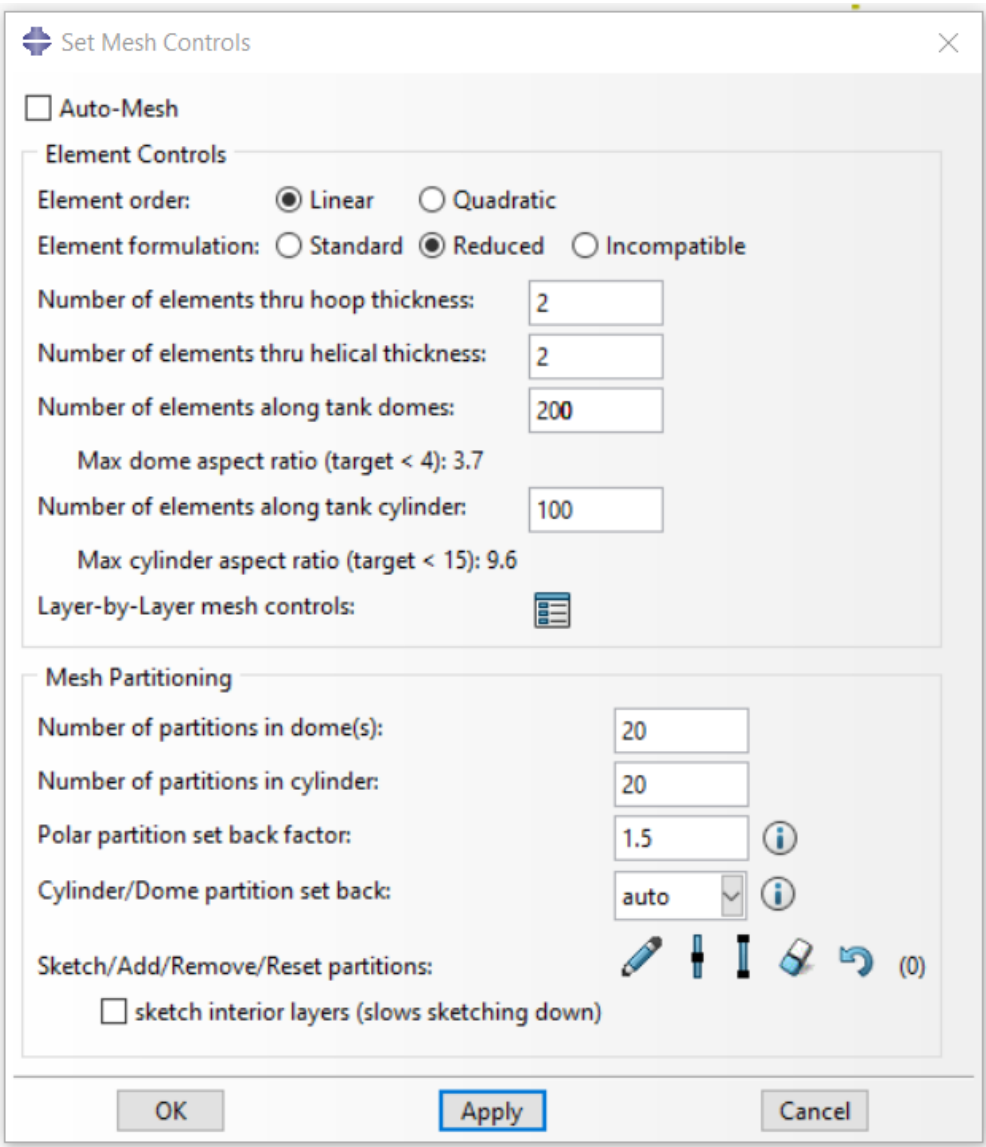
- ✓ **Abaqus/EXPLICIT** solver support to model drop tests and high-speed impacts



WoundSim Analysis
ODB: Workshop-4_3.odb Abaqus/Explicit 2022 Tue Nov 15 21:10
Step: Impact
Increment 34063: Step Time = 2.4501E-03

What's New In WoundSim 2022

✓ Enhanced **MESHING** parameters including automatic mesh possibility



What's New In WoundSim 2022

✓ Few **ADDITIONAL** Features

New Helical Layers **END-POSITION** possibilities

End Position

Geodesic

Geodesic

By-X-Coord

By-Radius

NON-SYMMETRIC Wing Angles



Angle Cylinder 1	Angle Cylinder 2
30.0	40

New Hoop Layers **ANGLE-DEFINITION** possibilities

Angle Def

Direct

Direct

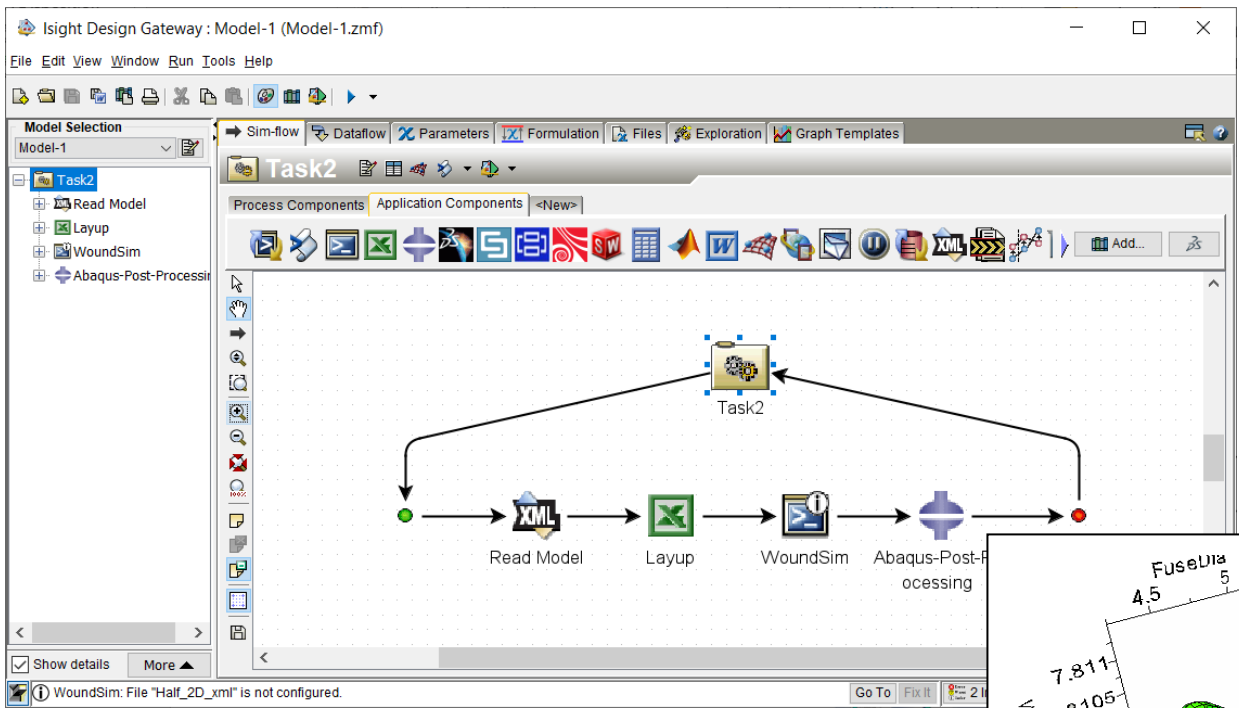
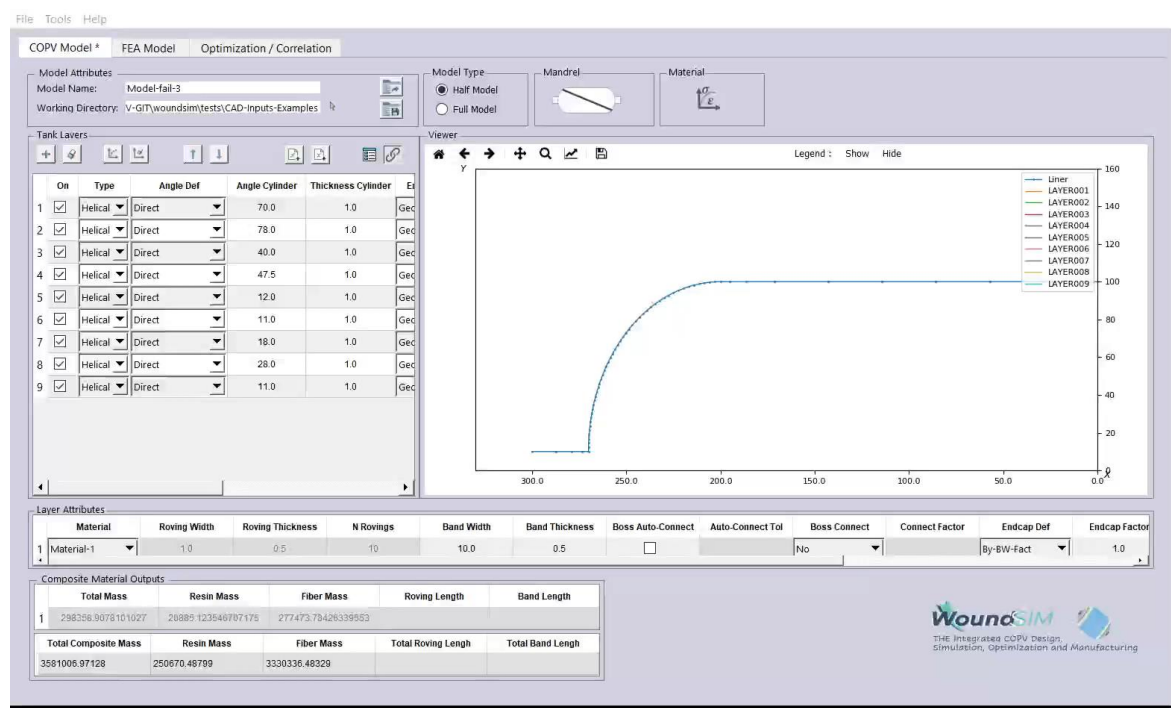
By-Band-Advance

Composite Material **OUTPUTS**

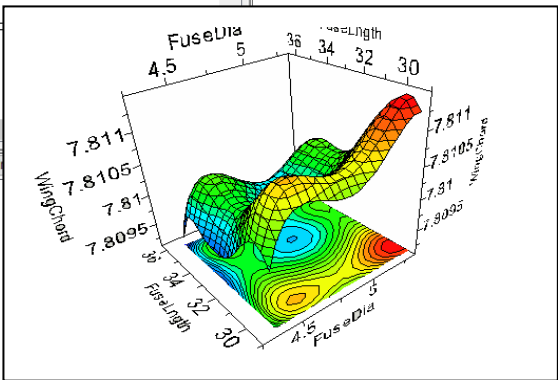
Composite Material Outputs					
	Total Mass	Resin Mass	Fiber Mass	Roving Length	Band Length
1	550703.4261860905	220281.3704744362	330422.05571165425		
Total Composite Mass		Resin Mass	Fiber Mass	Total Roving Lengh	Total Band Lengh
5743346.513849		2297338.605539	3446007.908309		

What's New In WoundSim 2022

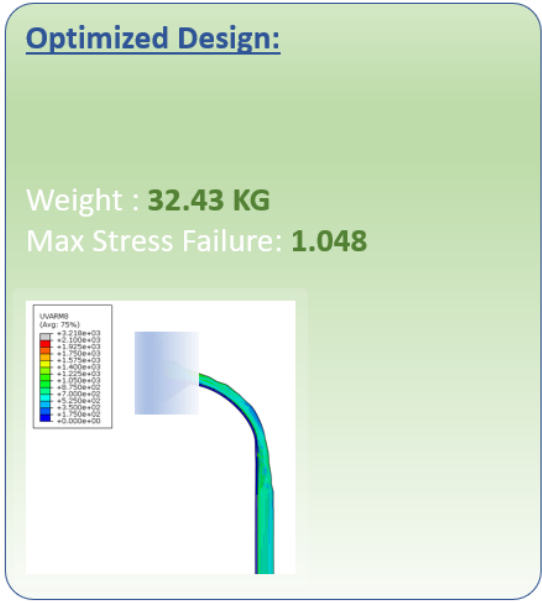
- Additional to the embedded Optimization based on the DOF technique, the **COMMAND LINE** interface allows now be run WoundSim in a fully automated way with a simple command line and input parameters,
 - WoundSim models are now compatible with optimization software (e.g., SIMULIA Isight)
 - Meta-Models (Response Surface) of the tank can then be generated and used for advanced design/optimization/correlation procedures



Command Line Interface:
buildWsModelFromInputFiles
buildAbaqusModelFromInputFiles



10% Weight reduction
Optimization
Performance Increase





**THE integrated intelligence for composite pressure vessels
design and simulation**

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