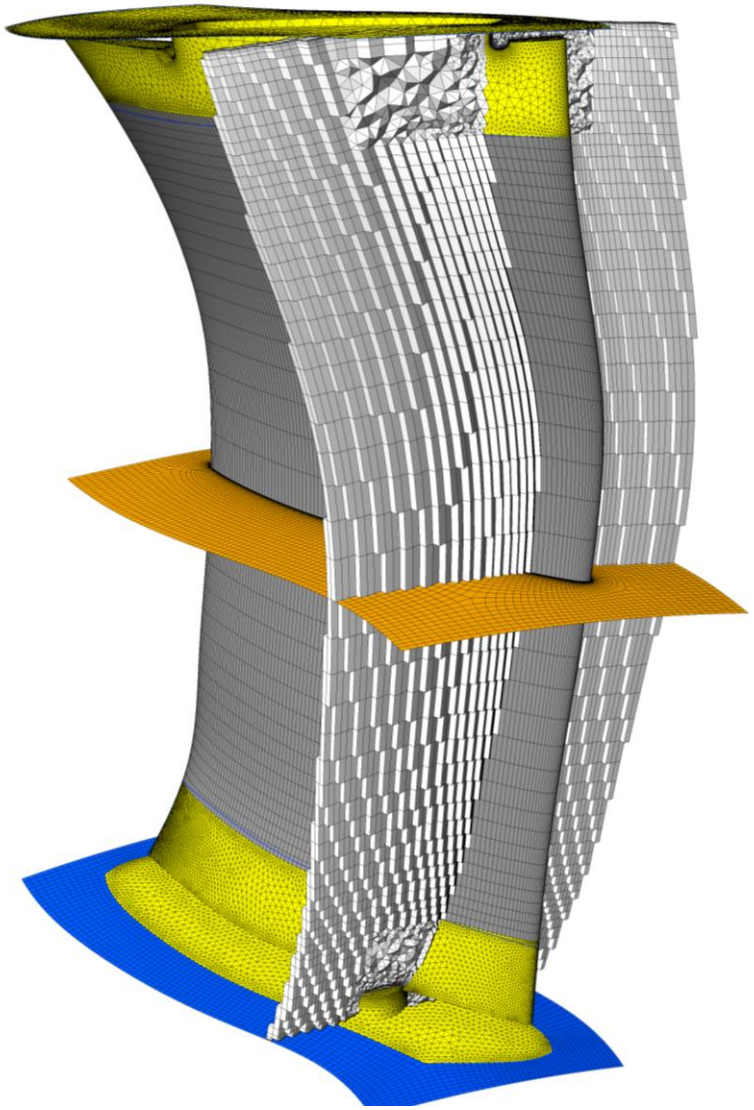
Release 2022 R1 Highlights
CFX and Turbo Tools

Ansys

TurboGrid Hybrid Meshing

Reduce your meshing time for high fidelity blade geometry from hours/days with full block-structured mesh to minutes with TurboGrid hybrid meshing

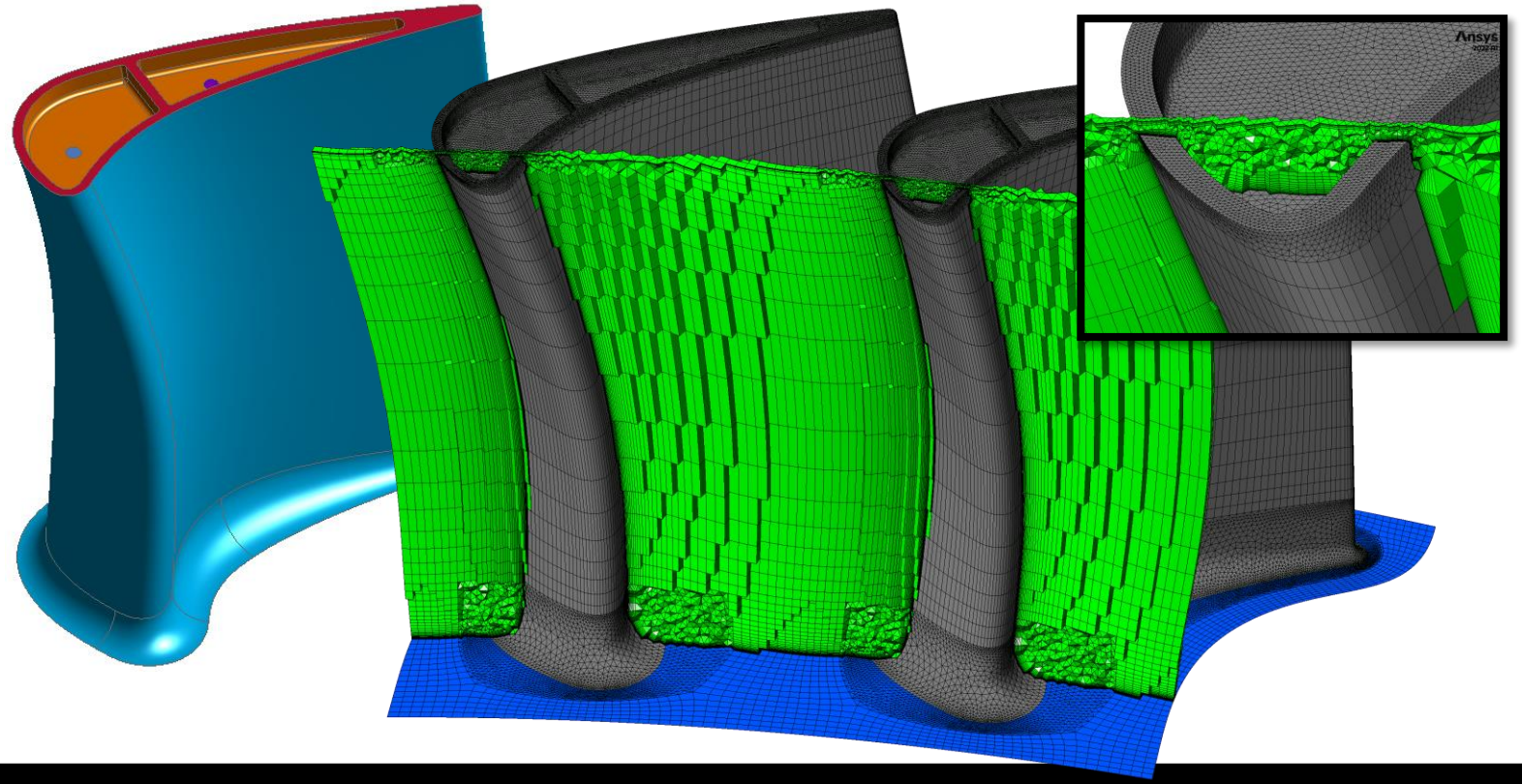


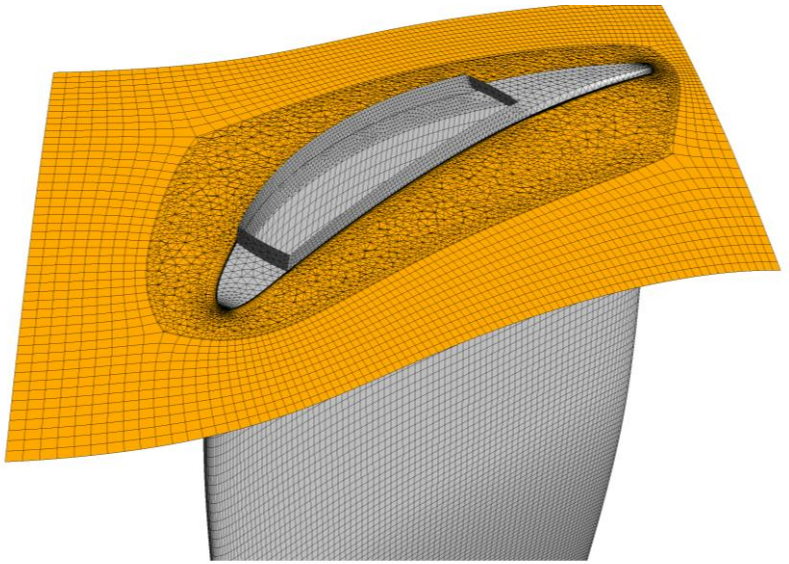
Hybrid meshing provides automated meshing for detailed turbomachinery blade design

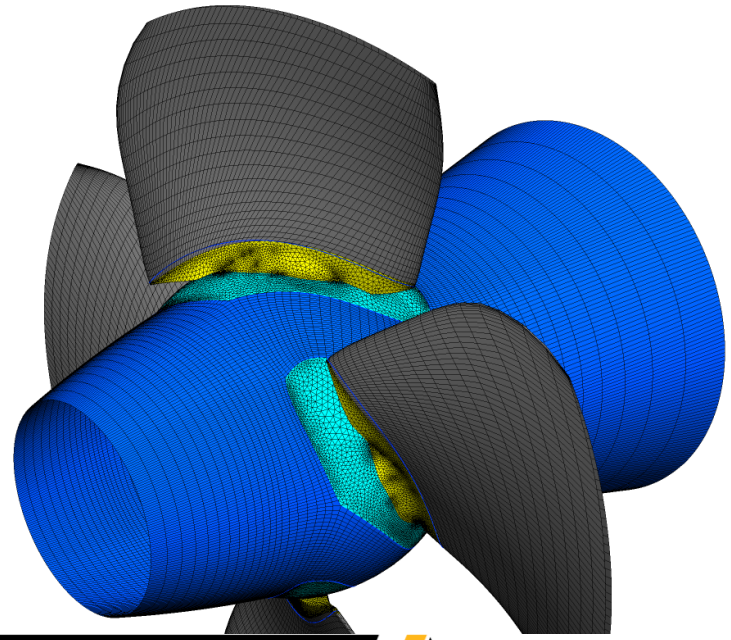
- Fully automated, repeatable meshing process to mesh low and high-fidelity blade geometry in one batch operated session
- 1 - 1 mesh connectivity between pure hex and hybrid meshing parts
- Preserves mostly block-structured hex elements
- Operates on a single *Global Mesh Size* parameter
- Self-similar meshes – the hex mesh topology is retained during mesh refinement studies to minimize solution differences

TurboGrid Hybrid Meshing

- Supports partial tip/hub gaps including buttons for inlet guide vanes (IGVs) & variable guide vanes (VGVs)
- Can be used to capture other features on rounded blades



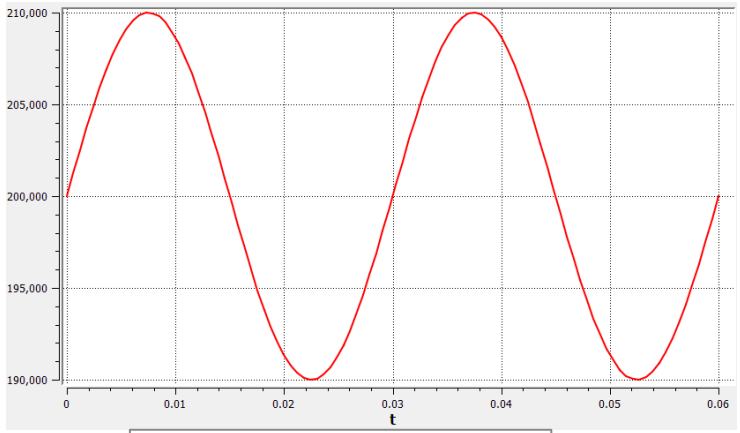




CFX

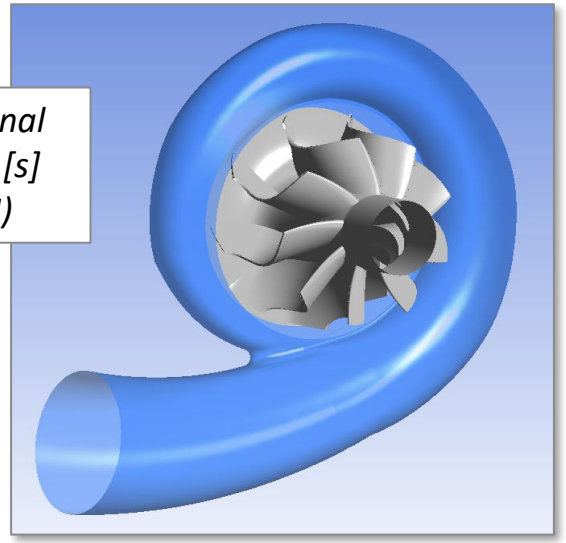
Harmonic Analysis accelerates turbocharger turbine durability analysis by >100X

- Turbocharger turbines are subject to exhaust gas pulses that are at a much lower frequency compared to the turbine rotation speed
- Calculating transient force variation on the blades is important for structural durability analysis
- Due to the different timescales, transient simulations are extremely costly
- Harmonic Analysis in 2022 R1 compresses the simulation time to only a few hundred solver iterations – ***more than 100x faster than a transient simulation***



Inlet pressure pulse period = 0.03 [s]

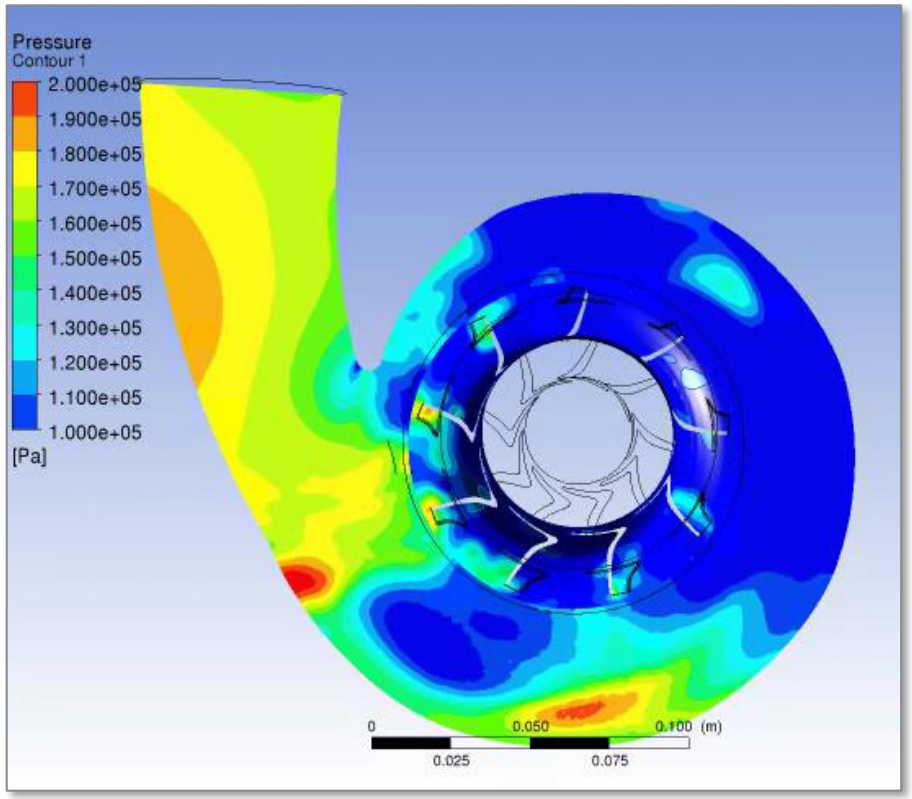
Turbine rotational period = 0.001 [s] (60,000 RPM)



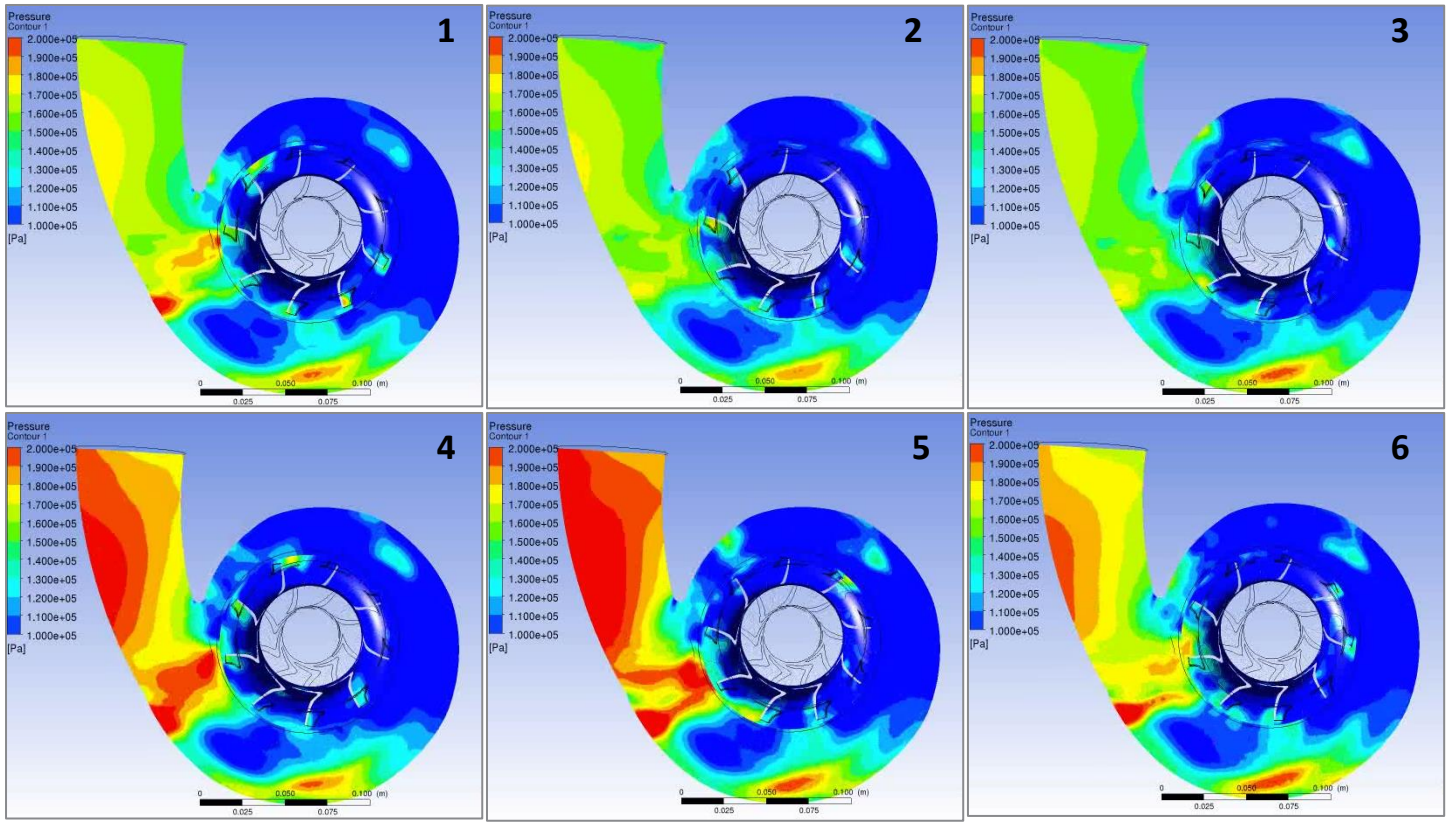
Turbine geometry courtesy of PCA Engineering

30x difference in turbine timescale and inlet pulse timescale makes transient simulations costly

Harmonic Analysis captures transient behavior for turbocharger turbines



Animation of inlet pulse captured with Harmonic Analysis

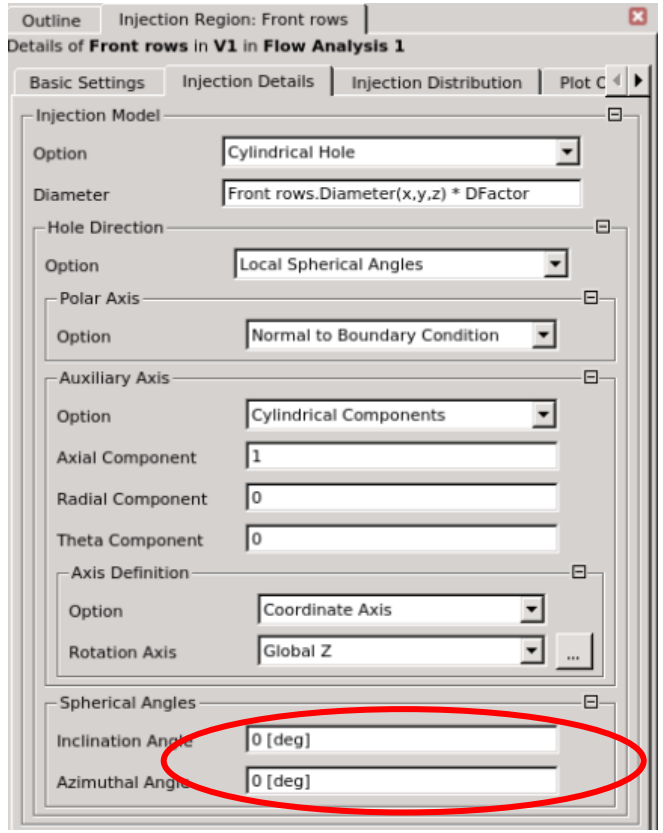


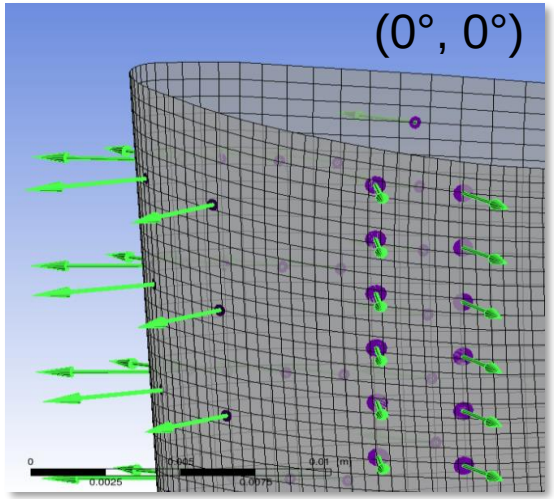
Evolution of pressure during inlet pulse cycle

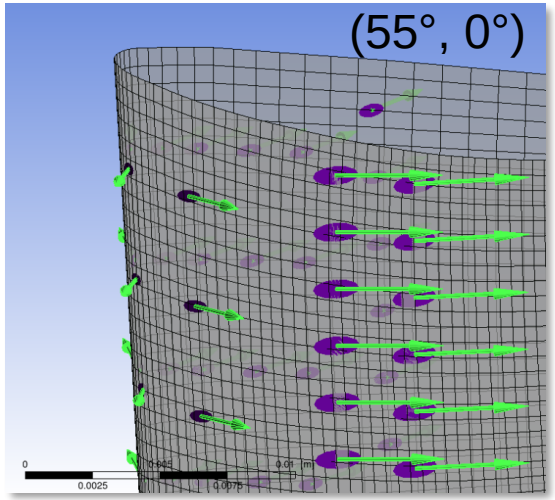
Geometry courtesy of PCA Engineering

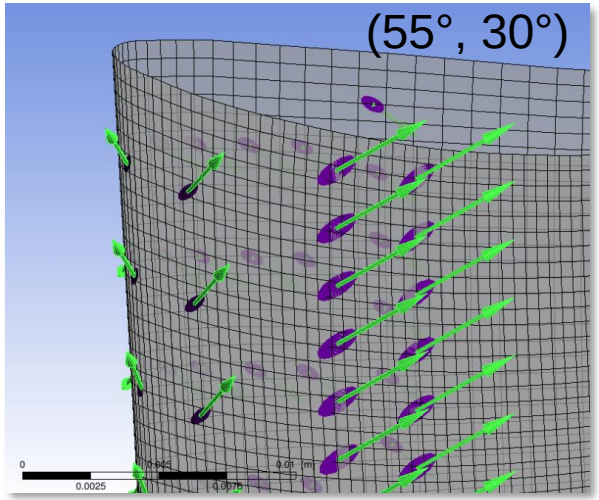
Improved Visualization for Blade Film Cooling

- Improved visualization of injection positions, shape of the injection, and injection angles
- By overlaying the mesh, it is possible to determine the effective resolution of the model
- Compatible with circular and cylindrical holes for all hole direction options









Other CFX Enhancements

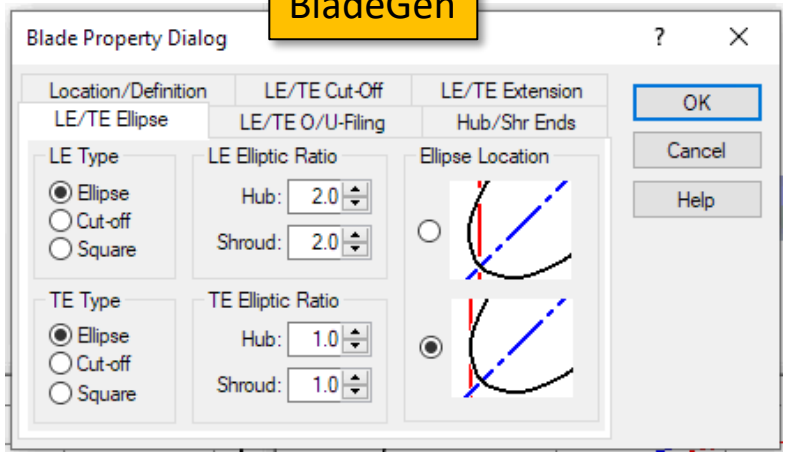
- ***Additional support for Fluent CFF (Common Fluids Format) files***
  - CFF mesh import to CFX Pre
  - Improved performance for CFF file load in CFD Post
- ***CFX Solver MPI updates:***
  - Support for Microsoft MPI (MSMPI) start method on Windows for local parallel
  - OpenMPI upgraded to v4.0.5 from v3.1.2

BladeEditor

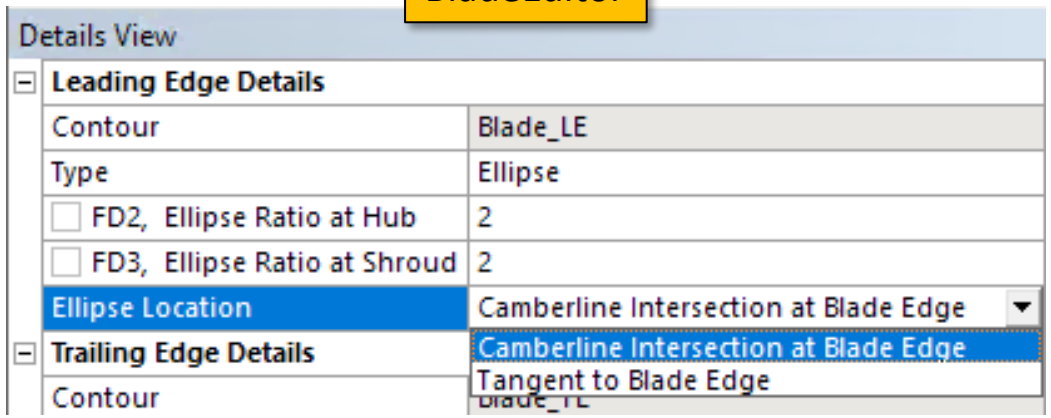
Additional support for BladeGen to BladeEditor workflow via NDF updates

- NDF updates in BladeEditor apply incremental changes to an existing model rather than build the model from scratch with each update
- Avoids the need to script all BladeEditor steps for a parametric workflow
  - Create a base model interactively, then apply parametric changes via iterative NDF updates
- The Ellipse Location with Tangent option is now available in BladeEditor and supports NDF updates

BladeGen



BladeEditor



BladeEditor

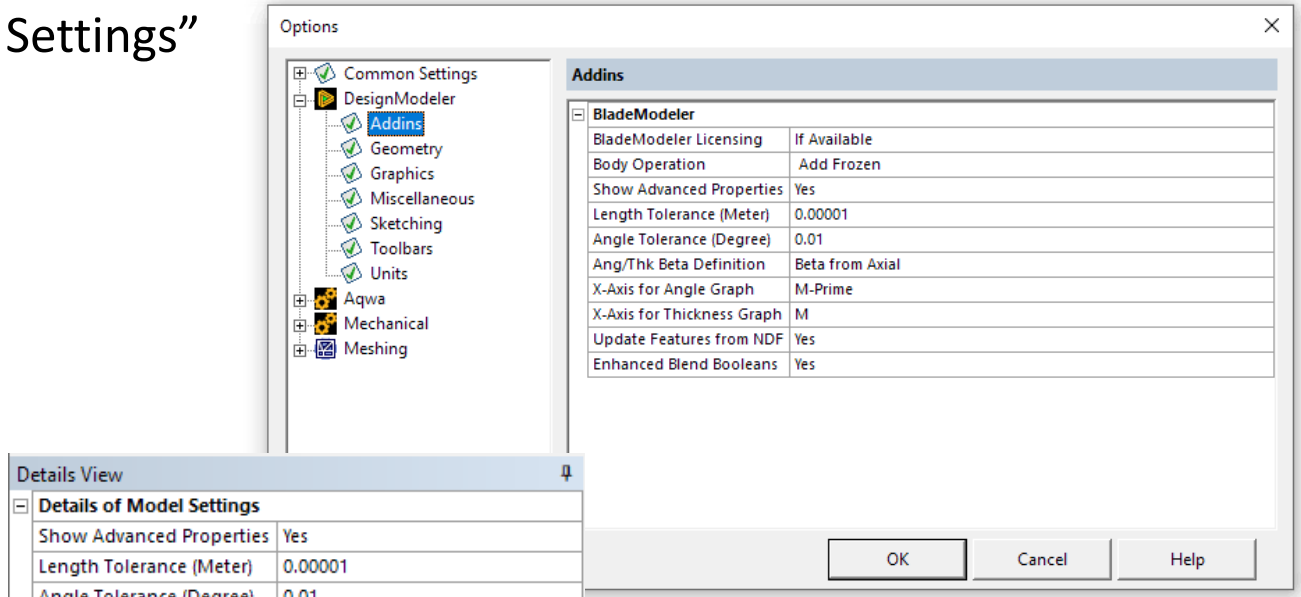
Improved BladeEditor preferences under Tools > Options > DesignModeler > Addins

- Preferences now persist with the application rather than the model
  - E.g. can now set a persistent preferences to load from NDF
- Previous preferences are moved to “Model Settings”

Details View

Details of Preferences	
Length Tolerance	0.01
Angle Tolerance	1.00000042857568E-02
Beta Definition	Axial
Show Advanced Properties	No
X-Axis for Angle Graph	M-Prime
X-Axis for Thickness Graph	M
Load NDF Updates Model	Yes
Improved Boolean Operations	Yes

2021 R2: preferences set in BladeEditor and only applicable to that session



Details View

Details of Model Settings	
Show Advanced Properties	Yes
Length Tolerance (Meter)	0.00001
Angle Tolerance (Degree)	0.01
Ang/Thk Beta Definition	Beta from Axial
X-Axis for Angle Graph	M-Prime
X-Axis for Thickness Graph	M
Update Features from NDF	Yes
Enhanced Blend Booleans	Yes

2022 R1: user preferences set in the Workbench Options. Previous preference in BladeEditor are now Model Settings


Ansys