Femtet

2019.0

What's New

Murata Software Co., Ltd.
https://www.muratasoftware.com/en/

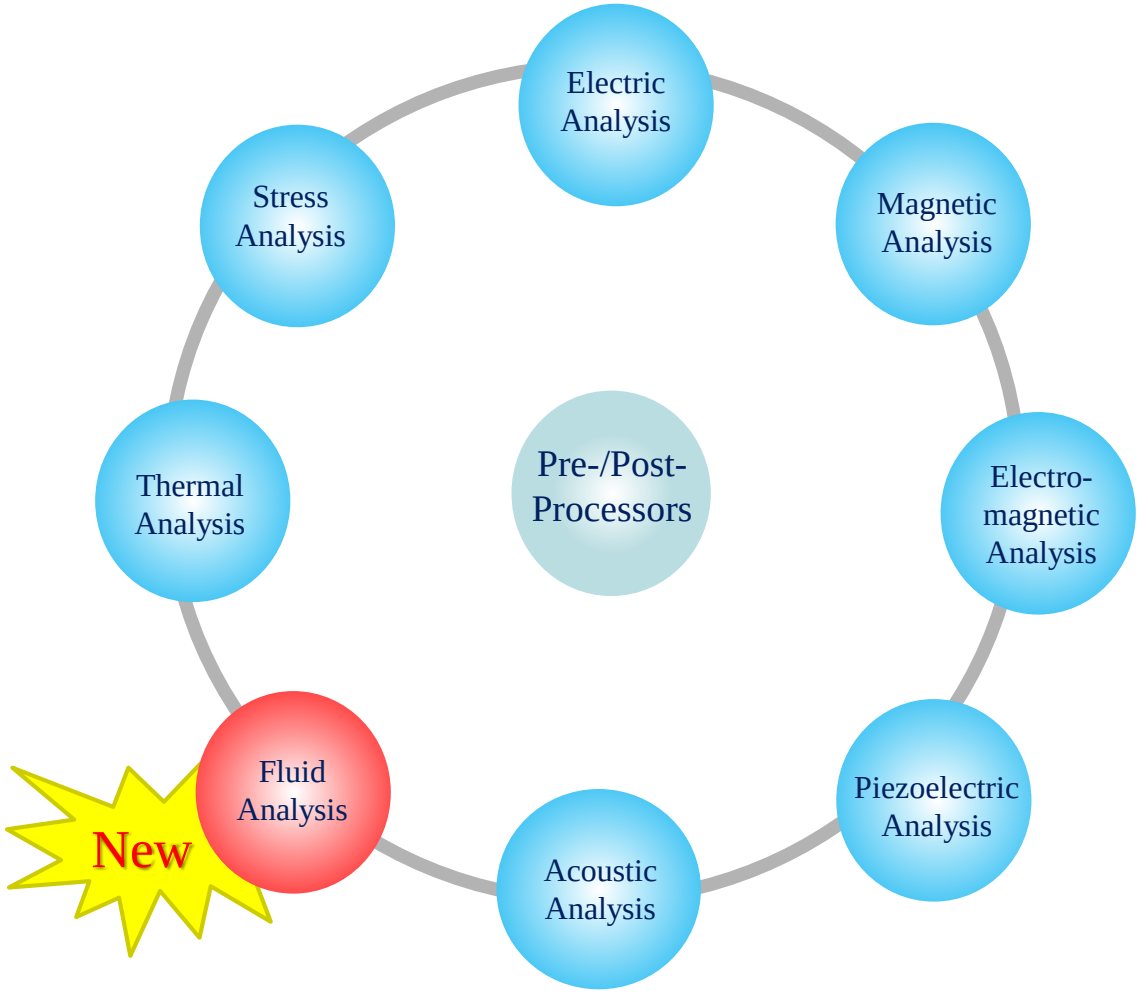
Table of Contents

Murata Software

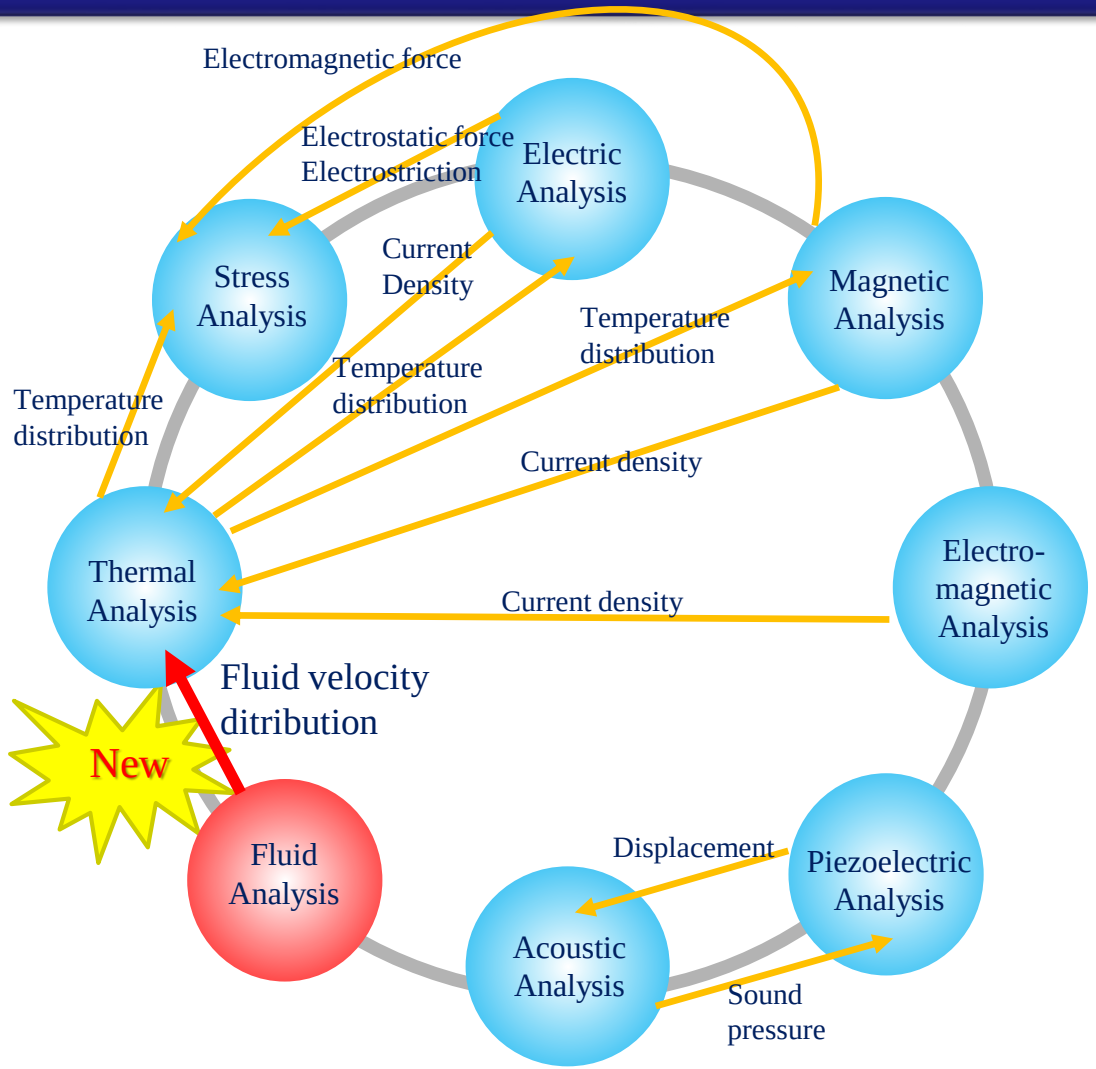
Fluid Solver Added

Murata Software

Solvers / Multiphysics



Solvers



Multiphysics

Fluid Analysis

Murata Software

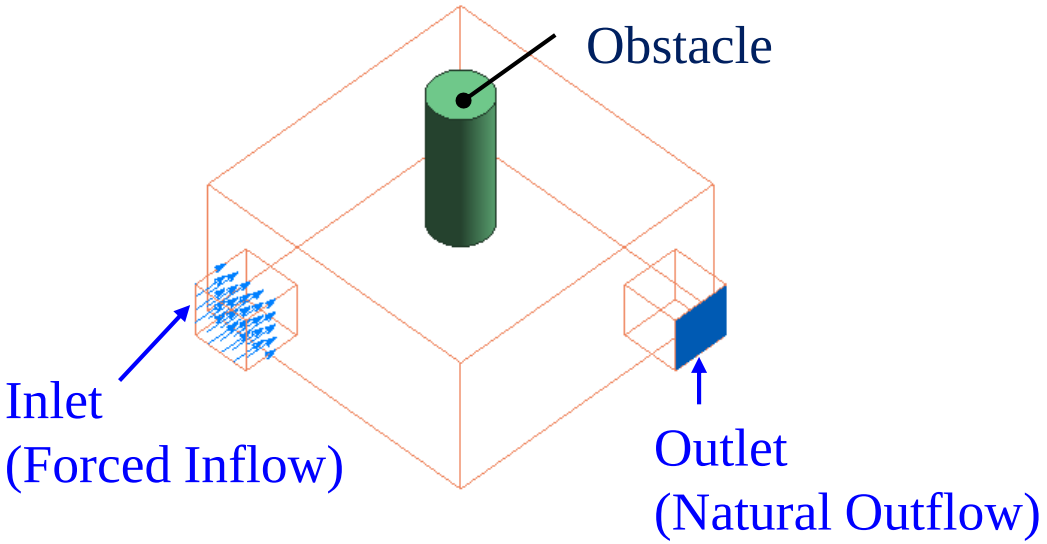
Functions

Item	Function
Analysis Type	Steady-state
Flow Type to Analyze	Non-compressive flow, Single flow, Non-temperature dependent flow (no buoyancy)
Material	Density, Viscosity
Boundary Conditions	Solid wall, Slip wall, Forced inflow, Forced outflow Natural inflow, Natural outflow
Output Result	Fluid velocity, Pressure, Turbulent energy (K), Energy dispersion rate (ε, y+), Force on Wall Surface, Volumetric flow rate
Laminar Flow/Turbulent Flow	Laminar flow, Turbulent flow (Realizable K-ε model)
Analysis Space	2D, 3D (axisymmetricity not available)
Analaysis Method	Finite volume method Steady-state analysis: SIMPLE method
Advection Scheme	1st-order upwind difference/2nd-order upwind difference
Mesh	1st order element Wall surface: Layer mesh (square, triangle prism)

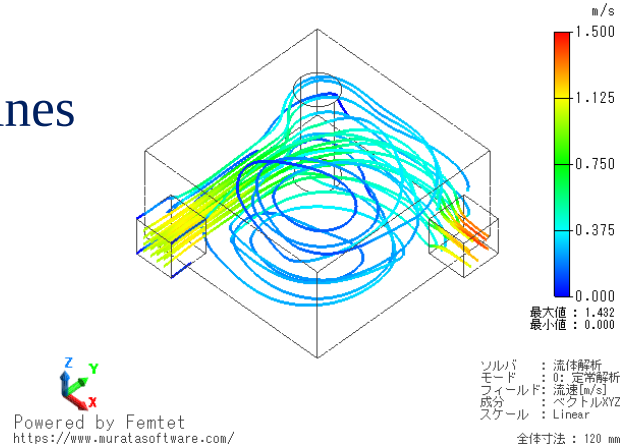
Fluid Analysis

Murata Software

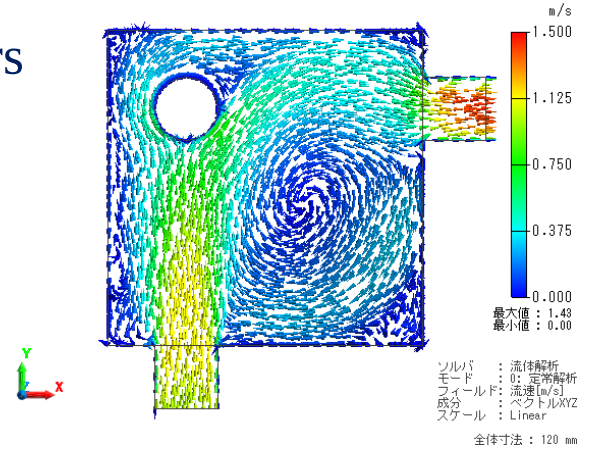
Example: Flows in the Flow Path with Obstacle



Streamlines



Vectors



Fluid-Thermal Coupled Analysis Added

Murata Software

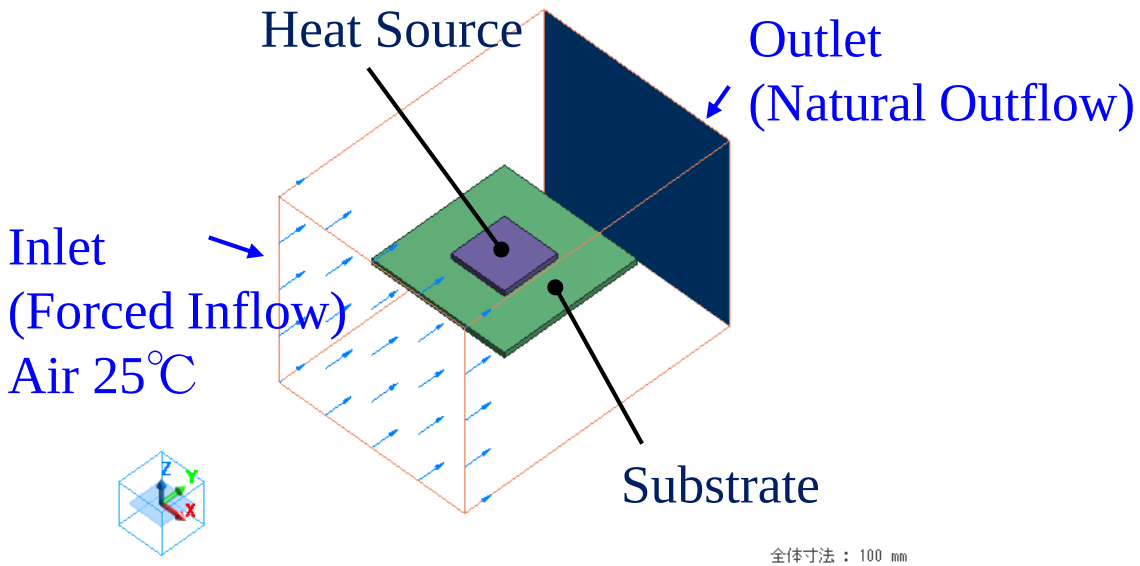
Functions

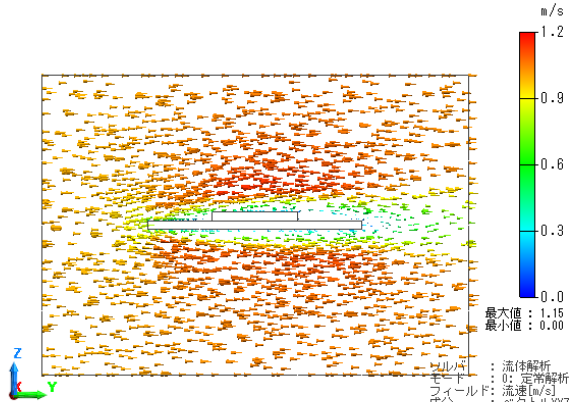
Item	Function
Analysis Type	Fluid steady-state analysis -> Thermal steady-state analysis (Forced convection) Fluid steady-state analysis -> Thermal transient analysis (Forced convection)
Flows to Analyze	Non-compressible flow, Single flow, Non-temperature dependent flow (no buoyancy)
Material	Density, Viscosity, Thermal conductivity, Specific heat
Boundary Condition	Solid: Temperature, Heat flux, Heat radiation/Ambient radiation, Radiation, Thermal resistance Fluid: Heat flux on wall, Wall temperature, Inflow temperature
Output Result	Temperature, Heat flux, Heat flux on wall, Heat balance, Heat amount
Laminar Flow/Turbulent Flow	Laminar flow, Turbulent flow (Realizable K-ε model)
Analysis Space	2D, 3D (axisymmetricity not available)
Analysis Method	Solid: Finite element method Fluid: Finite volume method
Advection Scheme	1st-order upwind difference/2nd-order upwind difference
Mesh	1^{st} order element Wall surface: Layer mesh (square, triangle prism)

Fluid-Thermal Coupled Analysis

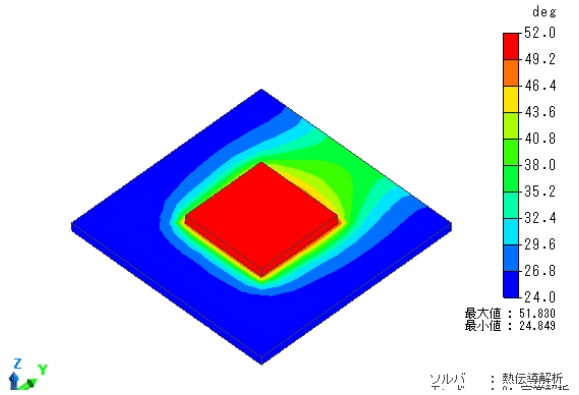
Murata Software

Example: Forcible Cooling of Substrate and Heat Source





Fluid Velocity Distribution

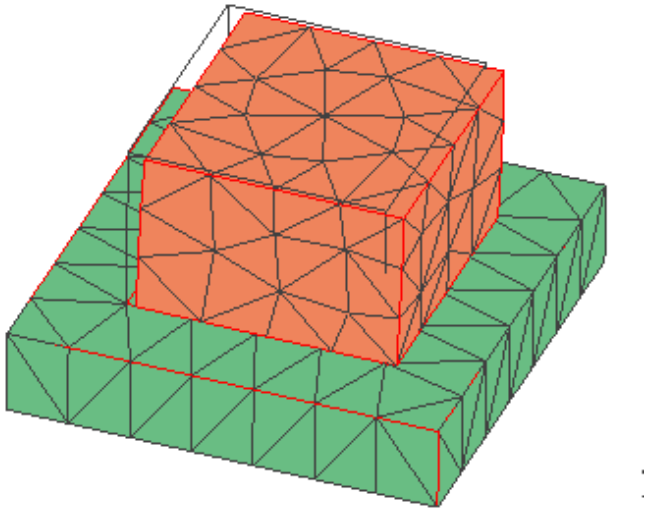


Temperature Distribution

Contact Force and Contact Area

Contact Force and Contact Area Are Added as Output Item

Contact Boundary	Output Value	Ver2018	Ver2019
Simple Contact	Contact Force	N/A	Available
	Contact Area	N/A	Available
Contact Surface	Contact Force	Available	Available
	Contact Area	N/A	Available

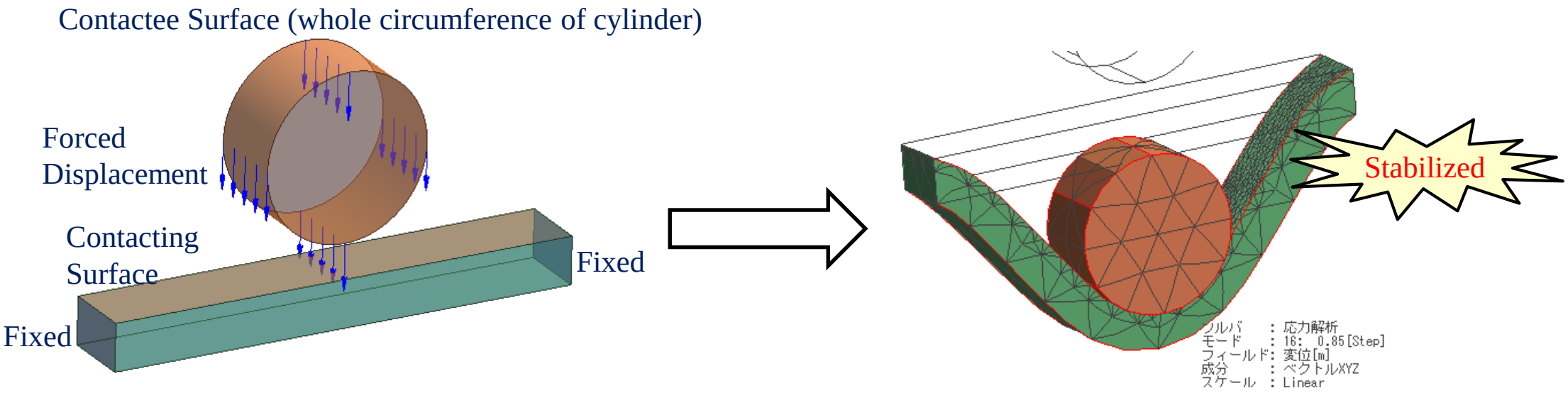


Stress Analaysis Example 43

Contact Analysis Improved

Murata Software

More Stable Analysis



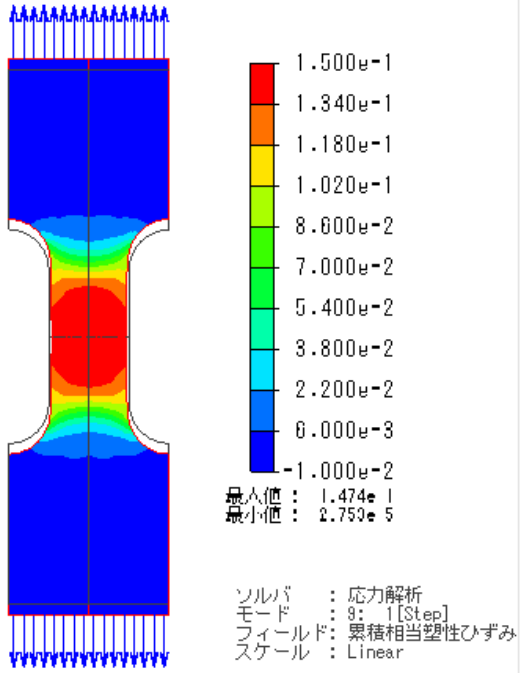
If a model which has a contacting surface under the cylinder, the contact analysis tends to be unstable in some cases.
The stability is now improved.

Stress Analysis

Faster Elastoplastic Calculation

Murata Software

Imporoved Convergence of the Analysis Model with Large Plastic Deformation



Stress Analysis Example 4 0

Automatic Acceleration	Large Displacement/ Large Strain Taken into Account	No. of Iterations (ver. 2018)	No. of Iterations (ver. 2019)	Ratio
ON	Yes	141	104	74%
ON	No	141	115	82%
OFF	Yes	295	95	32%
OFF	No	280	103	37%

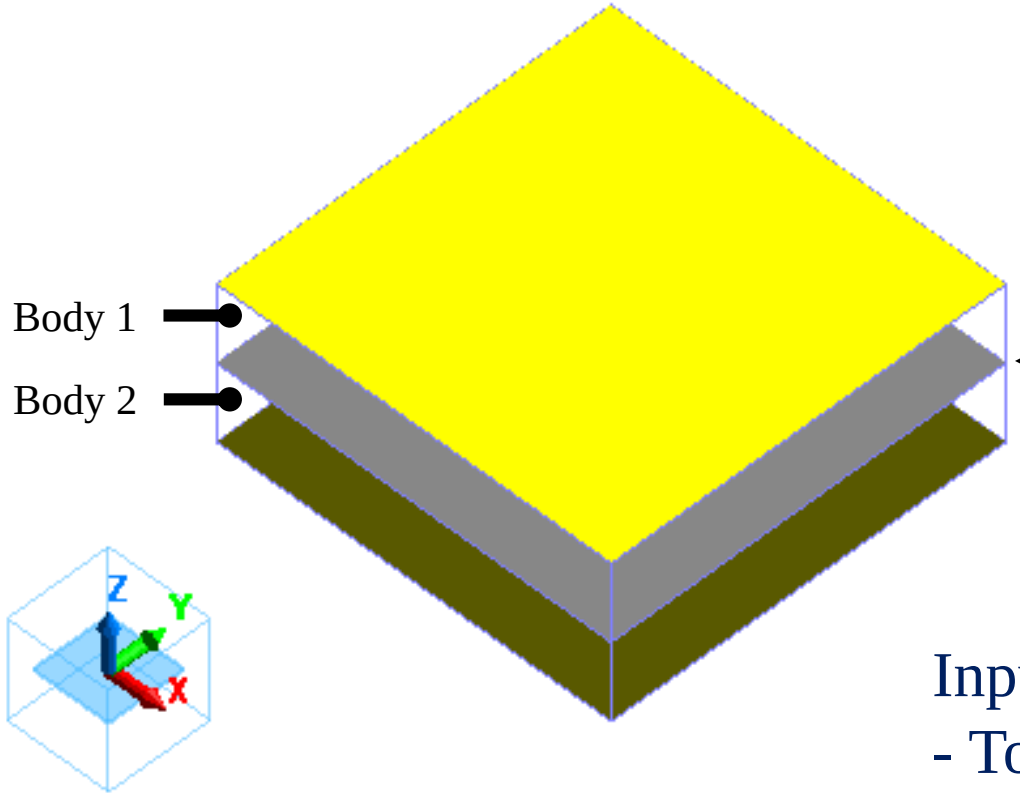
Improved

Materials with large plastic strain tend to take more calculation iterations.
Faster calculation is realized by reducing the iteration.

Electric Resistance Boundary

Murata Software

Electric Resistance Can Be Set to Interface of Two Bodies

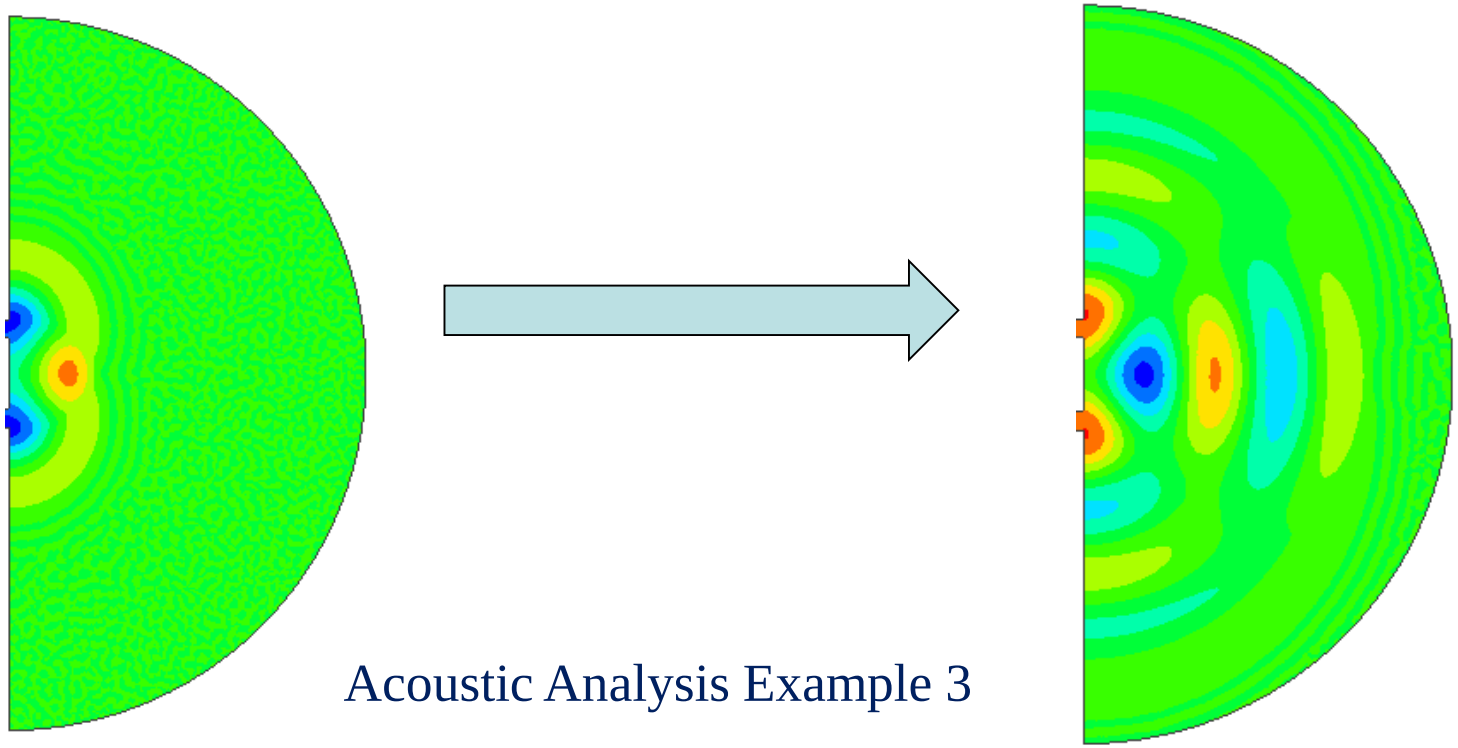


Electric resistance can be set between two bodies

Input type of the electric resistance is:
- Total electric resistance
- Electric resistance per area
- Conductivity and thickness

Transient Analysis Added

Transient Analysis Is Available for Acoustic Analysis



Acoustic Analysis Example 3

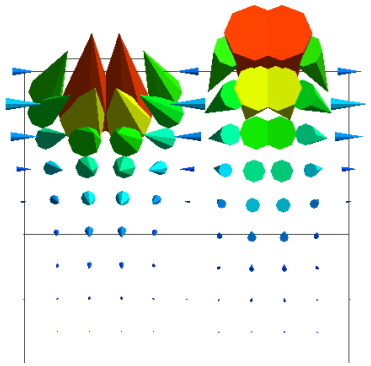
- Transient analysis is available for acoustic analysis
- Waveform of sine wave, square wave, arbitrary waveform can be entered
- Coupled analysis with piezoelectric, fluid, and stress analysis is not available

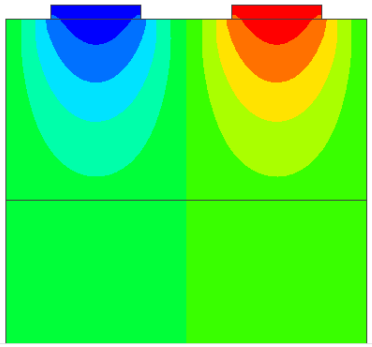
Piezoelectric Analysis

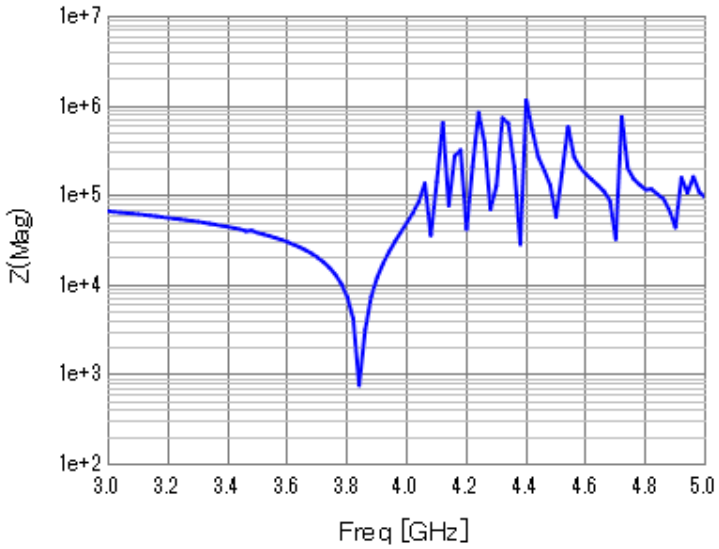
Harmonics Noise Analysis

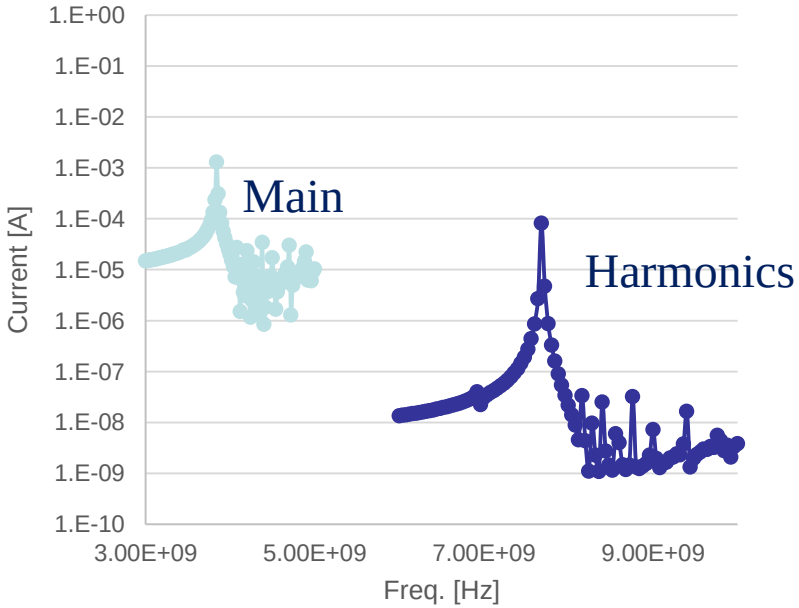
Murata Software

3rd Order Intermodulation Distortion Can Be Analyzed in the Non-linear Analysis of Surface Acoustic Wave





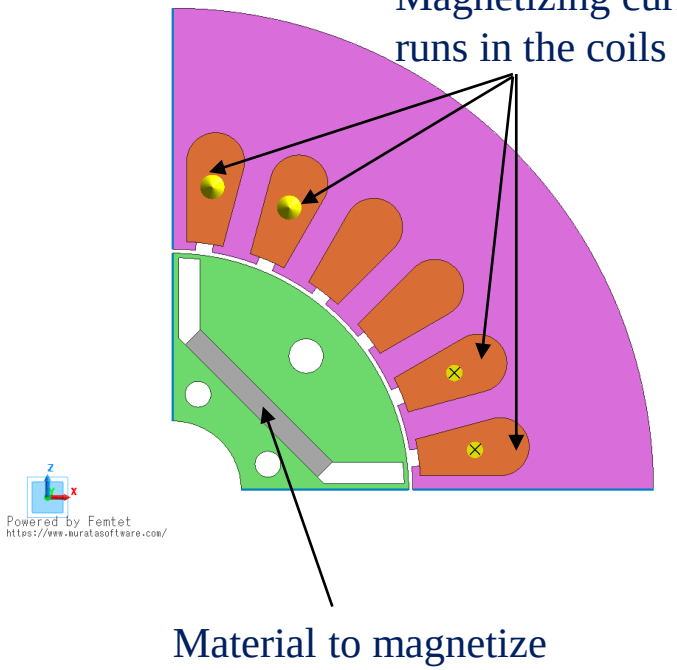




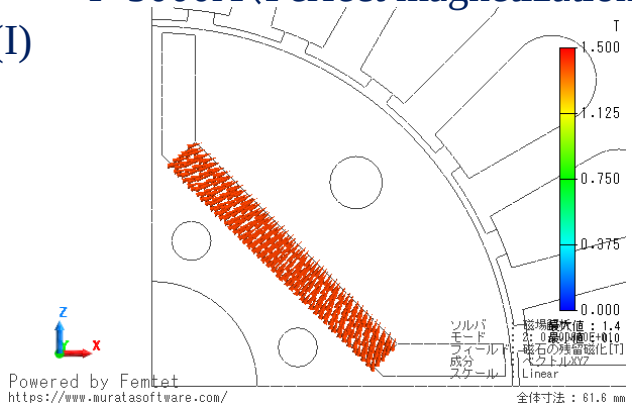
Magnetization Analysis

Analysis of Magnetization by Magnetizating Current

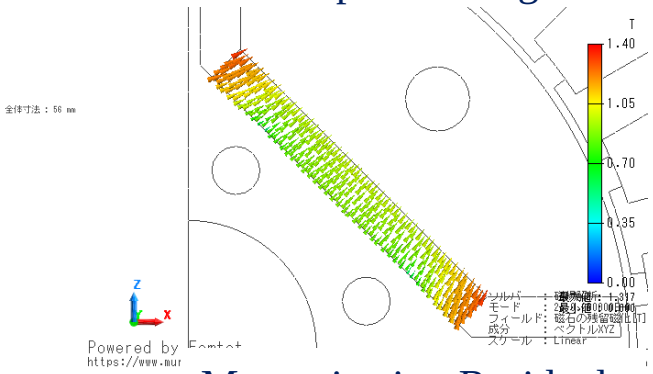
1. Magnetization Analysis



I=5000A（Perfect magnetization）

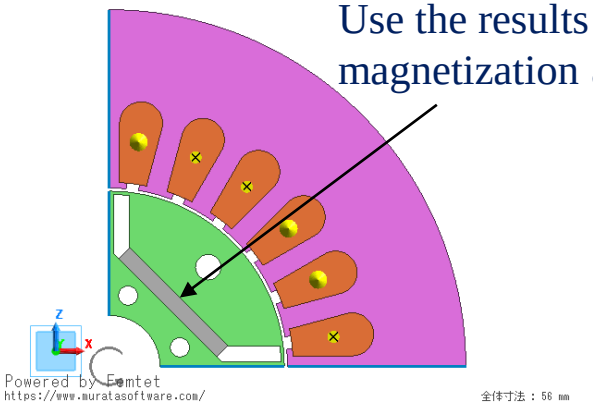


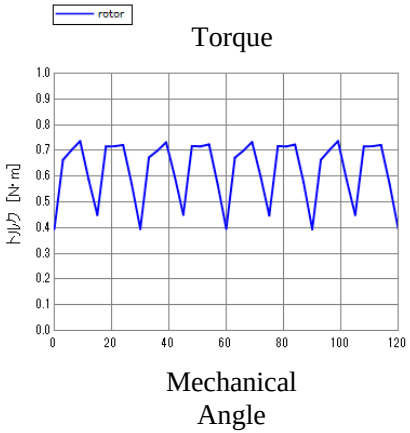
I=1000A（Imperfect magnetization）



Magnetization Residual

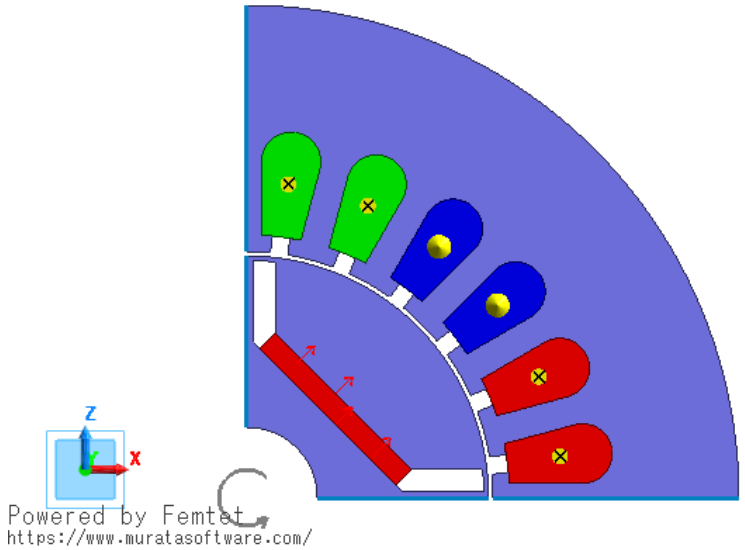
2. Analysis Using the Magnetization Results

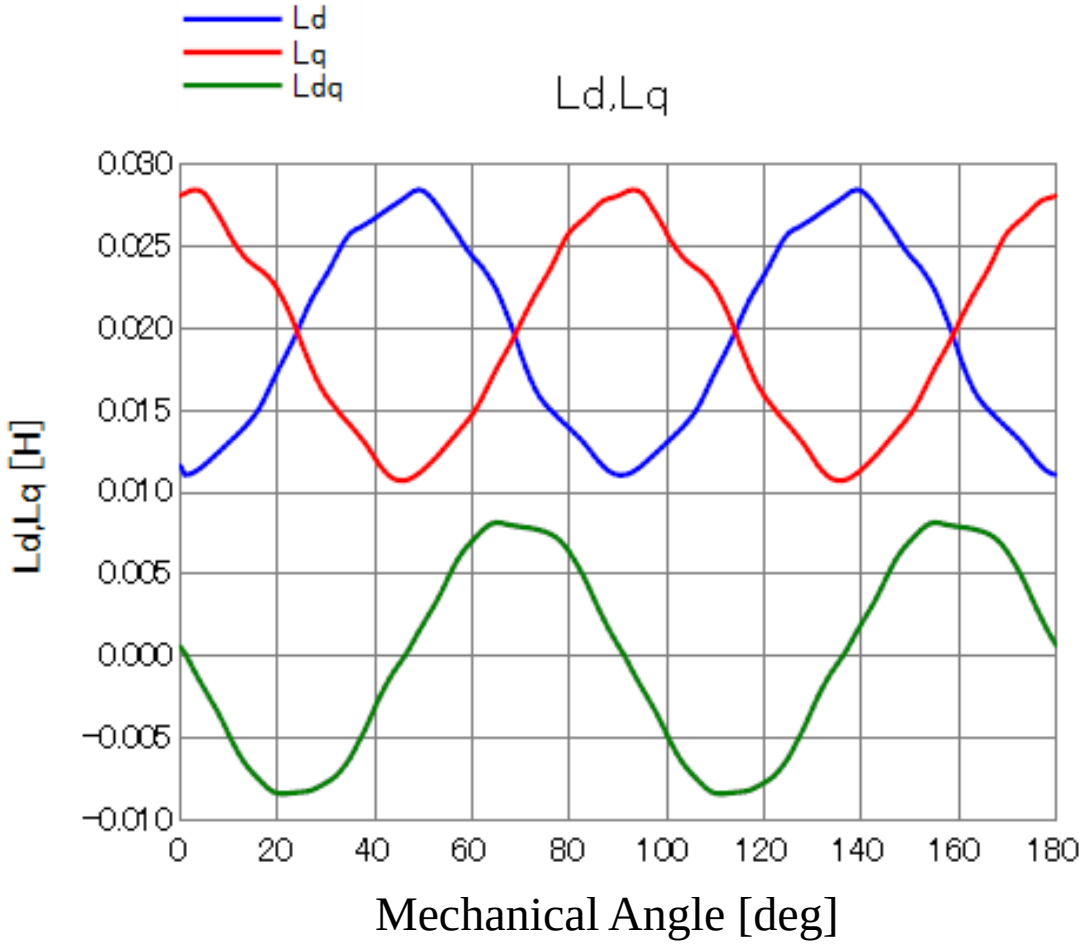




Magnetic Transient Analysis

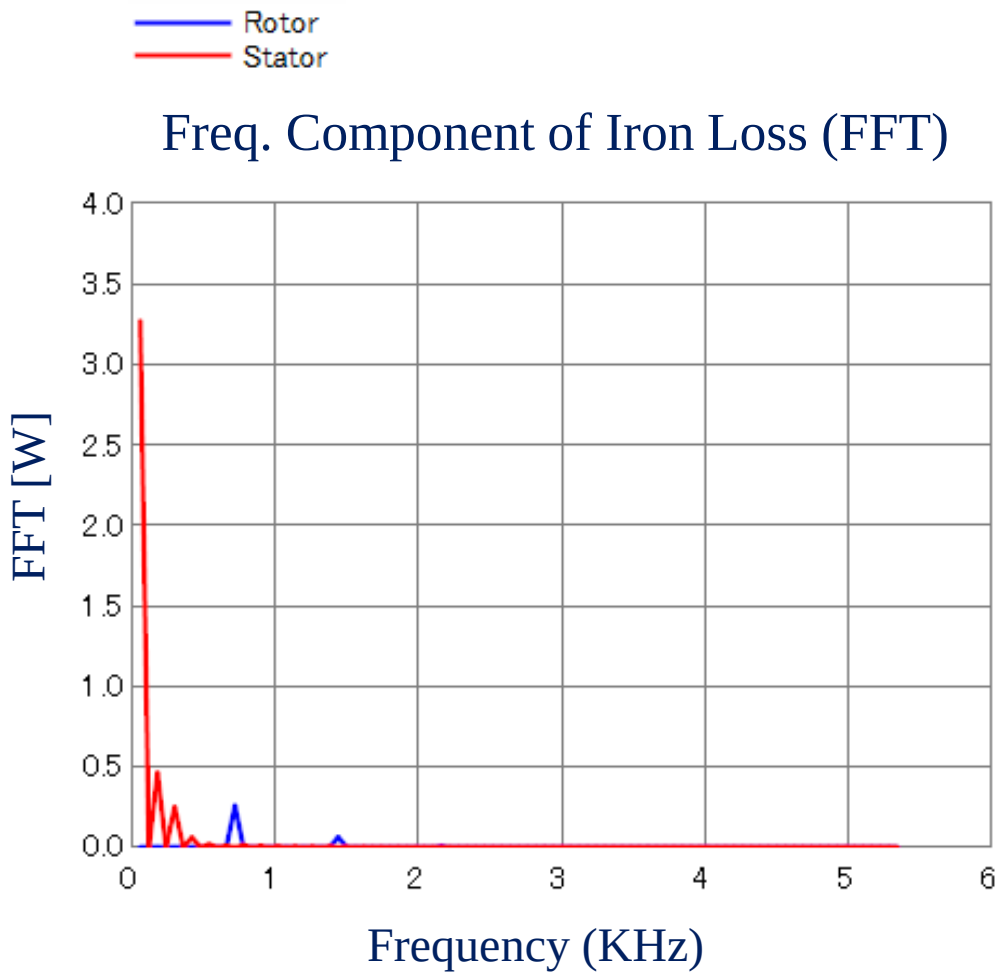
Motor's Ld and Lq





Lu, Lv, and Lw are calculated as well

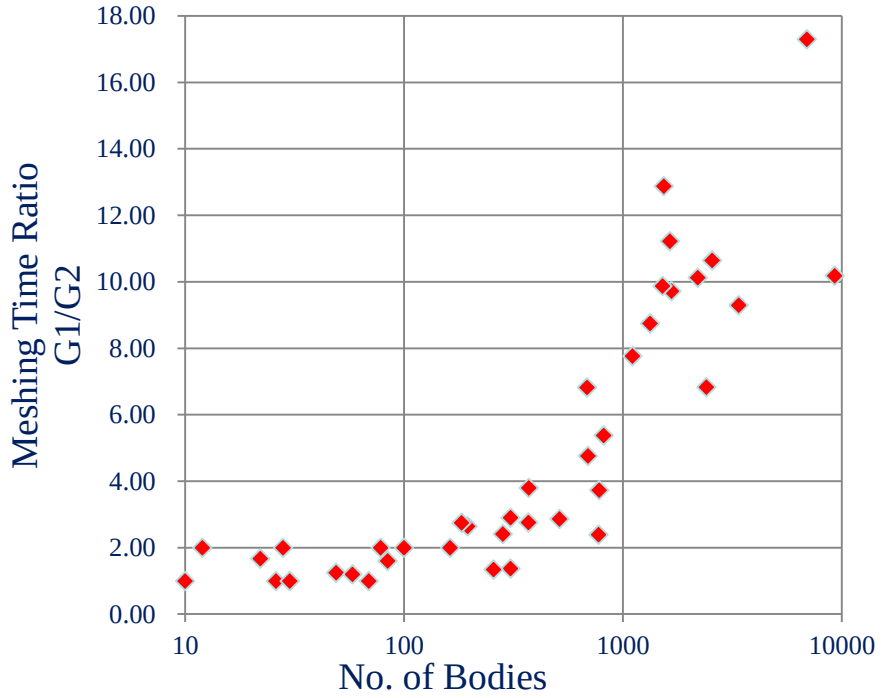
Iron Loss Calculation



Overall Improvement

Murata Software

Upgraded to Mesher G2 (Generation 2)



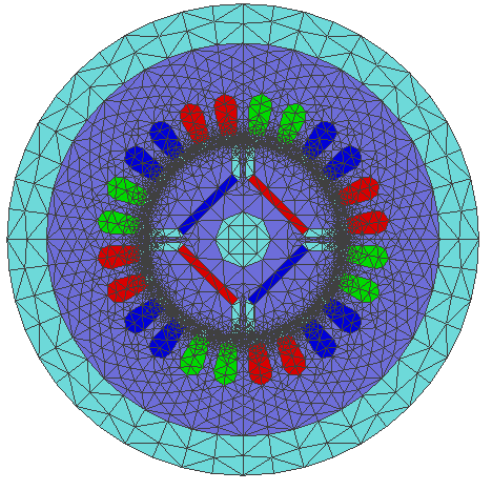
Compared to the conventional mesher G1, Mesher G2 reduces the meshing time for the large-scale analysis model.
The meshing speed is 6 times faster for the analysis model having bodies more than 1,000.

Periodic/Symmetric Mesh for 2D Motor

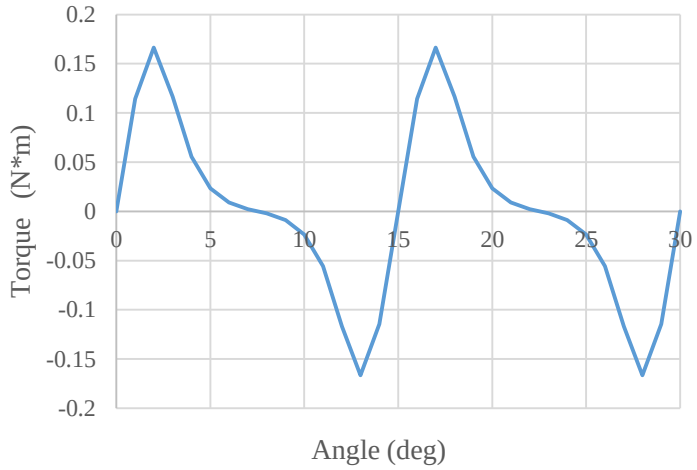
Murata Software

More Accurate Calculation

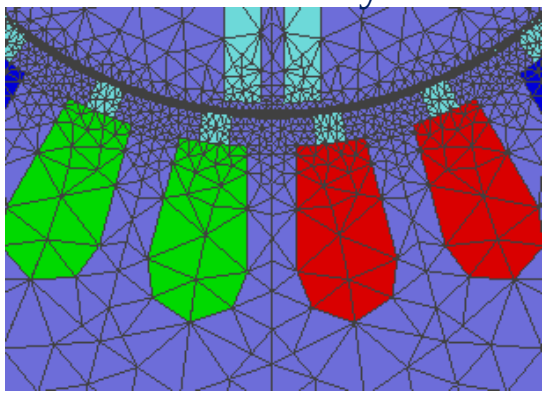
IMP Motor



Cogging Torque

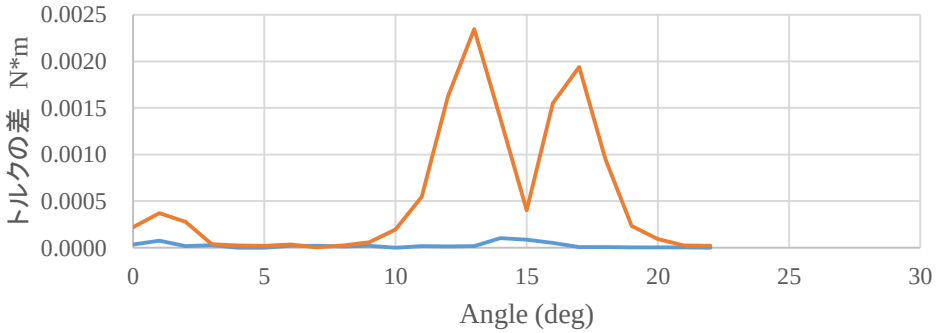


Symmetric Meshes on Symmetric Plane



Periodic Plane

Shift in Periodicity



High-periodic results are obtained

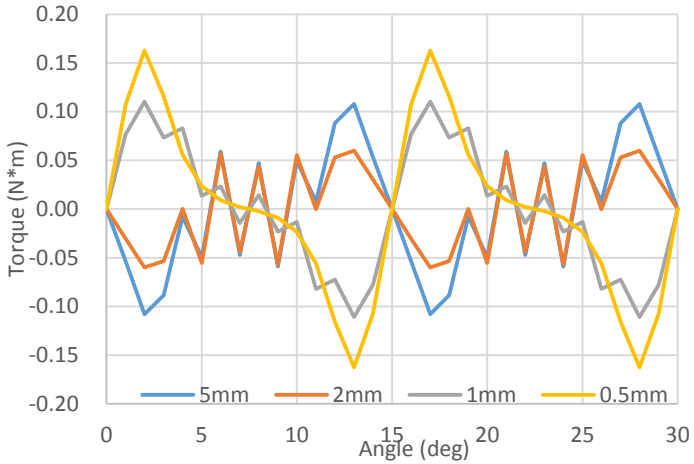
Mesh for Higher Accuracy

Murata Software

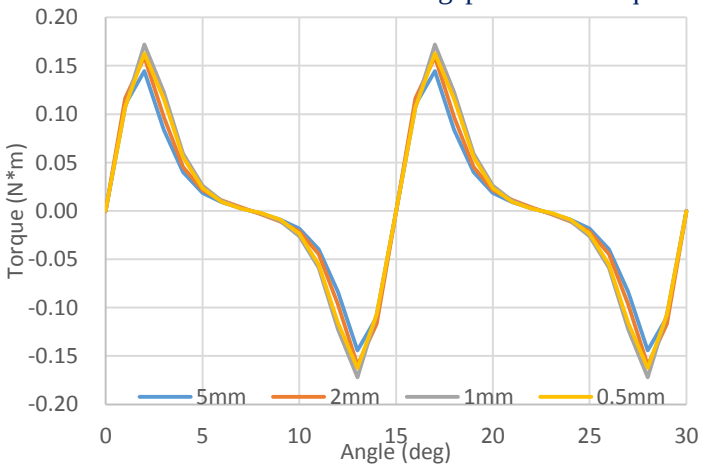
Finer Meshes Can Be Created near the Gap of Rotor and Stator

Mesh Size and Torque

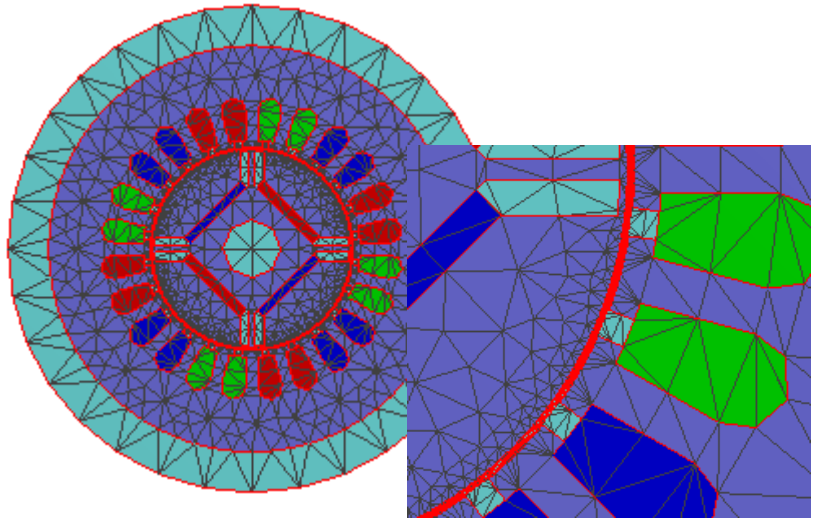
Ver2018 : Mesh size affects torque change drastically



Ver2019 : Finer meshes near the gap stabilize torque



Meshes



The number of meshes does not affect the calculation time

	Mesh Size	5mm	2mm	1mm	0.5mm
Ver2018	No. of Meshes	3,356	6,912	19,886	67,774
	Calculation Time (s)	19	22	40	112
Ver2019	No. of Meshes	4,872	8,892	22,038	67,774
	Calculation Time (s)	20	24	42	112

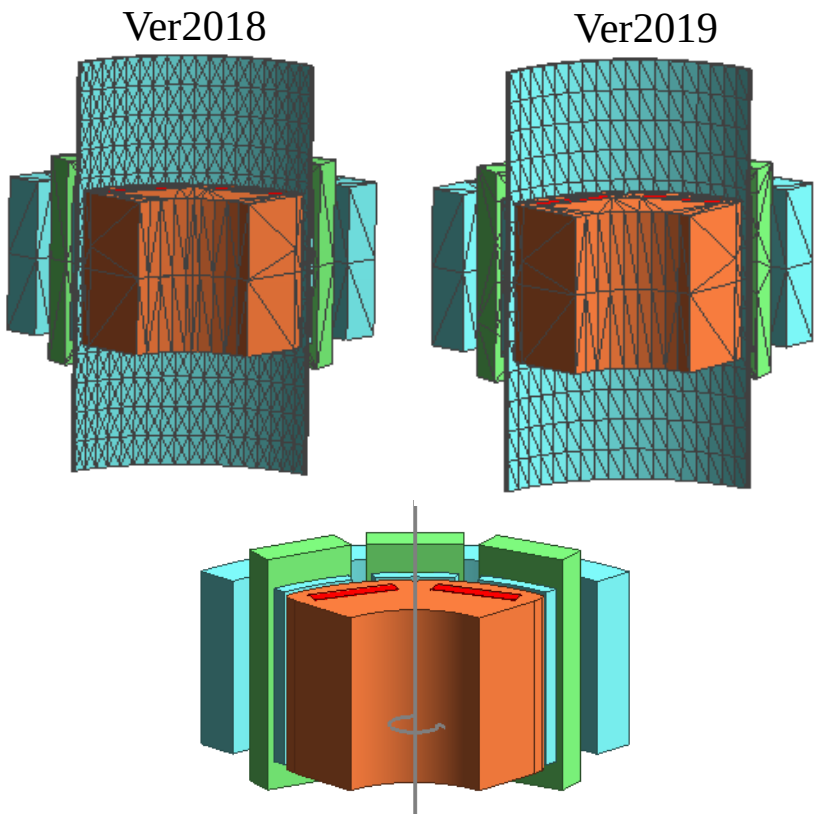
Mesher

Robust and Faster Meshing for 3D Motor

Murata Software

Shorter Calculation Time by Reducing Meshing Failure and the Number of Meshes

Enhanced algorithm for sliding meshes(*) reduced the number of meshes by half



(*)Slinding meshes exist between rotor and stator

Axial Motor: The No. of Meshes and Calculation Time

		Ver2018	Ver2019
No. of Meshes		212,486	172,486
Time	Mesher	35 sec	14 sec
	Solver	23 min 00 sec	15 min 24 sec
	Total	23 min 35 sec	15 min 38 sec

Meshing Results & No. of Meshes (12 models)

Model	Ver2018	Ver2019	Model	Ver2018	Ver2019
1	Failed	328,804	7	176,137	109,710
2	107,460	62,419	8	Failed	507,583
3	9,574	7,356	9	221,707	132,800
4	Failed	15,211	10	105,188	61,469
5	15,423	12,942	11	Failed	558,970
6	46,731	29,545	12	35,140	25,354

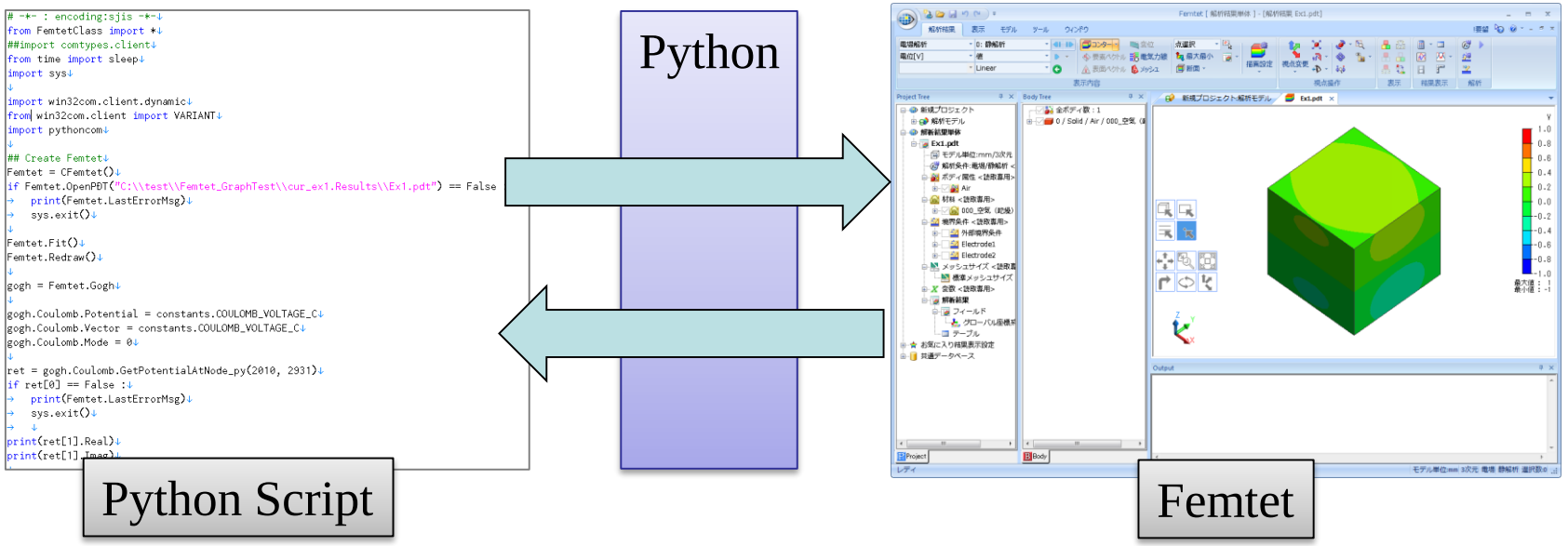
Python Script Added

Murata Software

Femtet Operation by Python Script

Substituting functions available for those that do not support Python script.

- ✔Functions that return multiple types of values
- ✔Functions that return arrays



For more information, contact us at

https://www.muratasoftware.com/en/