Total Solution for True Analysis-driven Design

midas NFX **2017R1** Release Note

midas NFX RELEASE NOTE 2017 R1

Major Improvements

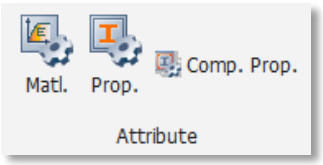
Midas NFX is an integrated finite element analysis program for structural, CFD simulation and optimization design. It provides efficient and accurate analysis together with an integrated pre-post processor, developed by senior mechanical engineers with over 20 years of CAE software development expertise.

The 2017 version of midas NFX contains several major improvements for easier and faster modeling, contact creation, optimization and CFD post processing.

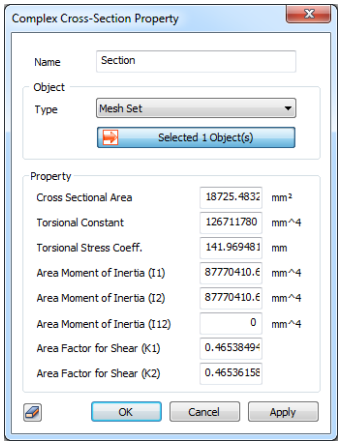
Modeling Enhancements

< Complex Cross Section >

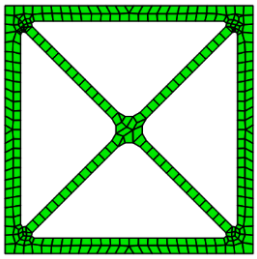
This feature is related with 1D elements and can automatically compute cross section properties for arbitrary shapes.



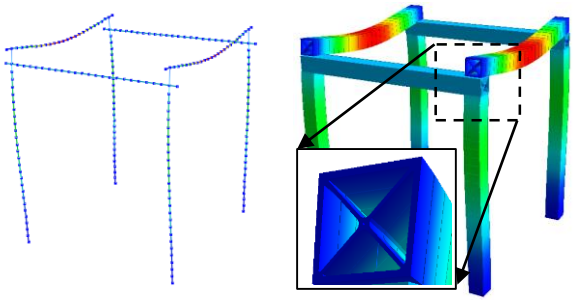
Complex Property command



Complex Cross-Section Property window



2D mesh is required to define arbitrary shape

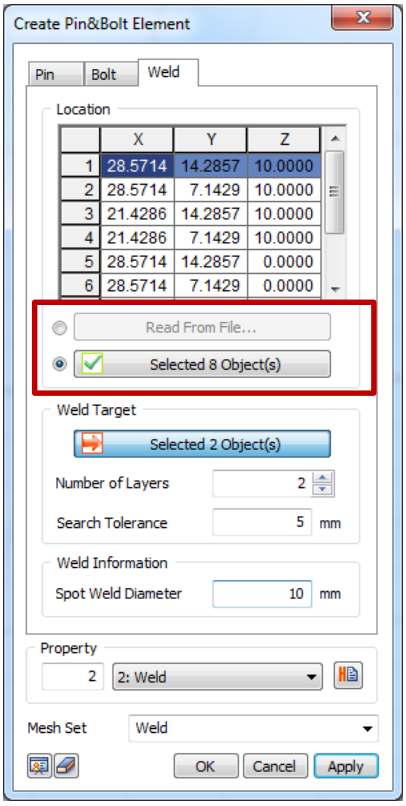


[Model with hidden Section] [Displayed Cross Section]

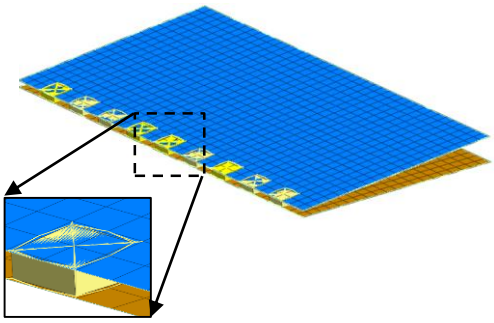
1D element modeling using the arbitrary section

< Weld Element improvement>

Creating Weld element is much simpler now and can be done with few mouse clicks.



Weld definition window

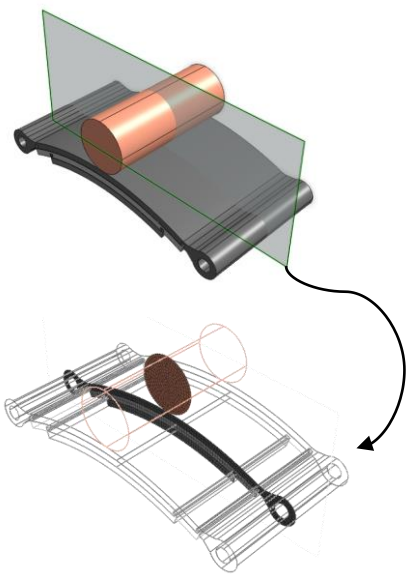


Weld element application example

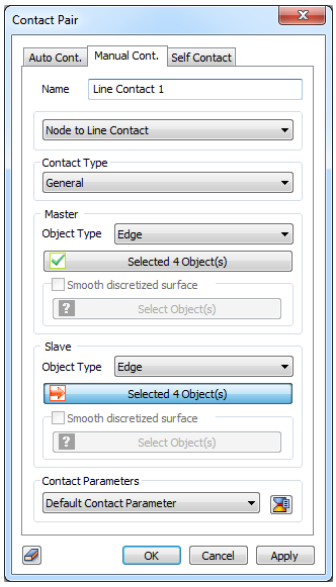
Modeling Enhancements

< Line Contact>

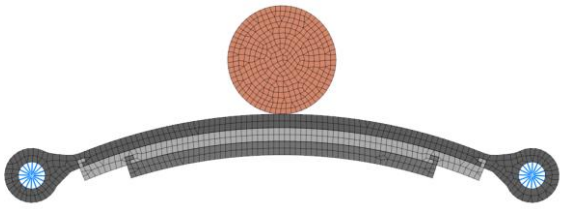
Line contact has been added to allow modeling of assemblies which are in plane strain state or are axisymmetric models.



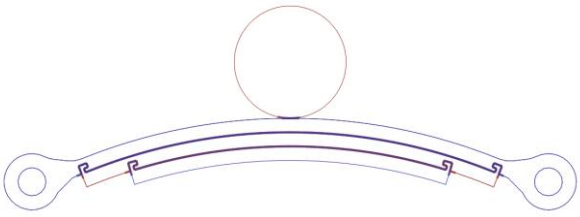
Leaf spring - application example



Definition window

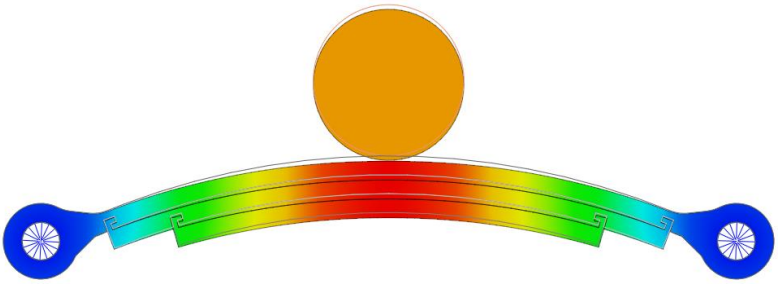


2D section used for modeling



Created contact pairs

Less computational effort required due to lower element count with the same accuracy as in 3D.

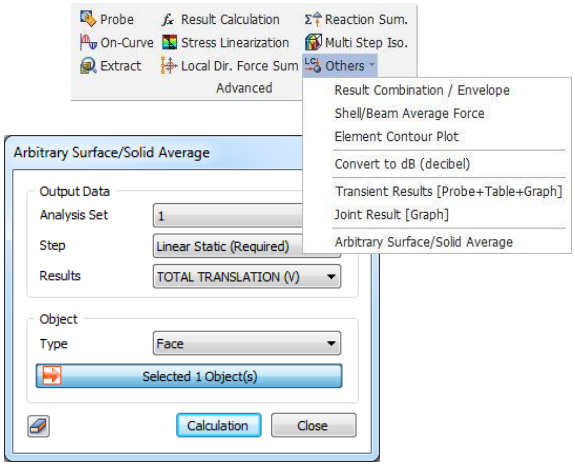


2D line contact results

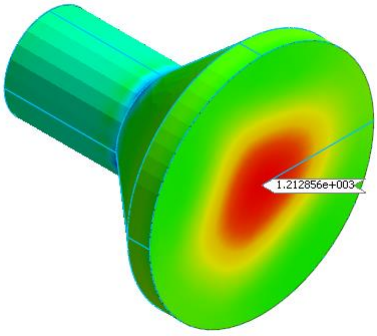
Results Post-processing

< Arbitrary Surface/Solid Average>

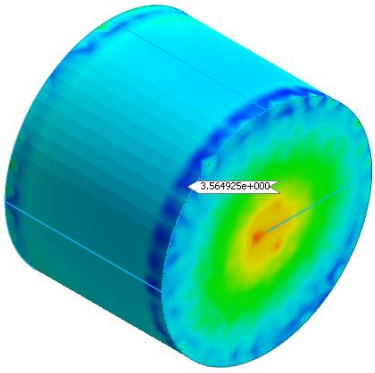
New post-processing tool for averaging result data from surfaces or volumes



Arbitrary Surface/Solid Average window



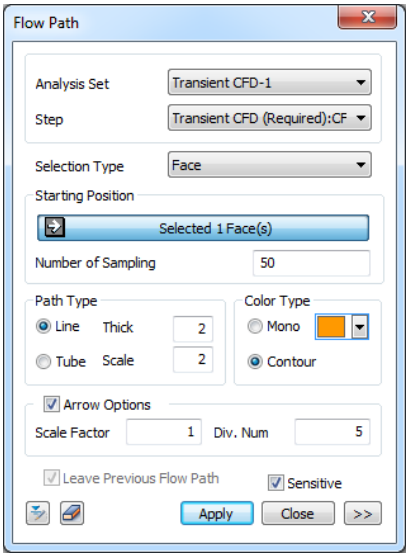
Application example – average output pressure on Face



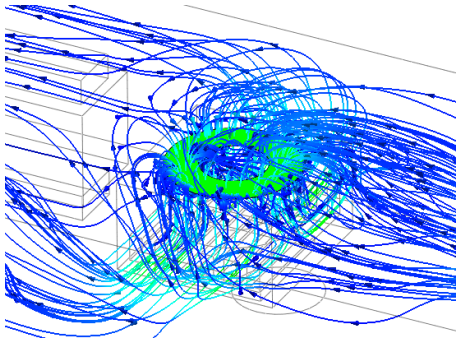
Application example – average velocity from volume

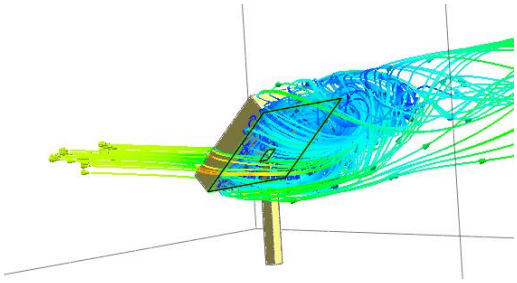
< Flow Streamline improvement>

Streamlines can be displayed from selected faces or from individual nodes



Flow Path command window



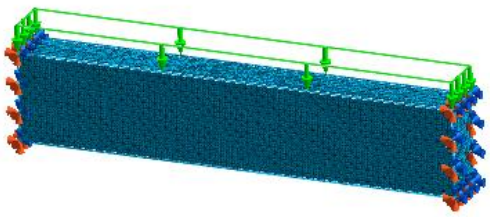


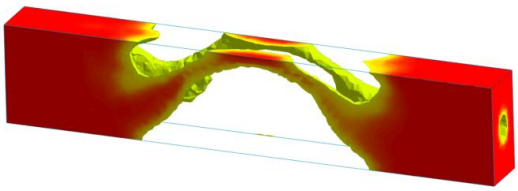
Application example-Streamlines generated from selected faces

Analysis Enhancements

< Topology Optimization –Multi Subcase support>

The topology optimization now has the new capability to simultaneous consider multiple analysis cases. The new feature is supported for linear static and eigenvalue analysis to optimize a structure based on minimal volume. Thus all Design Constraints (Stress, Displacement, Fatigue) can be used within the optimization simultaneously.





Constraint 1 : Displacement ≤ 0.3mm
Constraint 2 : Natural Frequency ≥ 5000Hz

Volume	40% Reduction
Constraint 1	0.296mm
Constraint 2	5080Hz

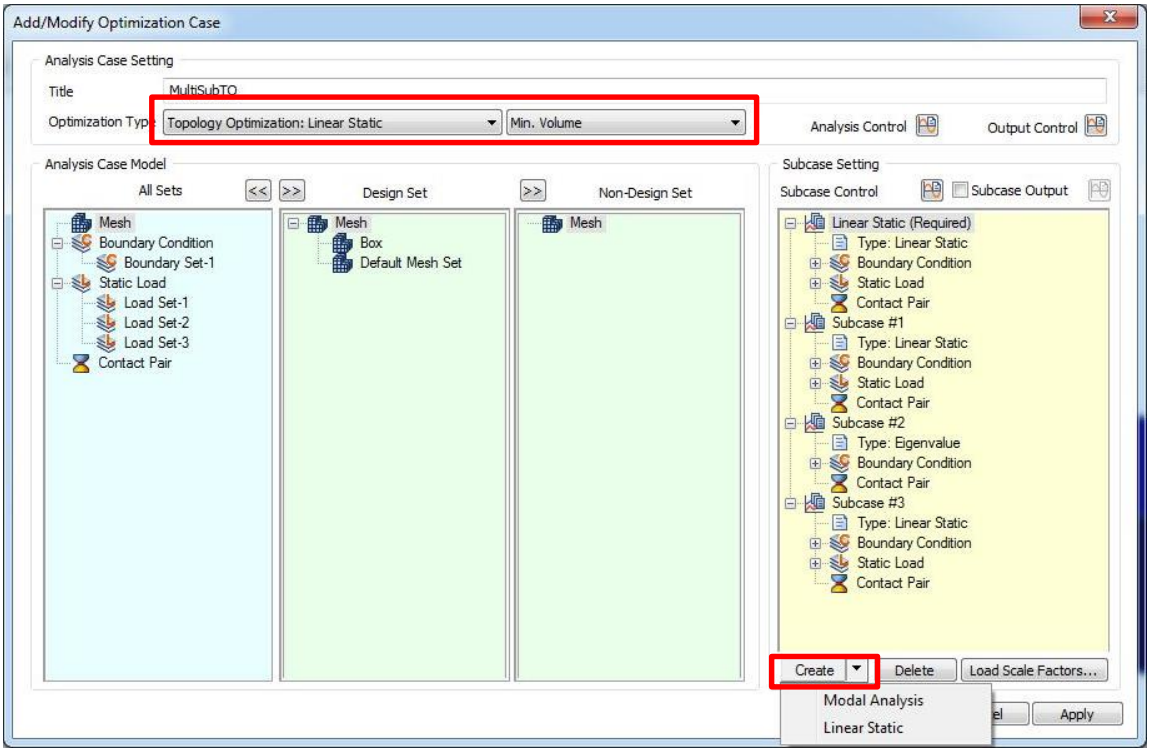
Multi-Subcase analysis can be done through the following approaches:

Case 1)

Topology Optimization based on Linear static analysis > min. Volume

Case 2)

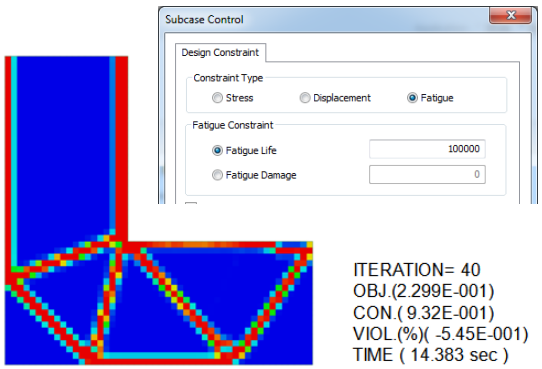
Add "Modal Analysis" through the Create button at the bottom of the subset case



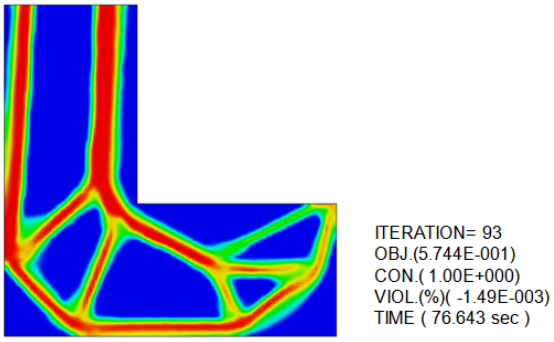
Analysis Enhancements

< Topology Optimization– Fatigue Design Constraint >

Topology optimization of structures subjected to repeated loading conditions can now be handled. Fatigue constraints are introduced in order to find a light weight design that is dimensioned by the critical fatigue stress and that avoids stress concentrations.



L-beam problem: Topology optimization result with fatigue constraint (Compliance-based)

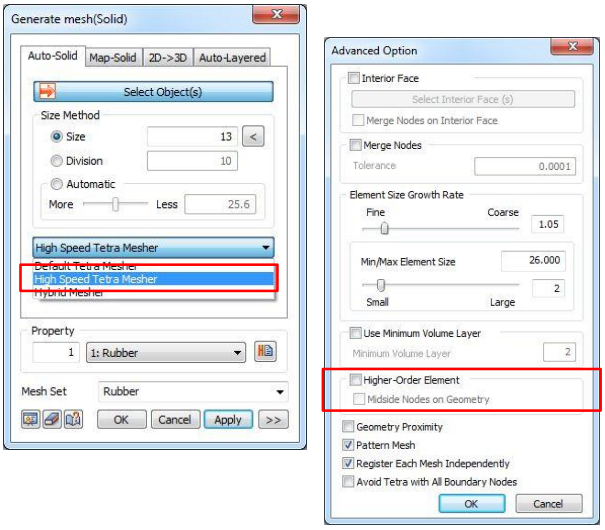


L-beam problem: Topology optimization result with fatigue constraint
(including Sensitivity)

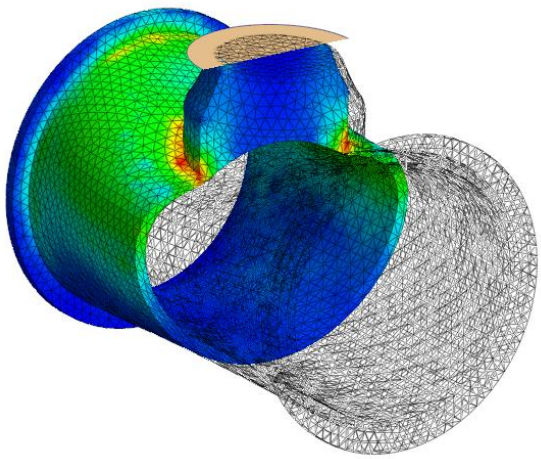
< Tetrahedral element – Rubber Property >

The formulation of lower order tetrahedral elements for incompressible materials has been improved.

Models with the rubber property can now be modeled with a lower number of DOF, keeping the same level of accuracy.



Lower-order tetrahedral element generated window

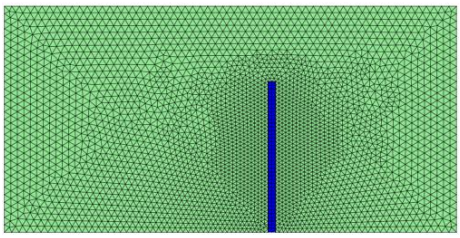


Model with rubber property

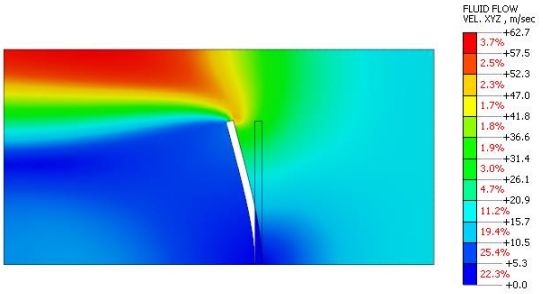
Analysis Enhancements

< 2-way FSI(Fluid Structure Interaction) >

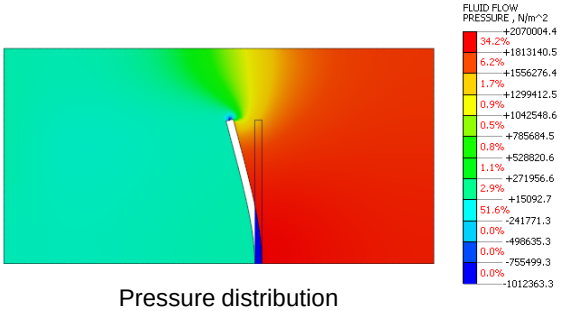
Coupled calculations are now supported in both directions. The structural response of the structure can be transferred to the fluid solver. The process is performed within iterative loop.



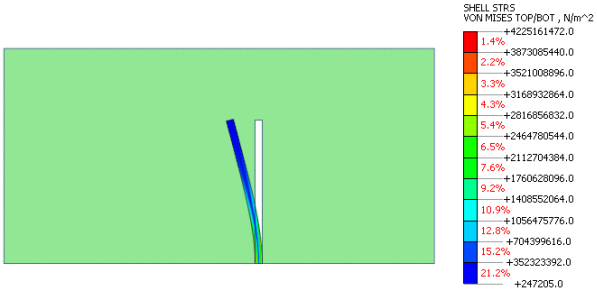
Application example – 2D Flow over obstacle



Velocity distribution
around the deformed structure



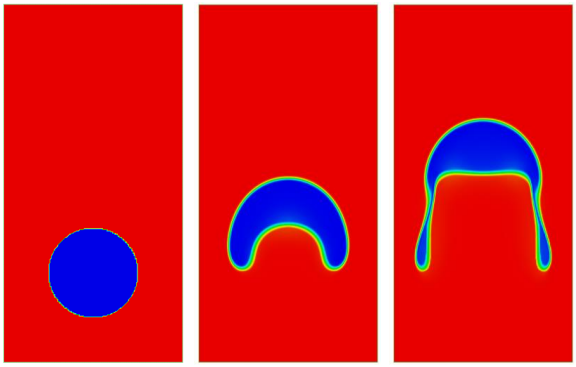
Pressure distribution
around the deformed structure



Stress distribution on deformed structure

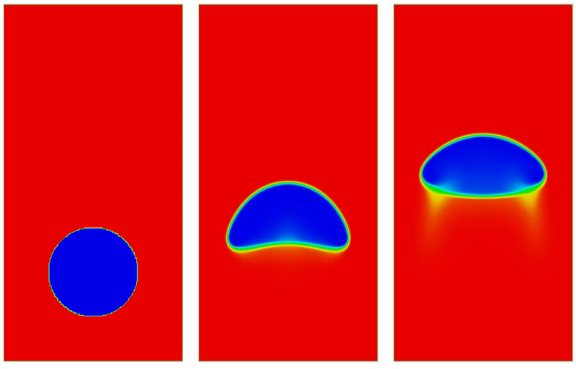
< 2 Phase Flow (VOF: Volume of Fluid) >

The Volume of Fluid (VOF) feature is designed to account for two immiscible fluids, where the position of the interface between the fluids is of interest.



0 sec 1.5 sec 3.0 sec

The bubbles rise with the passage of time
(Small difference in phase densities)



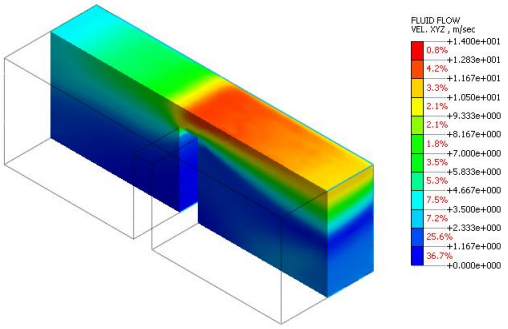
0 sec 1.5 sec 3.0 sec

The bubbles rise with the passage of time
(Big difference in phase densities)

Analysis Enhancements

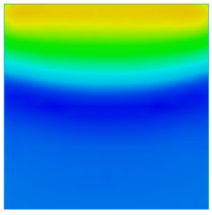
< Translational Periodic/Symmetry BC) >

Translational periodicity and symmetry boundary can be created. In many cases it is possible to use periodic boundary conditions where the output of one boundary is the input to another boundary.

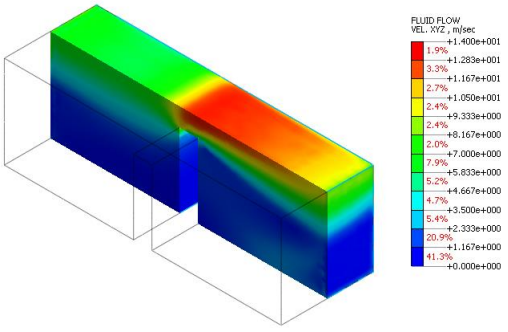


Model with applied Periodic BC

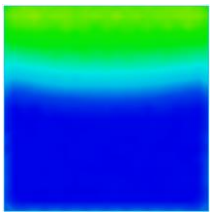
Inlet Velocity distribution



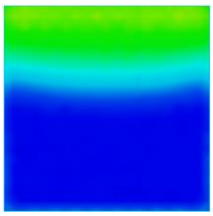
Outlet Velocity distribution



Model without applied Periodic BC



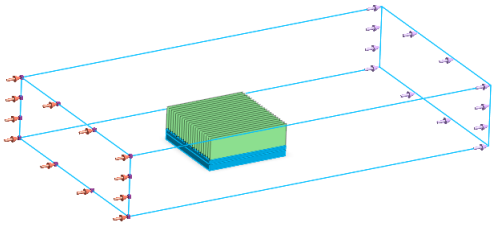
Inlet Velocity distribution



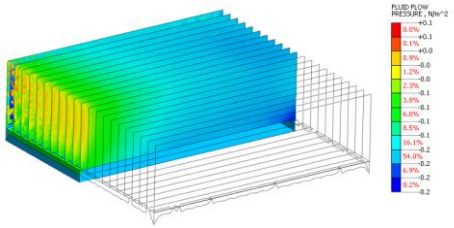
Outlet Velocity distribution

< Thin Wall - Conductivity>

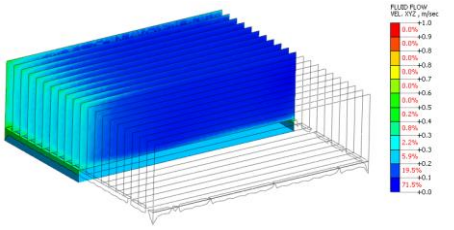
The Thin Wall BC now has two new inputs: the thickness of the layer and its thermal conductivity. This is used to calculate the effective thermal conductivity with the assumption that the heat flux across the thin wall is continuous.



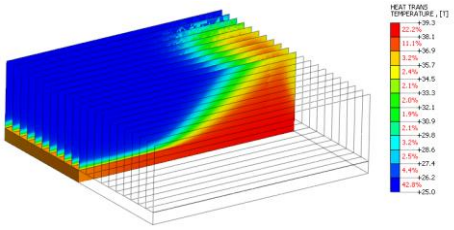
Model with applied Thin Wall condition



Pressure distribution



Velocity distribution



Lamination temperature distribution