Simcenter FLOEFD™
What’s New 2019.1-2019.4

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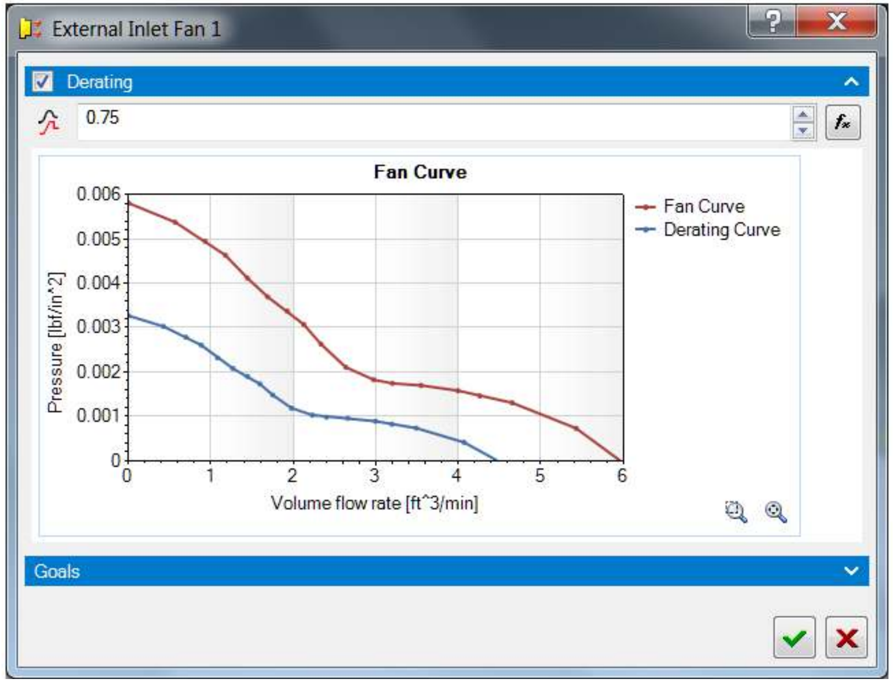
FLOEFD 2019.1

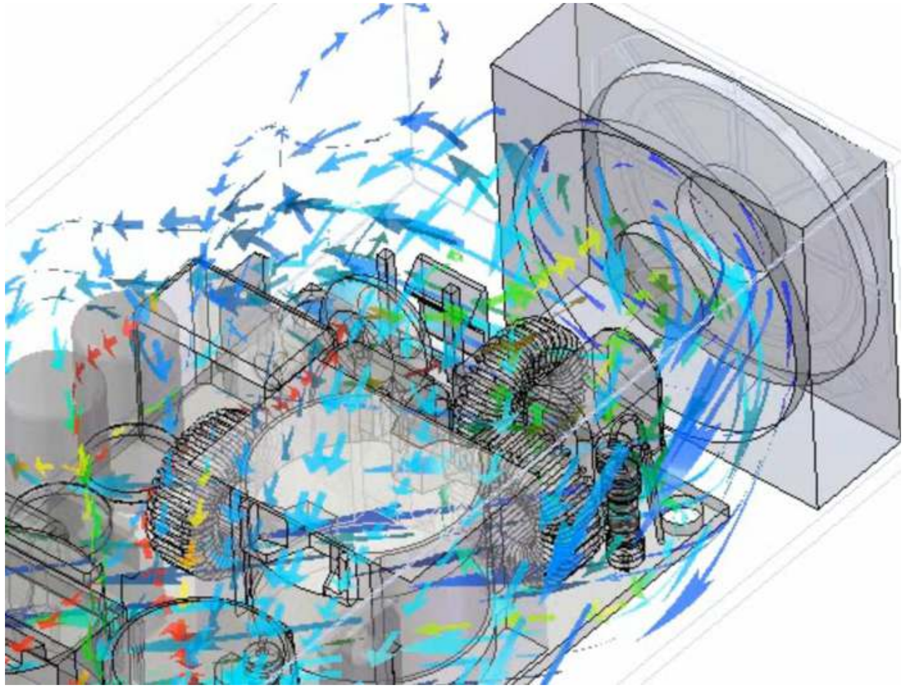
Fan Derating

Fans are often set to run below their maximum capacity, to reduce noise and increase their lifetime, but still achieve thermal cooling requirements. Fans are run at less than maximum capacity by reducing the RPM that they operate at. This has the effect of derating (reducing) the fan curve and is simulated using the Derating factor.



$$\Delta P_d = DF^2 \cdot \Delta P$$

$$\dot{m}_d = DF \cdot \dot{m}$$



Logical Expressions in Formula Dependency

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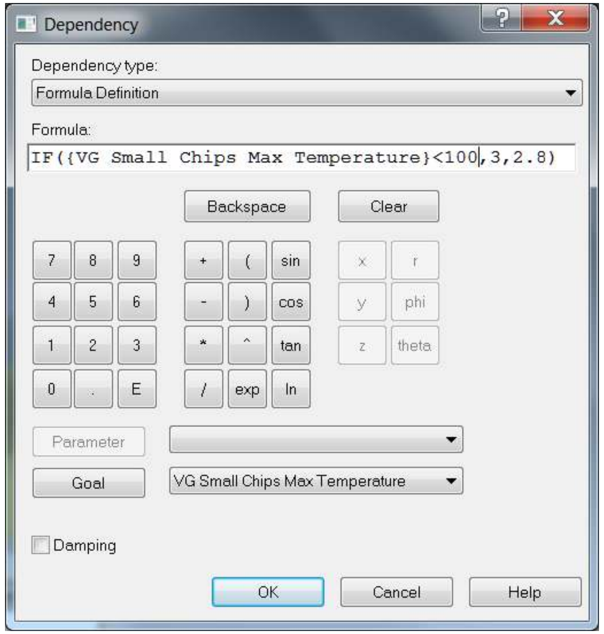
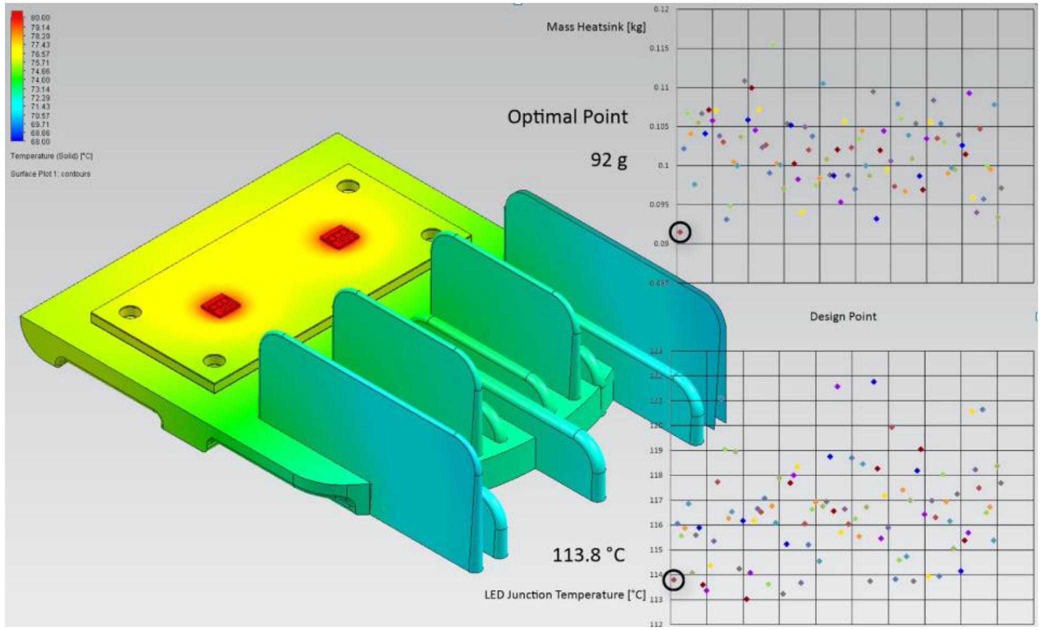
Boundary conditions can be dependent on coordinates, time and monitor parameters such as goals. It is now possible to define sophisticated dependencies using conditional and Boolean expressions such as IF, AND, OR, XOR, NOT, > (more than), < (less than), = (equal to). For example, you can easily set a value of a heat source dependent on two different temperature sensors (defined as temperature goals) so that the dissipated power is downgraded depending on the temperature at either one or another sensor.





Additional Rays for Radiation Sources

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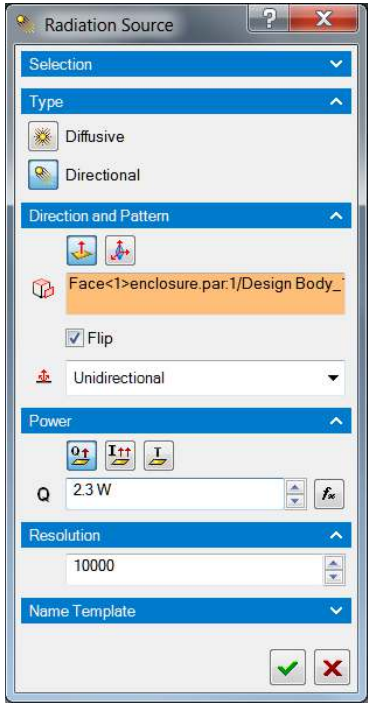
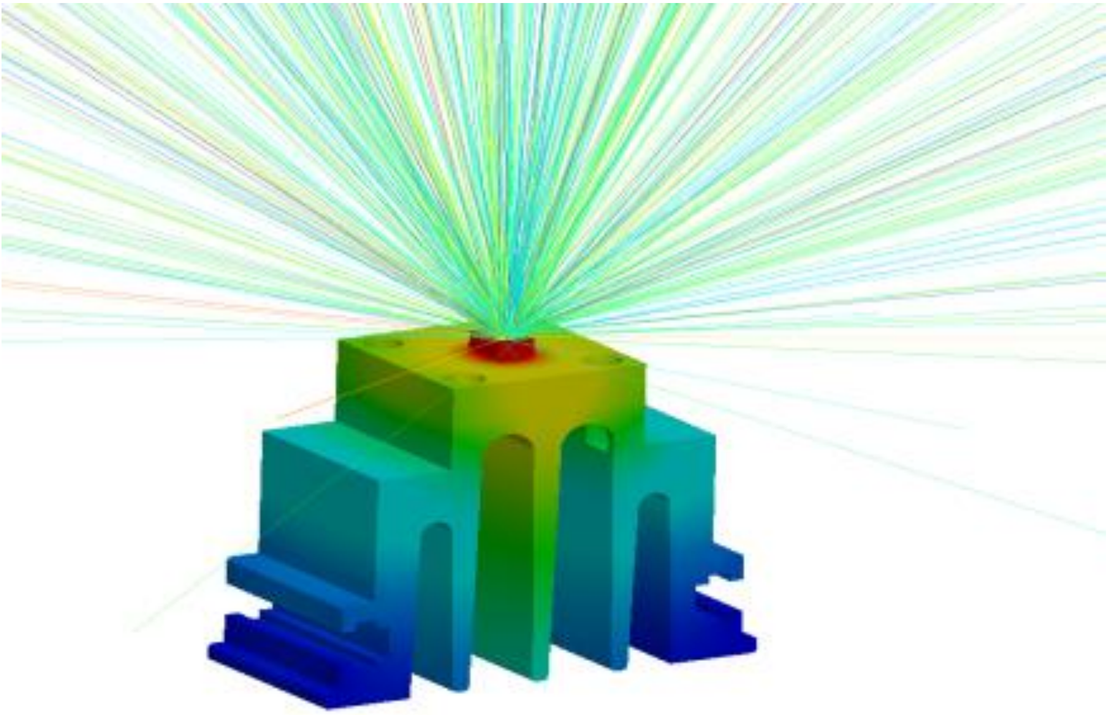
You can now add additional rays launched from a radiation source (for Monte Carlo radiation only). This allows for better resolution of radiation or light locally without significant increasing the total number of rays and therefore saving the calculation time. In addition, radiation freezing can be enabled automatically.





Network Assembly's Power is Function of Temperature

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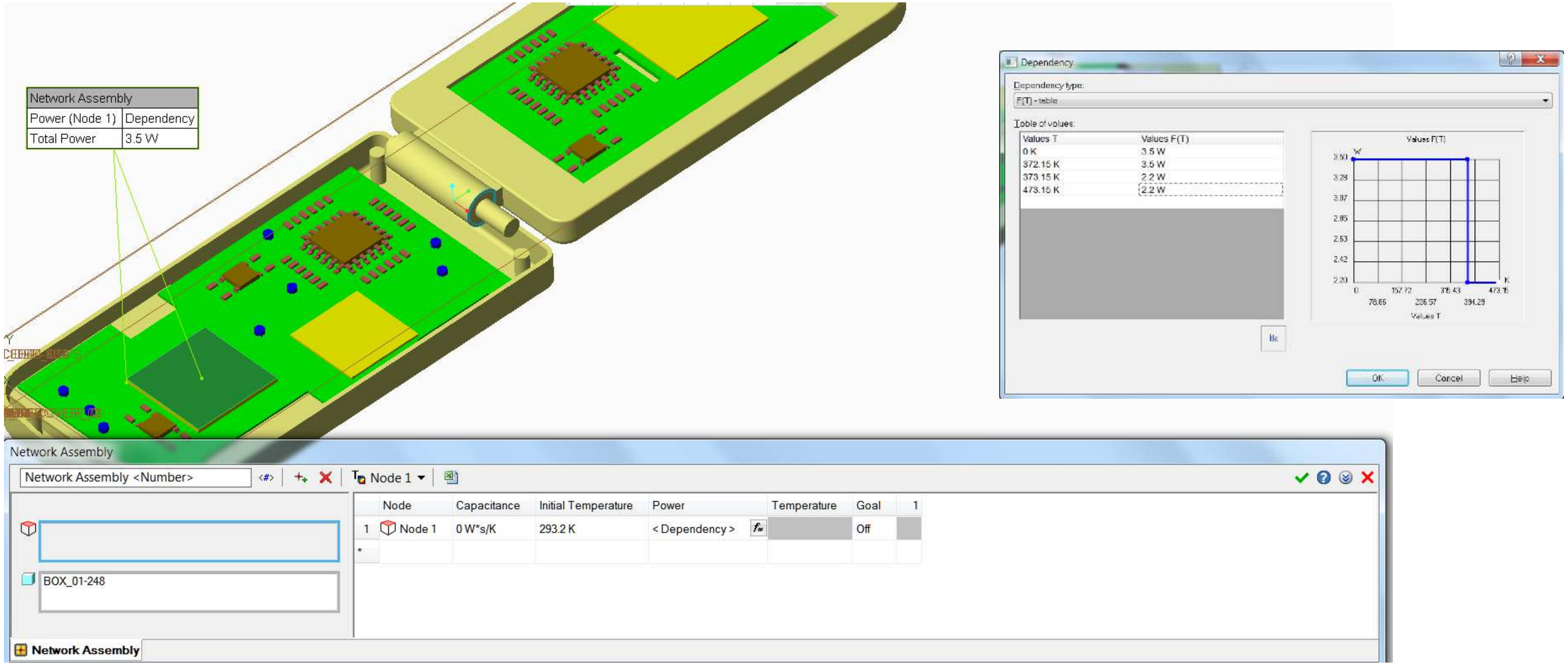
Heat power of a Network Assembly (DELPHI compact model) node can be set as dependent on the node's temperature (implicit dependency).



FLOEFD 2019.2

Heat Sink Model in Porous Media

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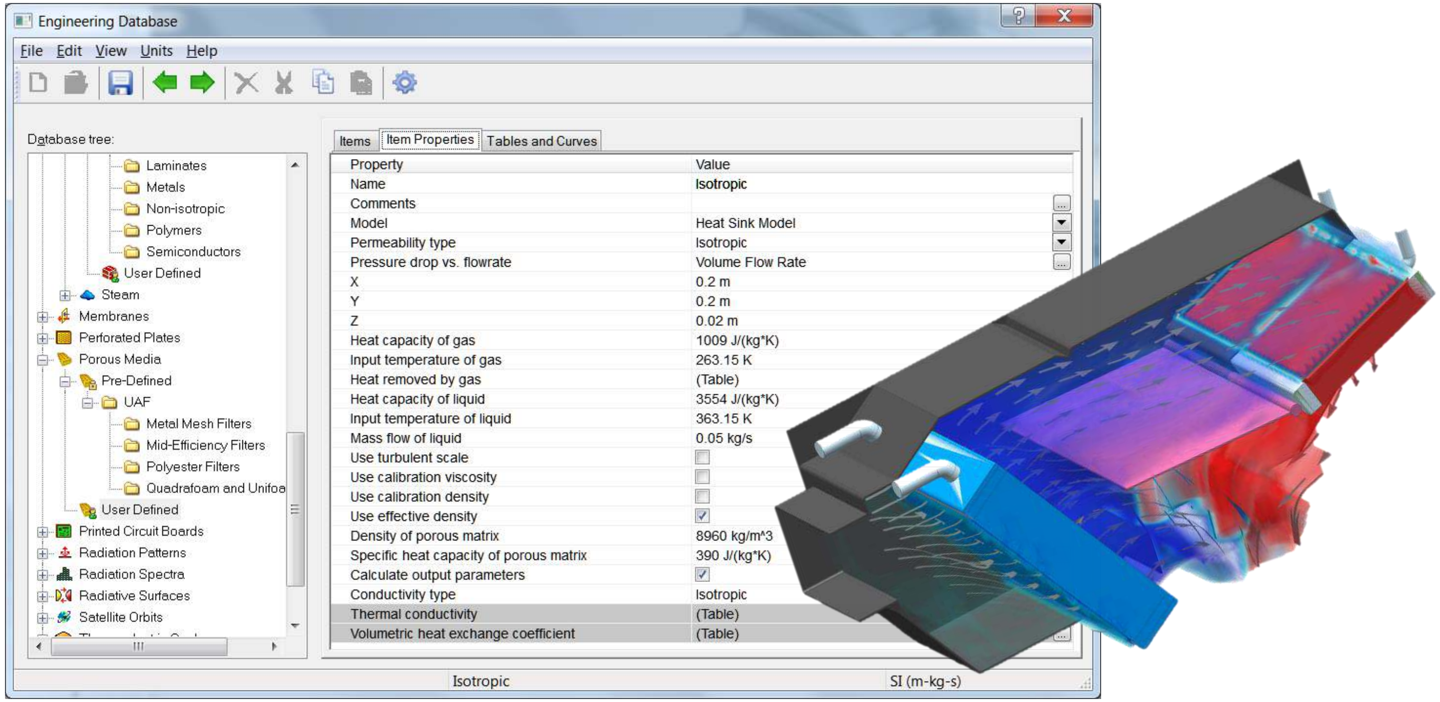
The heat sink model represents a gas-liquid cross-flow heat exchanger which is defined by a conductive porous medium. Cooling gas flowing through the porous medium is the actual fluid specified in the project. Hot liquid flowing perpendicularly is a virtual fluid and just adds heat to the system. The user needs to input Heat Removed vs Mass Flow Rate of gas (obtained from an experiment) and FloEFD calculates effective **Thermal conductivity** and **Volumetric heat exchange coefficient**.

HTC Airflow VS.Pressure Drop &Heat exchanger						
Hot(Coolant) fluid Inlet Temp (°C,Bare core):		90	Cold(Air) Inlet Temp		-10	
Hot(Coolant) fluid density(kg/m3)		1031.17	Cold(Air) fluid density(kg/m3)		1.342	
Hot(Coolant) fluid specific(KJ/kg.k)		3.5544	Cold(Air) fluid specific(KJ/kg.k)		1.009	
Air Volume Flow (m3/hr)	Coolant rate flow (l/min)					Dpa (Pa)
	3	6	9	12	0	
	Performance (W)					
100	3284.2	3392.7	3428.8	3446.8	0	
200	5580.7	5987.2	6123.1	6187.8	0	
300	7151.7	7945.8	8226.6	8370	0	
400	8277.9	9457.8	9888.2	10110.5	0	
500	9199.5	10737.4	11323.4	11629.2	0	
MAX						
DPw(kPa)						



Radiation Volume Scattering, Radiation distribution in space

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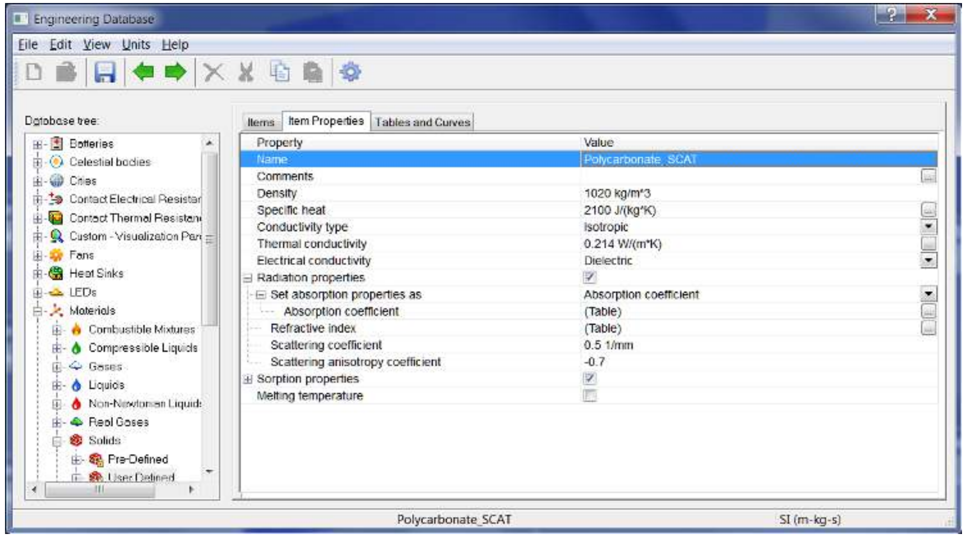
Scattering (**linear-anisotropic scattering**) of radiation within solid bodies can now be taken into account. **Scattering coefficient** (σ_s) and **Scattering anisotropy coefficient** (C) can be specified under **Radiation Properties** for the Solid Material in the Engineering Database (for Monte Carlo radiation model only).

$$\frac{dI(\vec{s},\vec{r})}{ds} = \sigma_s \left(\frac{1}{4\pi} \int_{4\pi} I(\vec{s}_i,\vec{r}) \Phi(\vec{s}_i,\vec{s}) d\Omega_i - I(\vec{s},\vec{r}) \right)$$

$$\Phi(\vec{s}_i,\vec{s}) = 1 + C\, \vec{s}_i \cdot \vec{s}$$



Also a **Radiation source** can now depend on coordinates and time.

Display Component Temperature (Min, Av, Max) in a section with Surface Parameters.

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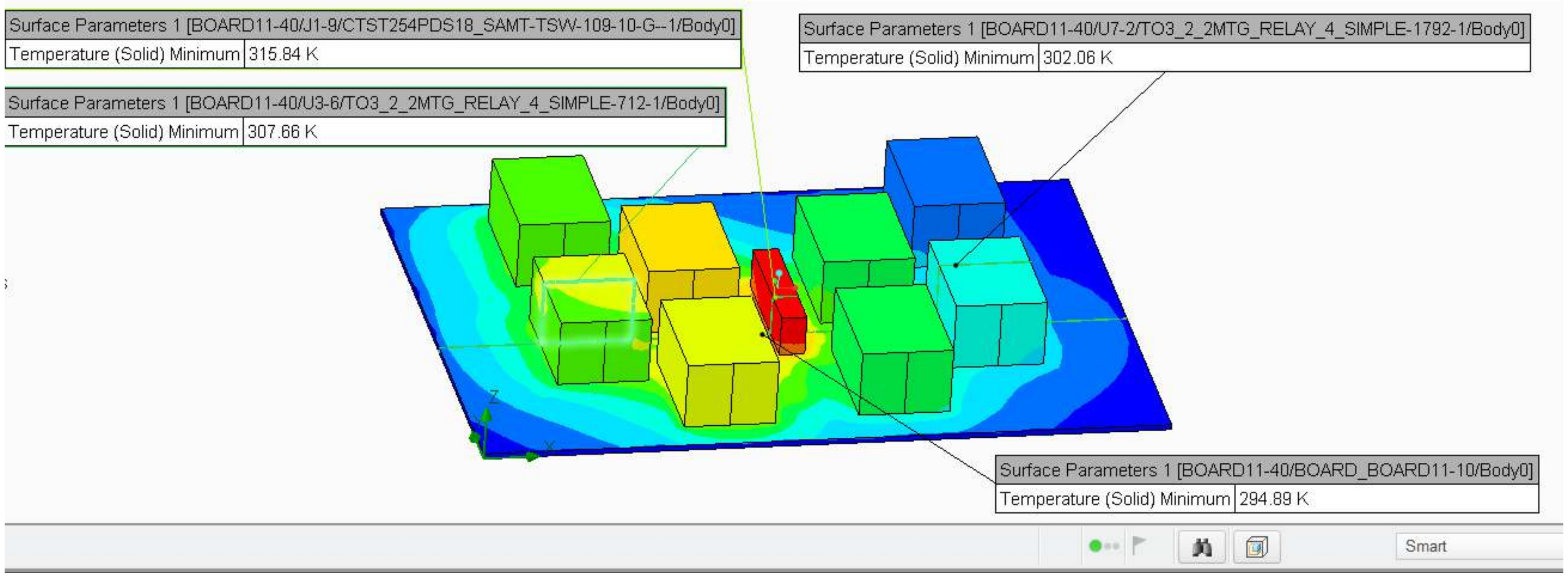
Earlier when local and integral surface parameters values were displayed for each contour (loop) separately, such contours were named by components materials names. For cases in which there were several components with the same materials, different contours were named similarly. Now contours are named uniquely by the **components' names**.



Other Improvements in 2019.2

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- **Vapor diffusion coefficient dependency on temperature for membranes**. Now vapor diffusion coefficient of a membrane can be specified as dependent on temperature.
- **Add from component (Linked conditions)**. Possibility to add local mesh condition from a component (conditional that it is still relative to basic mesh of the main project).
- **Dependency**. Coordinate dependency for turbulent parameters, components of velocity and Mach number, and pressure is added.
- **DoE**. Response Surface viewer now has a chart for objective function.
- **Free surface**. Air compression is taken into account.
- **Cauer export from Calibration**. You can now export a structure function into Cauer thermal network format (Spice ready) for further 1D simulation.
- **Project template**. Project template in FloEFD for CATIA V5 can be used by other FloEFD products so sharing simulation tasks among different CAD systems is now easy.
- **MLS update**. This version supports Mentor Standard Licensing (MSL) version 2019_2 which uses FlexNet™ 11.16.2.1. This may require updating the license server.

FLOEFD 2019.3

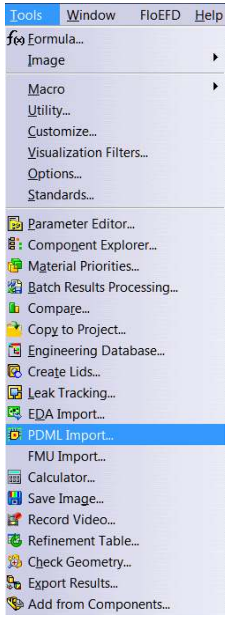
PDML Import

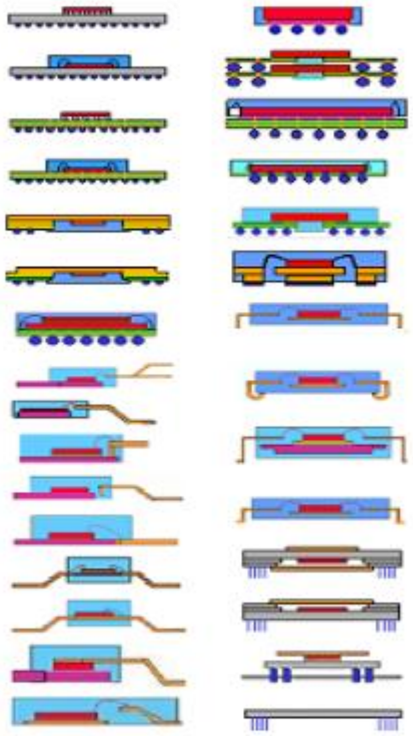
PDML is originally a FloTHERM format which is often used by IC vendors for supplying users with IC package simulation models. This format is also used by FloPACK – a product from Mentor Graphics designed to generate accurate thermal libraries of IC components, often as 2R or Network assemblies.

An IC package definition in *.pdml format can now be imported into FloEFD (requires EDA Bridge license).

PDML format contains information about geometry, sources and material properties. The following information can be imported:

- Geometry
- Power load (heat source)
- Material properties, including surface radiative properties
- 2R, Network assembly





EDA Bridge: Add PCB Model to Existing Project via Linked Conditions

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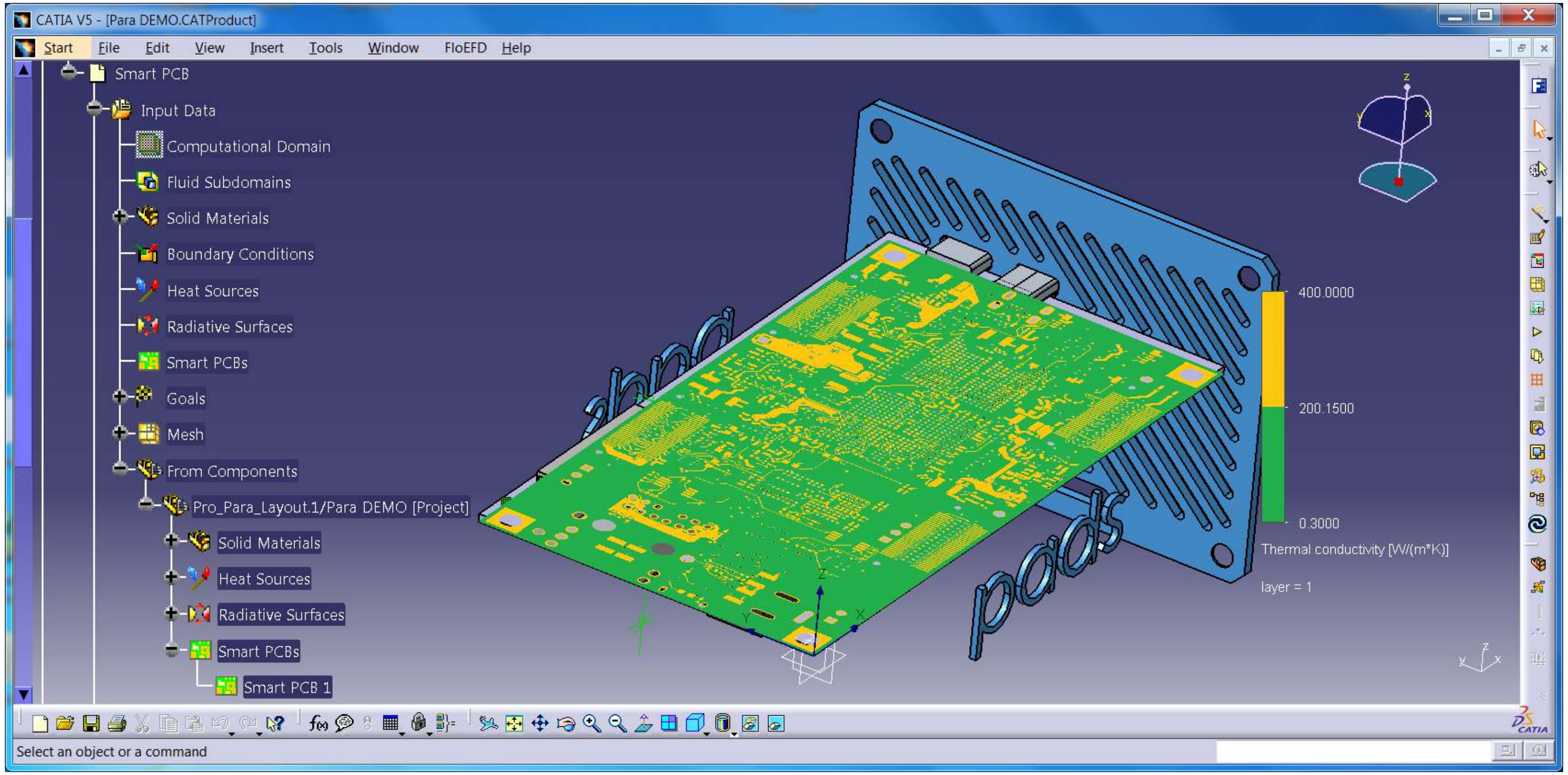
PCB can be now imported to an existing project and easily shared to other models.
EDA Import adds PCB to a separate model which is added into main assembly's project as Linked condition (Add from Component)



EDA

Imports EDA File, e.g. **IPC2581 (Rev B)**

EDA Bridge

Creates new part and add FloEFD project and PCB data

Part

Automatically adds using the **Add from Component** feature

Assembly/Product

Complex Dependensies

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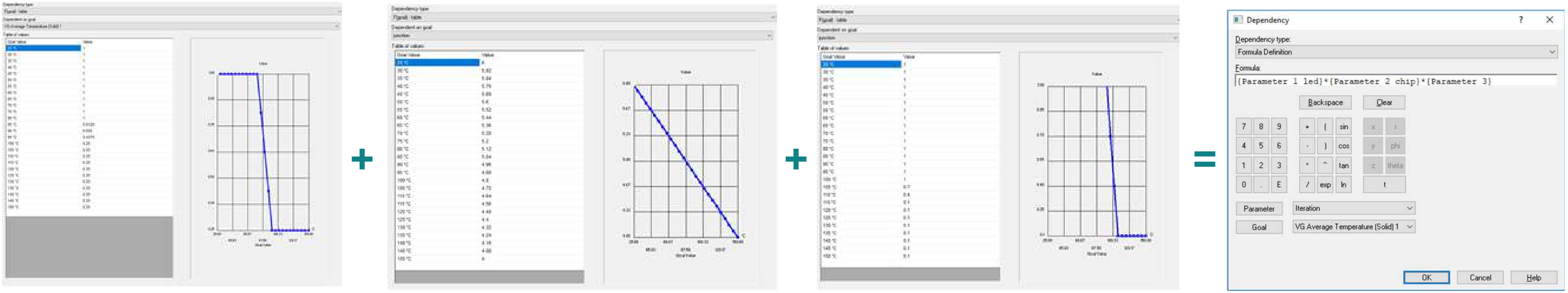
Parameters were introduced in 18.0 as constants. A boundary condition can be dependent on parameters. Parameters can now be dependent on goals, time, iterations and travels as a function or a table. Together with the possibility to define logical expressions (IF, OR, AND, >, <, etc.) this provides maximum ease and flexibility in defining complex dependencies.

	Name	Value	Dimensionality	Type
1	Parameter 1_led	< Dependency >	No unit	Number
2	Parameter 2_chip	< Dependency >	No unit	Number
3	Parameter 3	< Dependency >	No unit	Number



Equation Goal Dependent on CAD parameters

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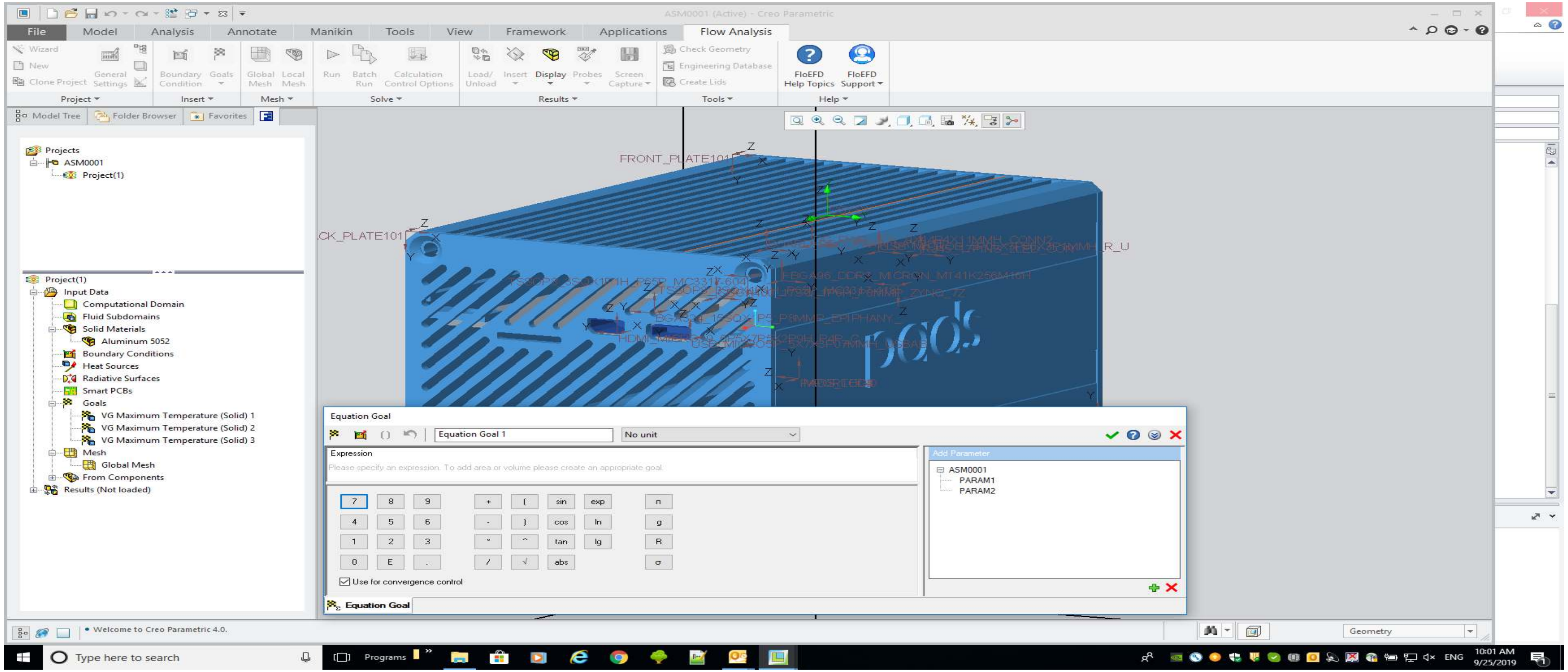
Equation goals can now depend on a CAD parameters.



Automatic Min/Max scale for contour plots

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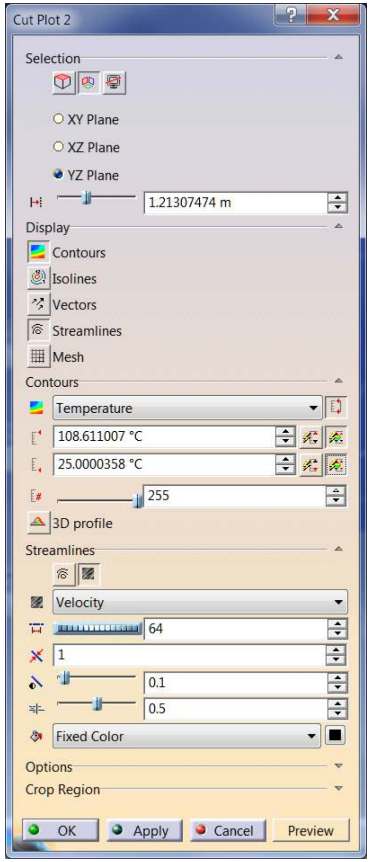
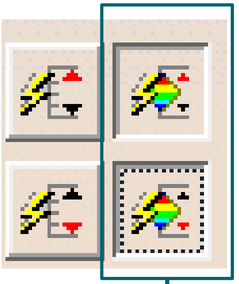
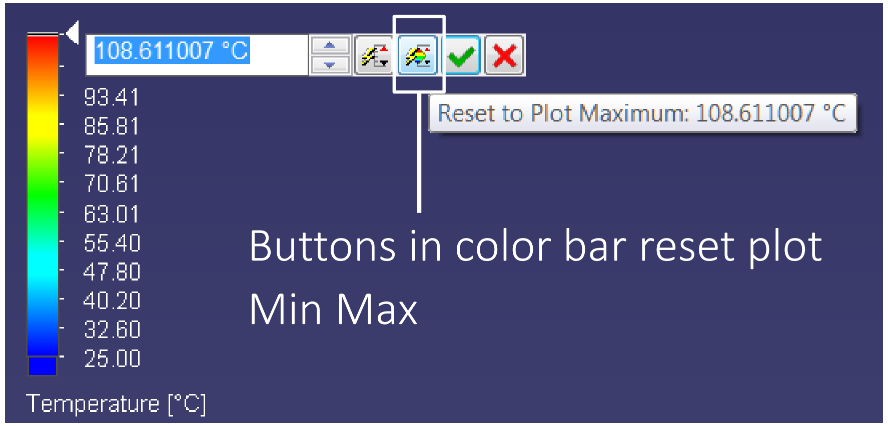
Plot minimum and maximum values can be automatically scaled when results are changed.







Buttons in color bar reset plot Min Max

Buttons in plot work as toggle and keep plot Min Max until they are reset

Remote Calculation Improvement

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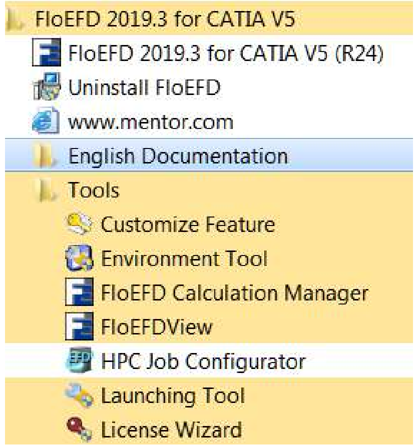
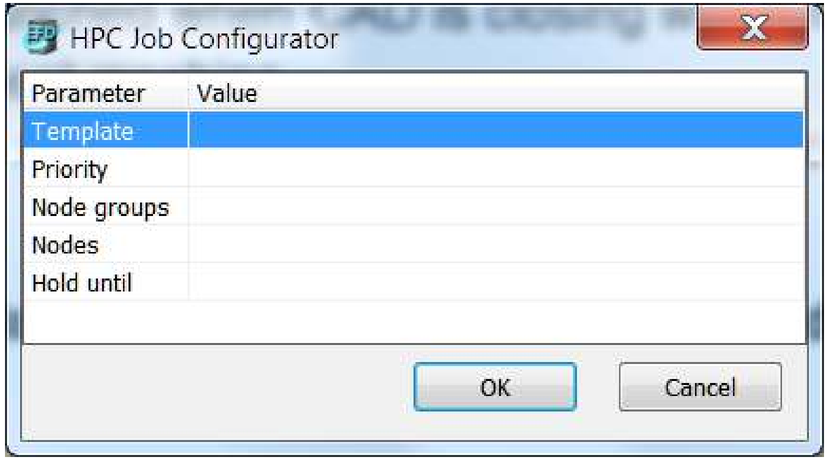
Improved copying of results from server.

Results are copied to client computer even though CAD was closed.
A special routine is launched when CAD is closing which monitors readiness of results and perform copying to client machine.
In case the computer was switched off, the copying procedure will be done on opening CAD.

Passing arguments to Windows HPC Pack 2016 scheduler at user level





Speed up Flow Trajectories (Pattern on Shape)

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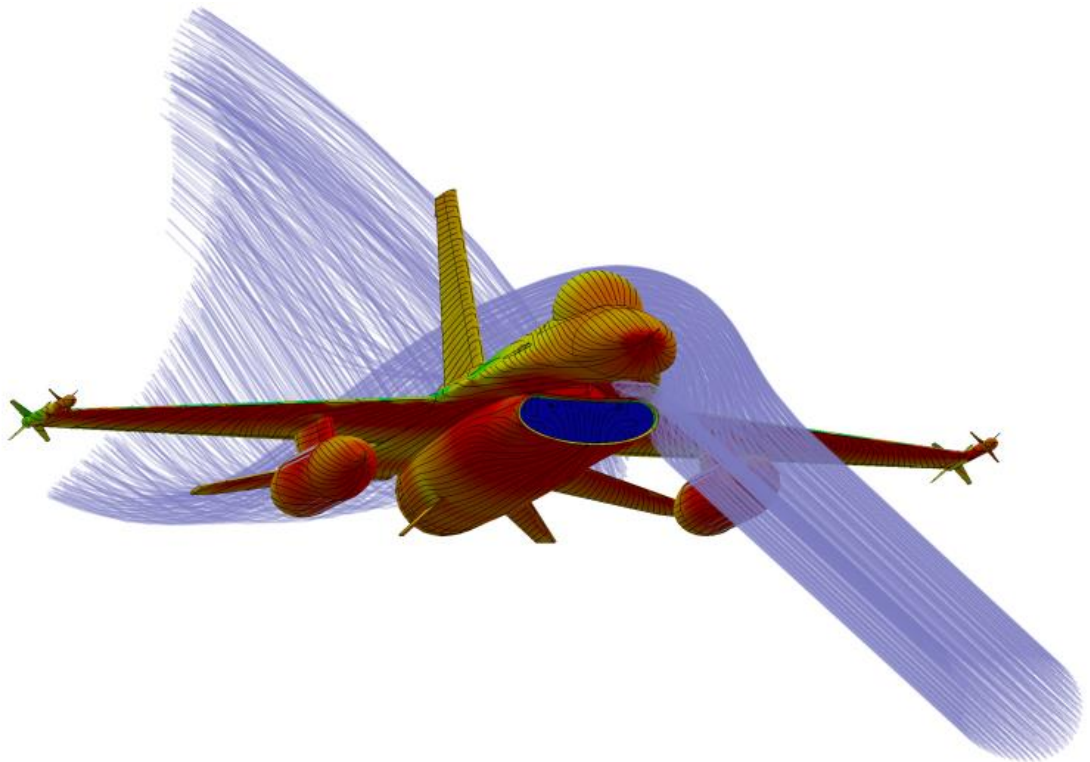
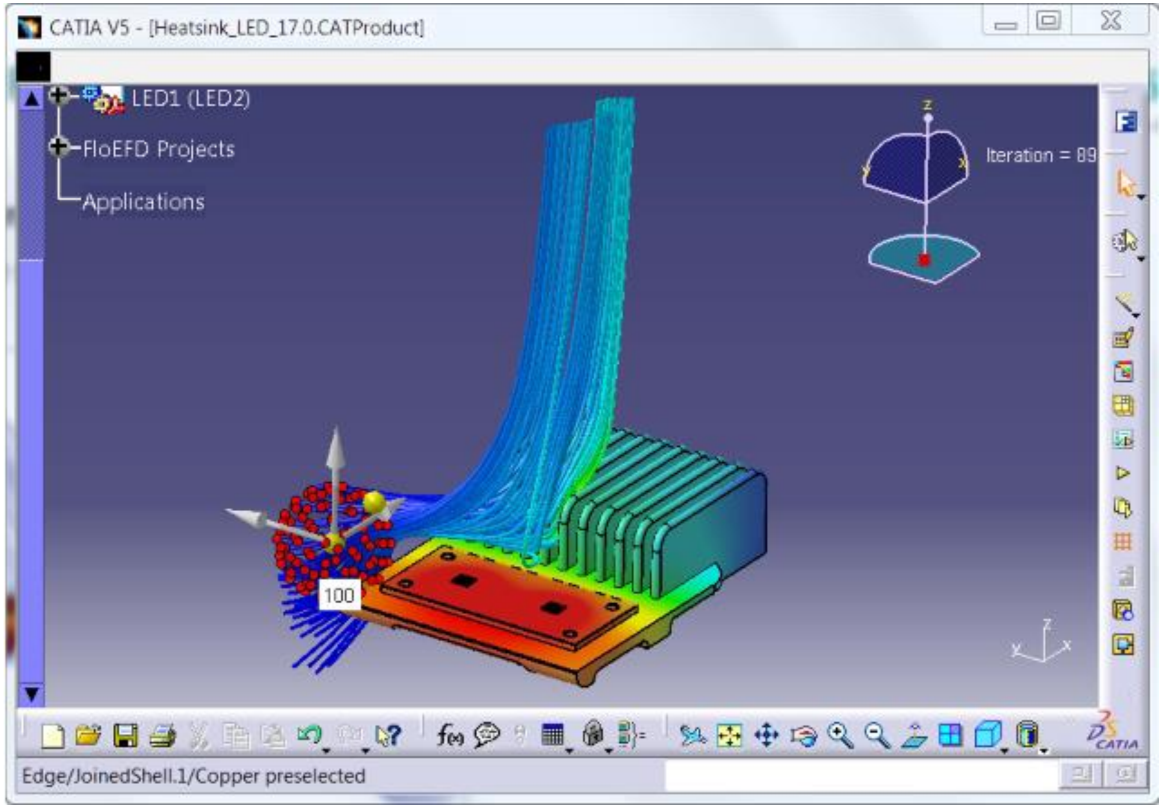
The **Pattern on Shapes** type displays a large number of trajectories much faster.

A new **Sphere** shape allows for easier definition of trajectory starting points.

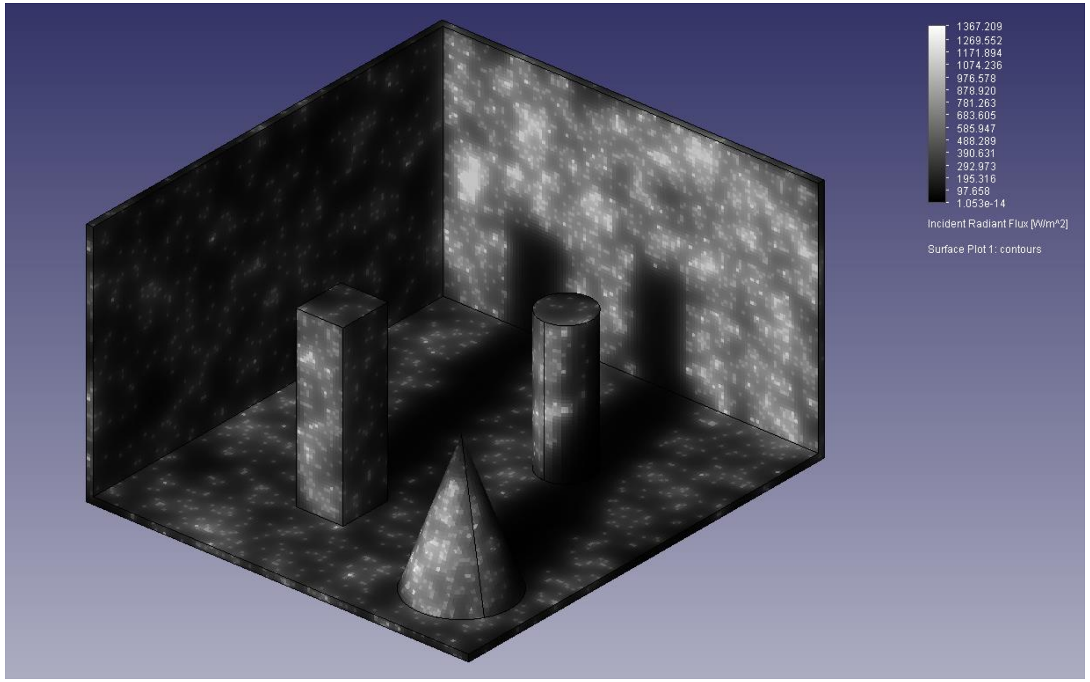




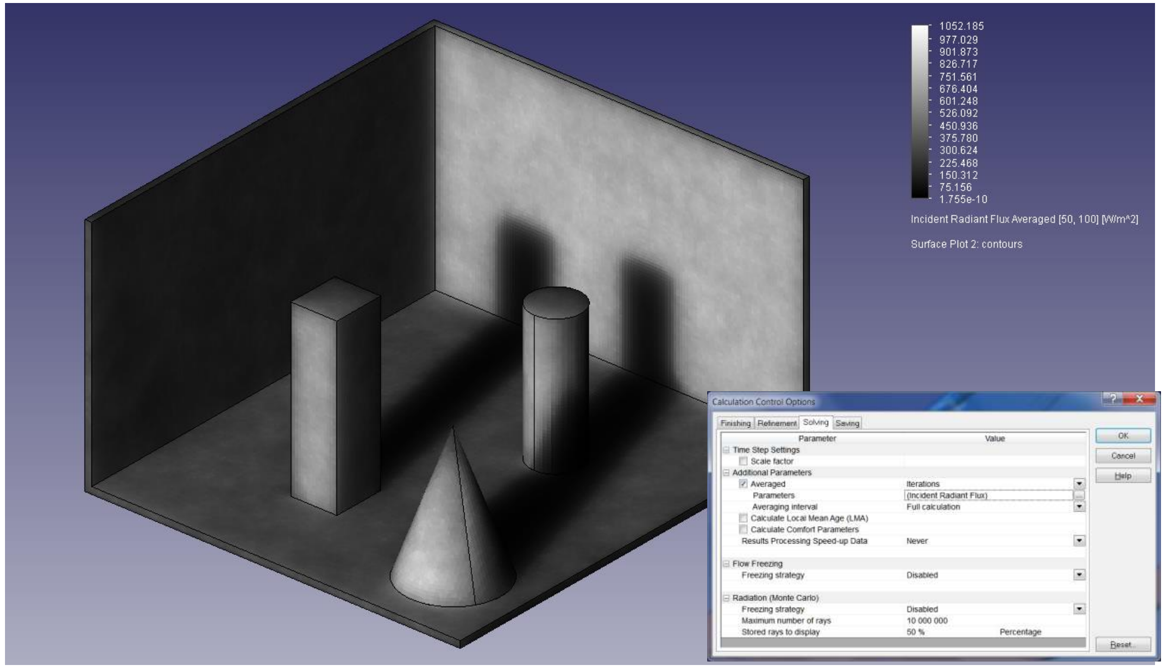
Averaging in Steady-State

Parameters can now be averaged over iterations in steady-state analyses.

This in particular can help to reduce noise in a Monte Carlo radiation simulation.



No Averaging



Averaging

Other Improvements in 2019.3

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- **Phase change for all real gases**. Phase change is now available for all real gases not only refrigerants.
- **FLOEFD View.** A few enhancements in FLOEFD's free results viewer:
  - "Normal to Plot" view is added for cut plots.
  - Rotating now rotates around the center of the view.
  - Section can now crop plots (Apply to plots option) not only the geometry.
- **Save As**. Added selection of View mode (Wireframe, Shaded, Shaded with Edges).
- **Results summary**. Added turbulence parameters into results summary.
- **Ray plot**. Ray plot is available for definition before calculation and can be processed with Batch Results Processing.
- **Surface parameters**. Offset option is added to Surface parameters.
- **Point goals**. When adding points by coordinates you can set the name of the goal.

CAD and Licensing Support

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- **CATIA V5-6R2019**. Support of CATIA R29 (SP1 tested).
- **Creo 6.0**. Support of Creo 6.0 (6.0.0.0 and 6.0.1.0).
- **NX 13**. Support of Siemens NX 13 (1847 and 1872 Series).
- **SE 2020**. Support of Solid Edge 2020.

- **Customize Licenses Feature**. Customize Features now lists modules rather than specific license features. System administrators can now customize the license choice for multiple users using the CustomizeFeatures.exe routine. For details, refer to the “Selecting License Features to Use” in the Installation Guide.

- **MLS update**. The new MLS 2109_3 is based on Flexera FlexNet 2019 R2 (11.16.4) where a bug with license management is fixed: A client can be removed from license queue after 2 hours of waiting in case of VPN connection to the server

FLOEFD 2019.4

FMU Export and Import

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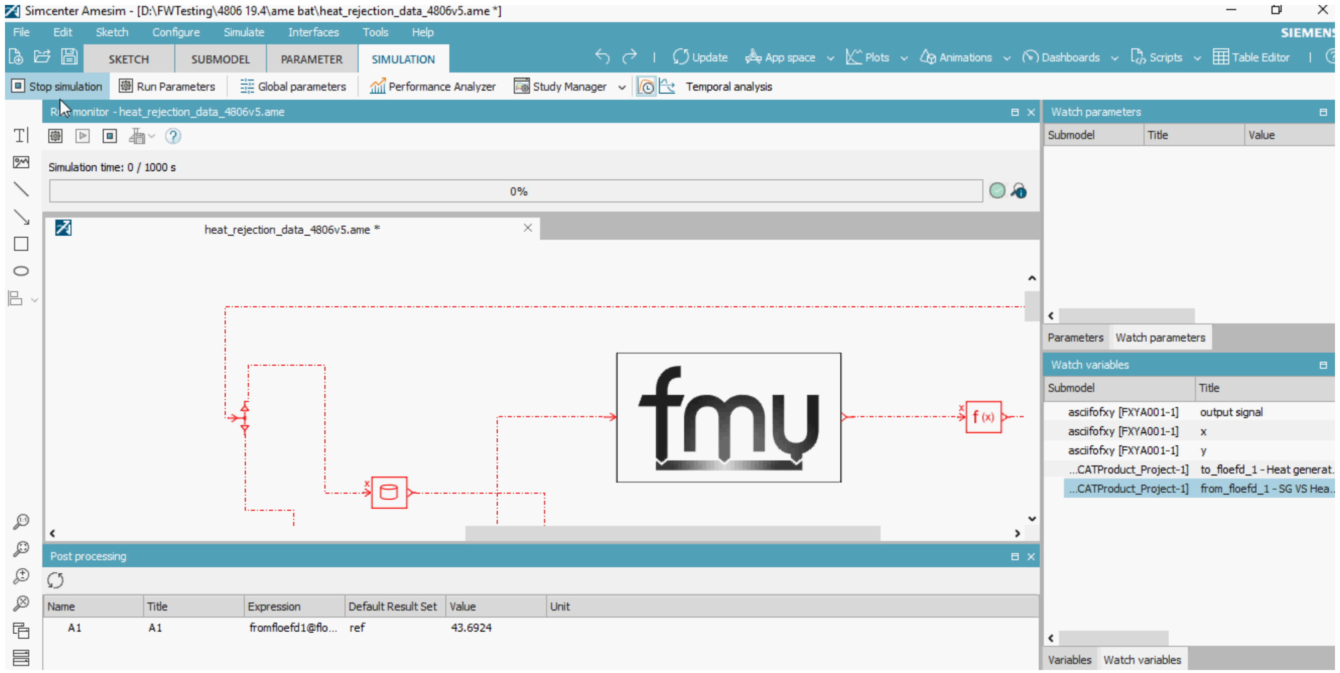
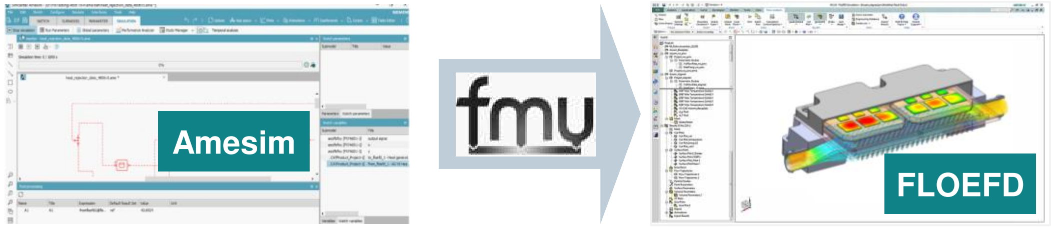
FMU Export (FloEFD is a slave) and **FMU Import** (FloEFD is a master) allows to perform co-simulations of FLOEFD with various simulation tools, such as Simcenter **STAR-CCM+, Amesim**, **Flomaster**.



FMU Export from FloEFD

FMU Import into FloEFD



Near field Illuminance, Far Field Luminous Plot

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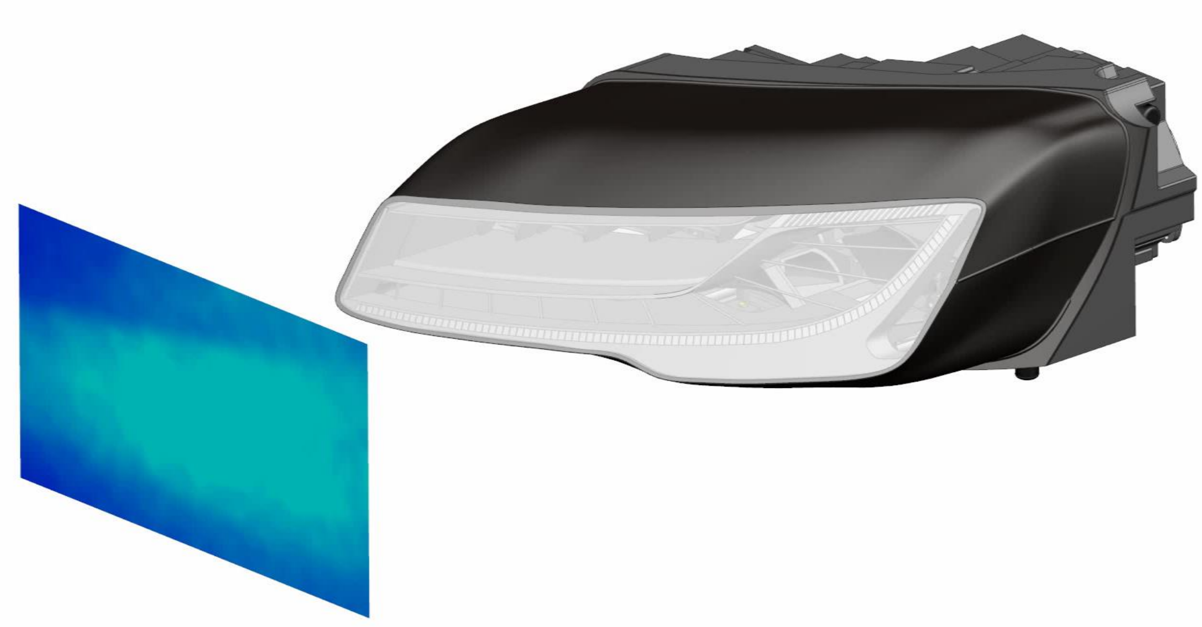
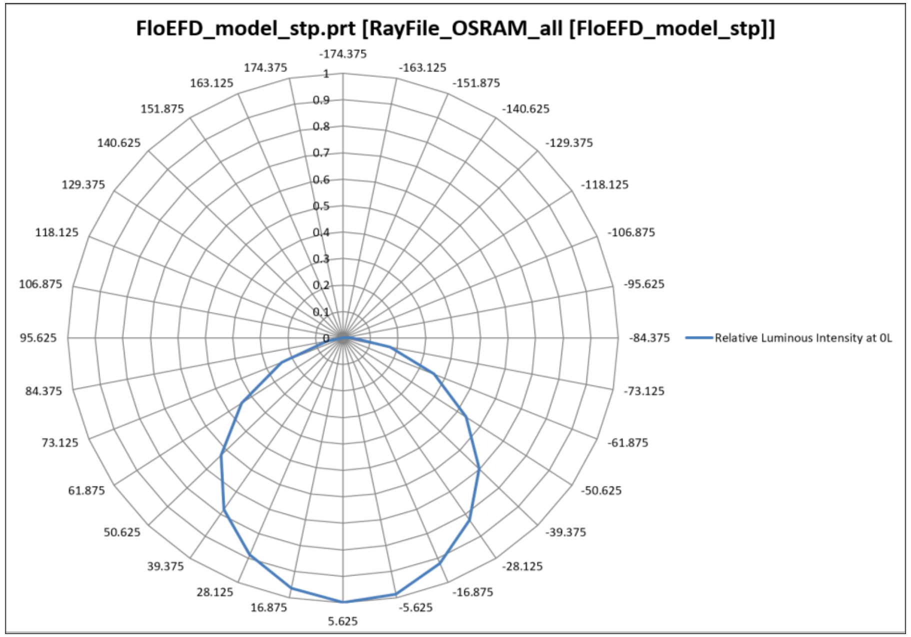
You can now display illuminance (incoming radiant flux adjusted for the capability of human eye, i.e. intensity of visible light) plot.



Near Field Illuminance



Far Field Luminous Intensity

FLOEFD Interface to Simcenter Motion

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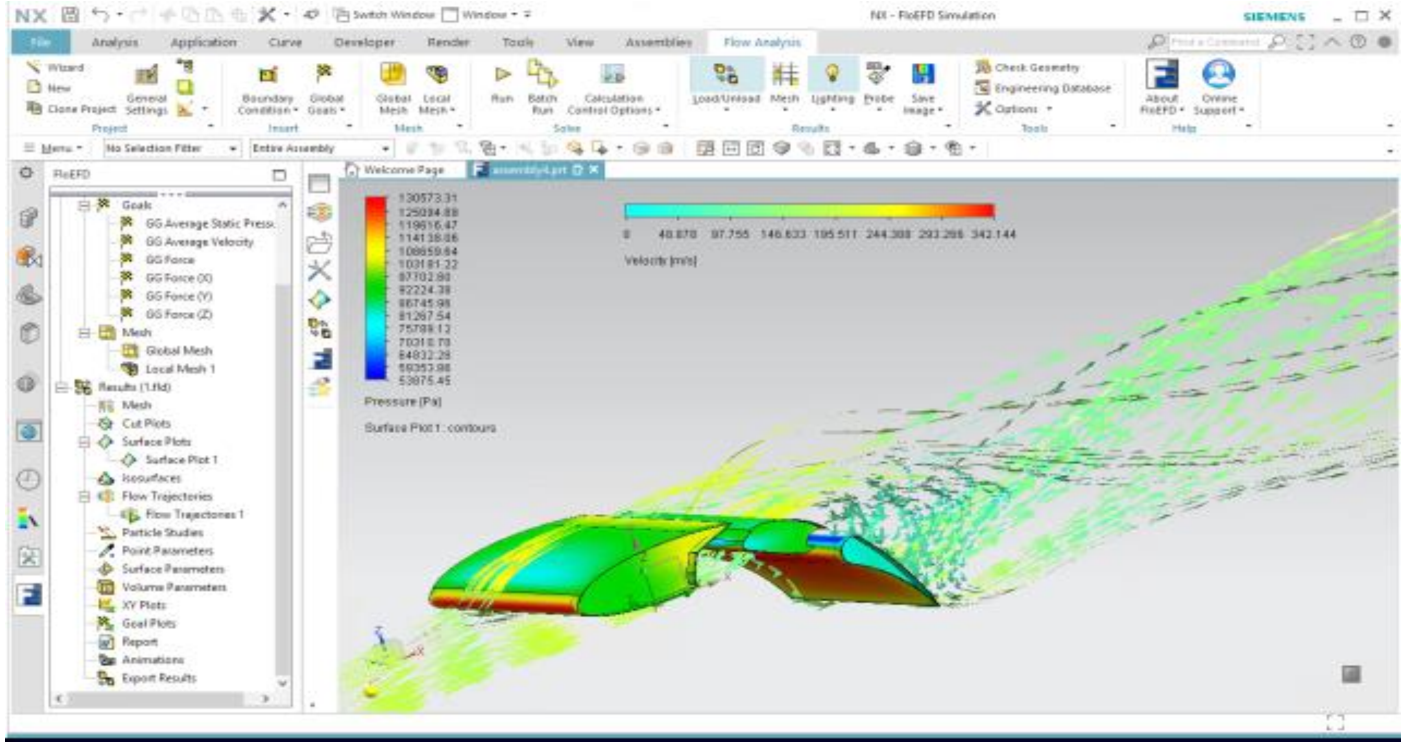
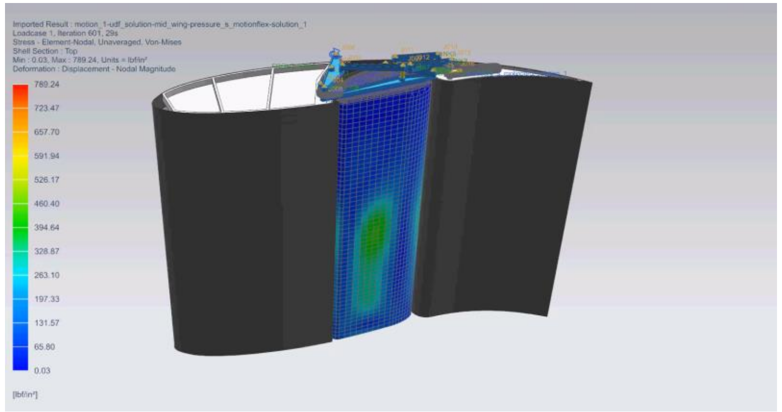
It is also possible to interface FloEFD with 3D Motion by transferring FloEFD results into Motion for analyzing fluid driven kinematic. The new export of forces makes it easier.





Other Improvements in 2019.4

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- **Import Structure function.** Structure function (RC ladder) from T3Ster (*.xCTM) can be imported into Network Assembly.
- **Via Material selection.** All vias in SmartPCB can be assigned either dielectric or copper material or can be excluded from calculation.
- **Component Control filter: Duplicated, Hidden**. You can show hidden or duplicated components in the Component Control dialog.
- **MinMax from cropped region**. Plot Min and Max values are now calculated taking into account plot's crop.
- **LED additional rays.** You can now add additional rays for a specific radiated LED (LED must have "Radiation properties" enabled).
- **Cut-off wavelength.** You can now specify a radiation wavelength above which the material is considered as opaque.

Thank You