

# FloEFD 17 What's New

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Product Manager

MAD, FloEFD

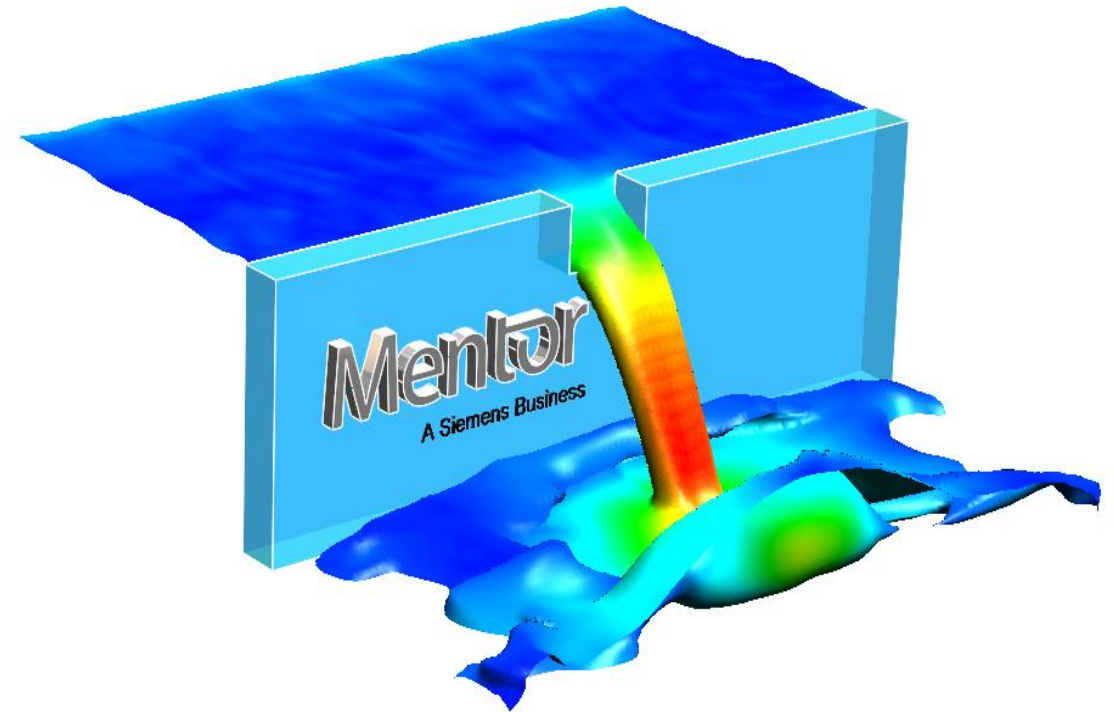
August, 2017

# Free Surface



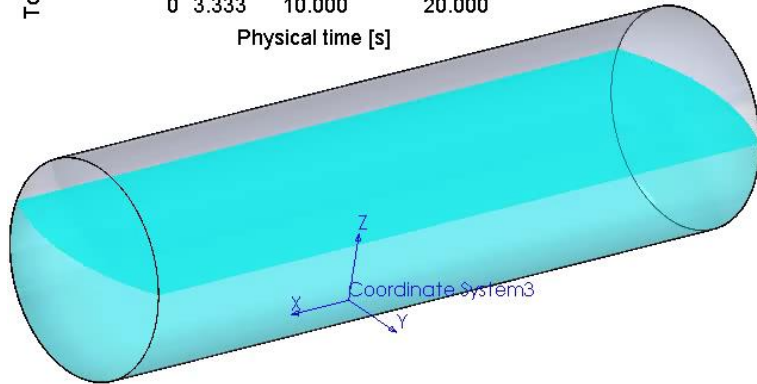
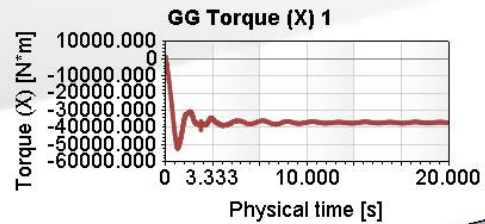
**Robust and general enough method (Volume-Of-Fluid) to simulate a moving interface between immiscible fluids with densities ratio up to  $10^4$ .**

- Two fluid mixture
- Gas – Liquid, Liquid – Liquid
- Gas – Non-Newtonian (ADVANCED module)
- Incompressible solver only (valid for Mach < 0.3)
- Many drops, bubbles or complex topology of free surface lead to large mesh for accurate representation of the surface
- Surface tension is not modelled
- No Boundary Layer model on free surface
- No condensation, evaporation, cavitation
- No rotation (plan to include in 17.1)

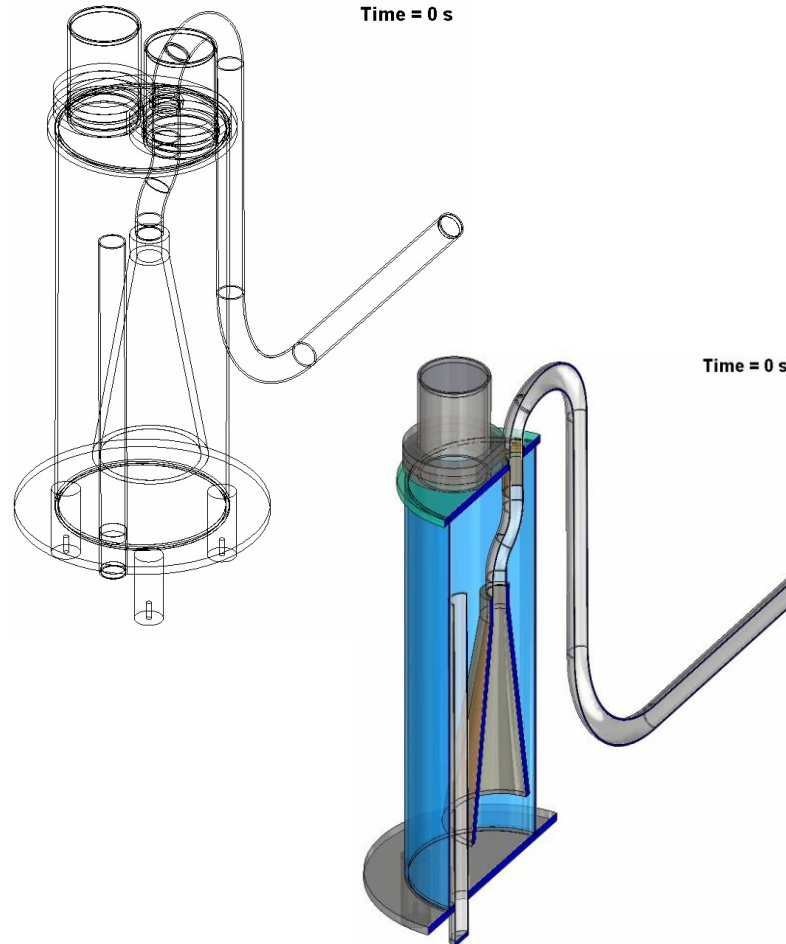


# Free Surface - Applications

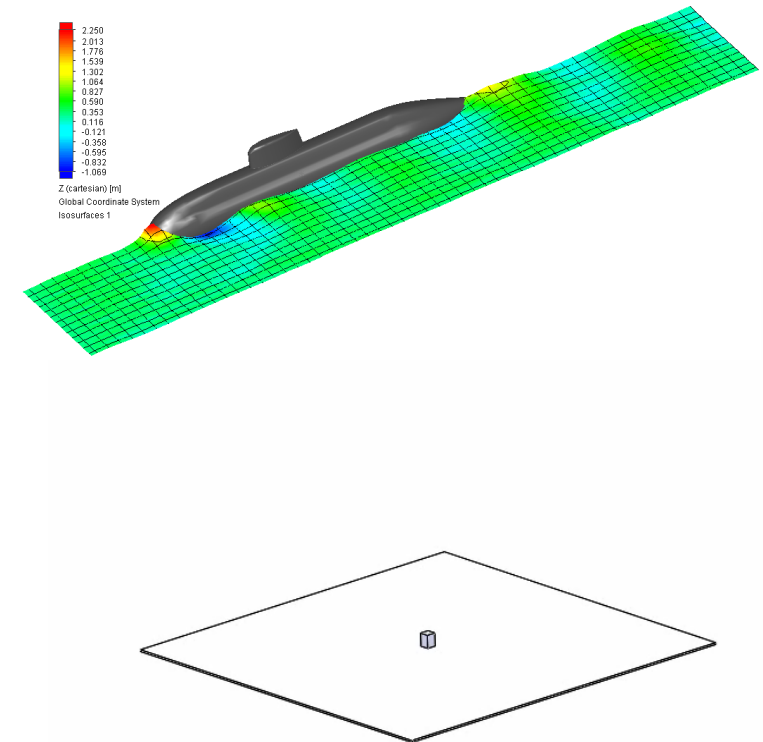
## Sloshing



## Filling/Evacuation

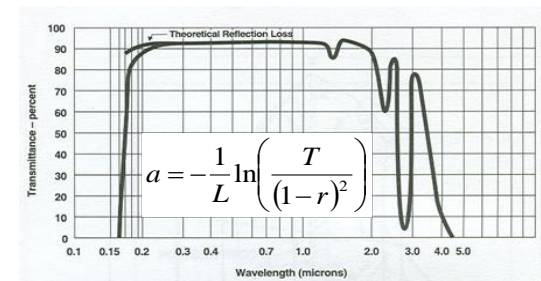
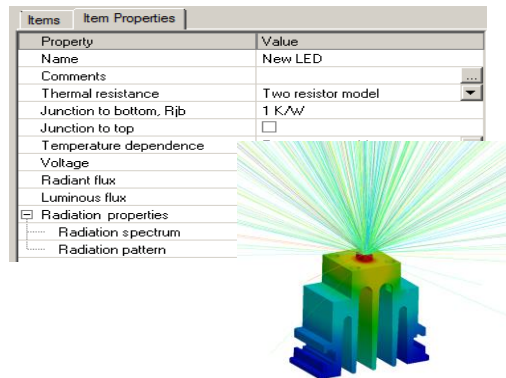
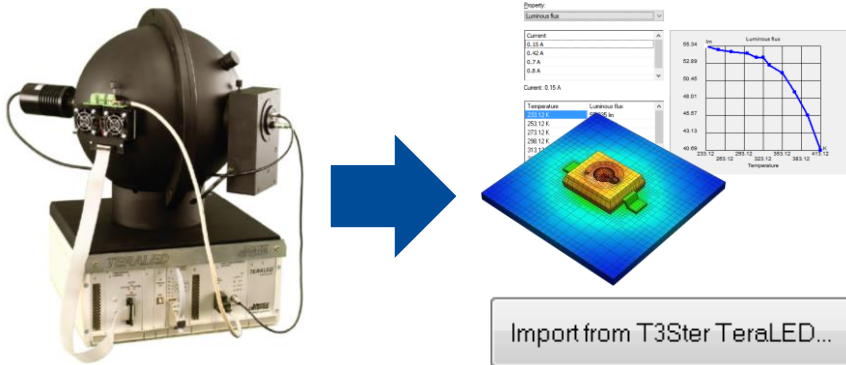


## Jet/Open water

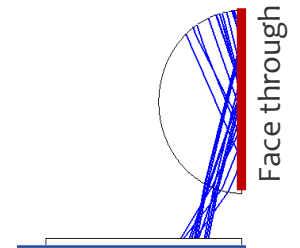


# Lighting & Radiation

- Import **non-linear LED** characteristics from **TeraLED** as a raw table instead of coefficients of linearity (sensitivities).
- Radiation **spectrum and pattern** (power dependency on angle) are added to the definition of **LED Thermal-Optical** compact model.
- Possibility to add **transmission curve** instead of absorption curve as a radiation characteristic for semi-transparent solid materials.
- Ray visualization. Possibility to display **rays going through** a face of a semitransparent solid (not only start/end at).



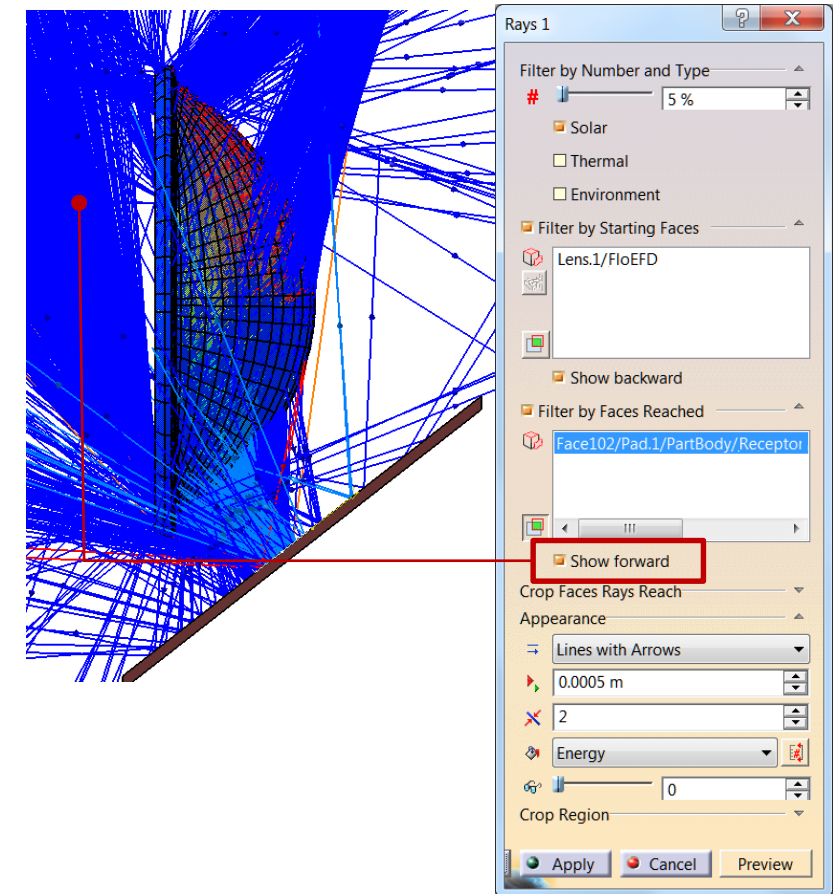
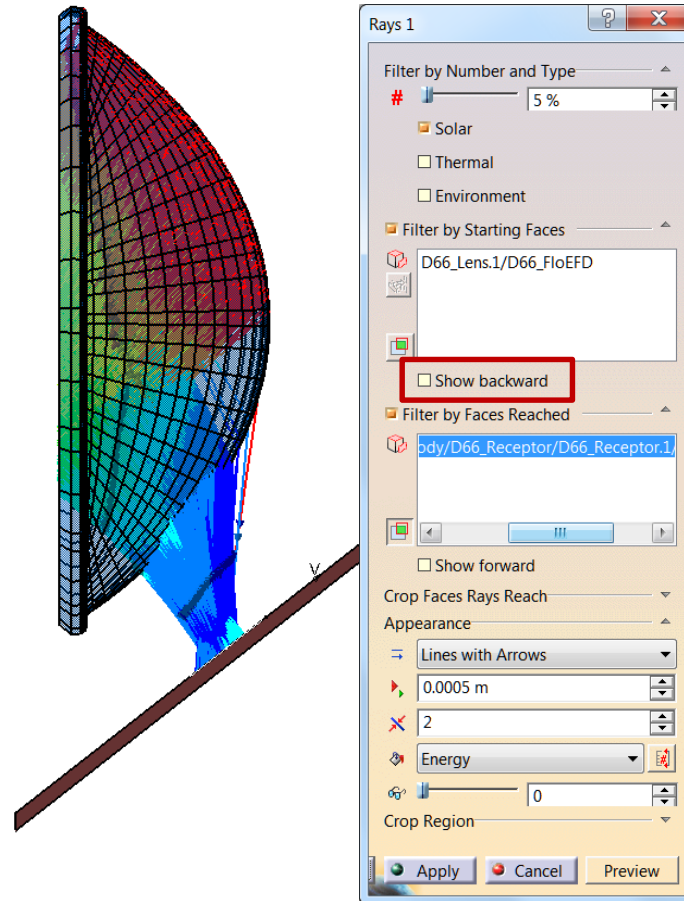
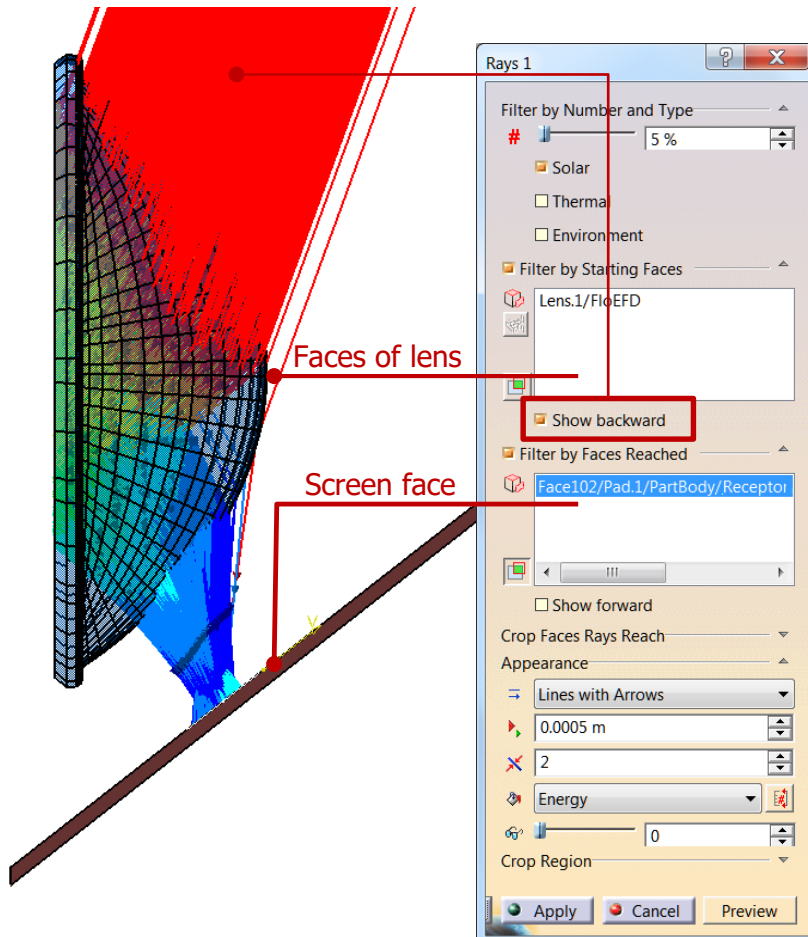
Transmission curve





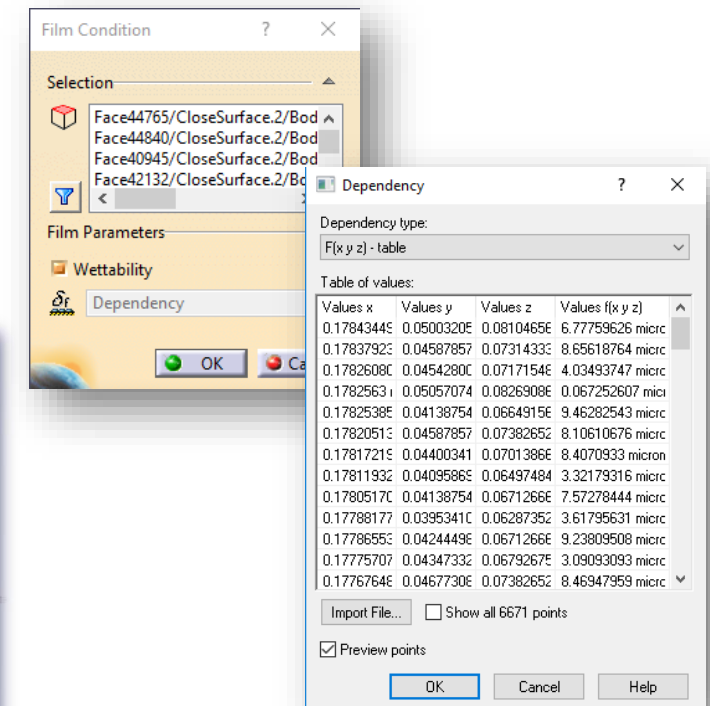
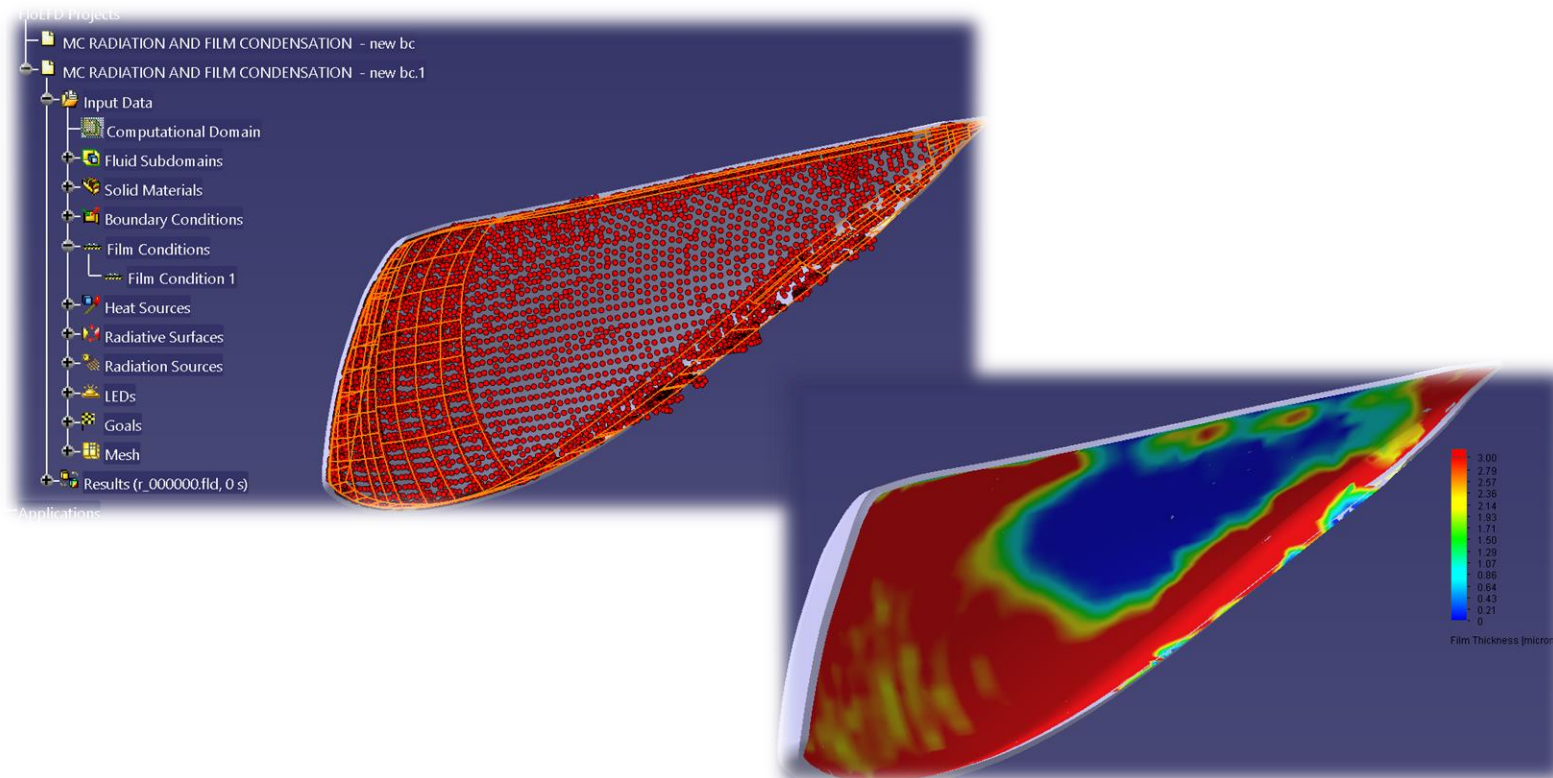
# Rays (details)

You can now display rays between two selected surfaces, including those which go through a selected semi-transparent surface.



# Film Enhancements

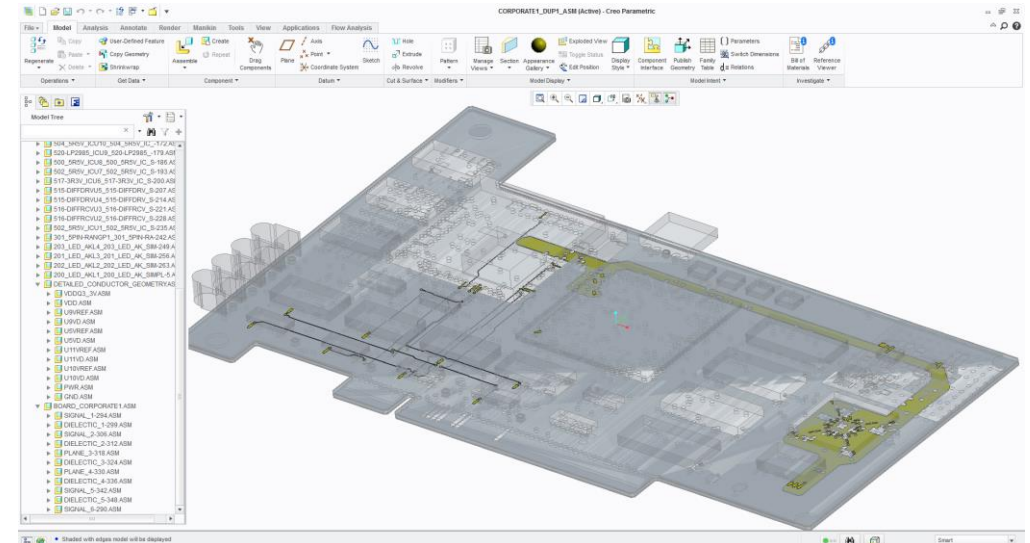
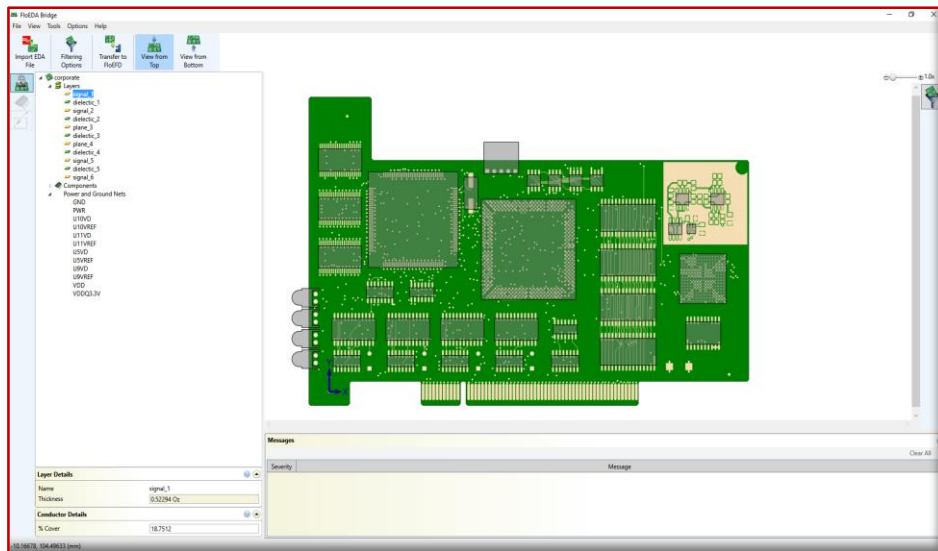
- Film thickness mapping - Import film thickness as a table of points. Used for transferring results of film condensation to other simulation.



# EDA Import Enhancement

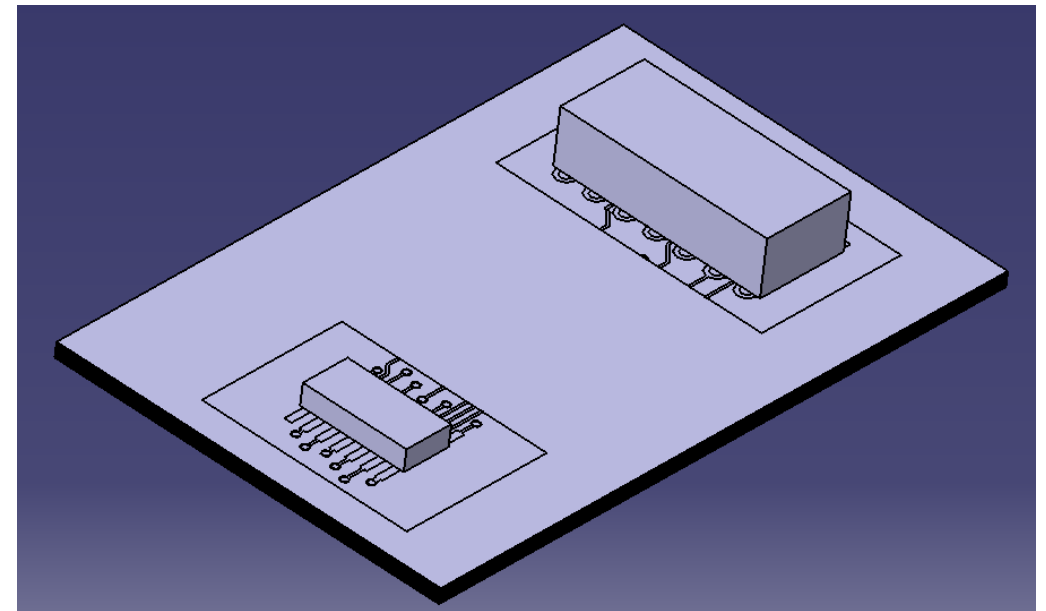
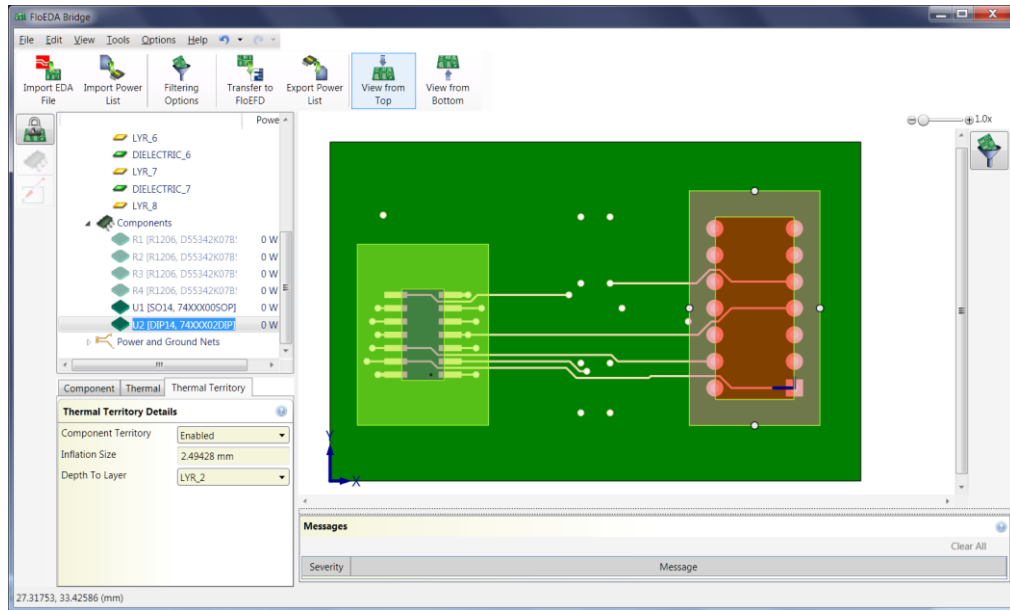
Import Material, Power Map.

Automatic definition of effective material properties from the layer structure.  
Undo.



# EDA Import Enhancement

**Thermal Territory** is ability to explicitly model only a selected area under a component.





# Component Explorer Enhancement

Create/edit sources, 2R, LED, PCB and materials from the table.  
Display total power applied.

The screenshot displays the Component Explorer software interface. At the top, there is a toolbar with icons for Scan, Save, Undo, Redo, and other functions. Below the toolbar is a table with the following columns: Component, Material, Volume Source, and Printed Circuit Board. The table lists various components and their associated materials and power sources. A status bar at the bottom indicates "Scan completed."

Component	Material	Volume Source	Printed Circuit Board
Total power: 33 W			
epic pc			
EPIC PCB-1	Solid Material 1		
PC104 ISA Connector-1	Solid Material 1		
PC104 PCI Connector-1	Solid Material 1		
SODIMM Connector-1	Solid Material 1		
SODIMM-1			
SODIMM PCB-1			4s2p PCB
ram chip-1	Steel (Mild) (Default Solid Material)		
ram chip-3	Default Solid Material (Steel (Mild))		
ram chip-4	Default Solid Material (Steel (Mild))		
ram chip-5	Default Solid Material (Steel (Mild))		
Heatsink-5	Copper	5 W	
CPU Heat Pipe-1	Default Solid Material (Steel (Mild))		
Northbridge Heat Pipe-1	Default Solid Material (Steel (Mild))		
Case-1	Default Solid Material (Steel (Mild))		

Properties

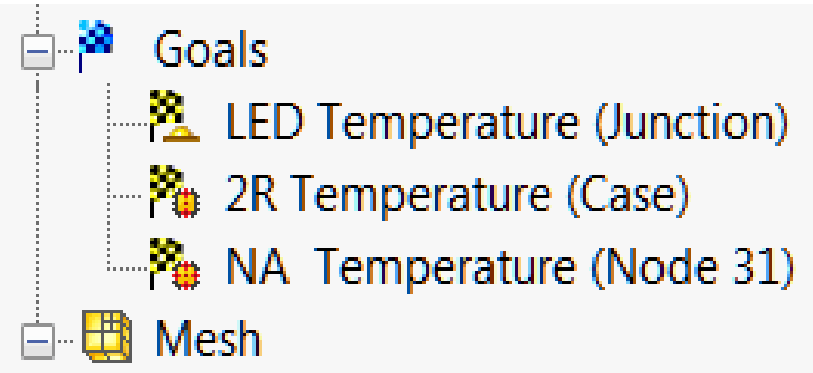
Property	Value
Name	VS Heat 1
Heat generation rate	1 W

Scan completed.

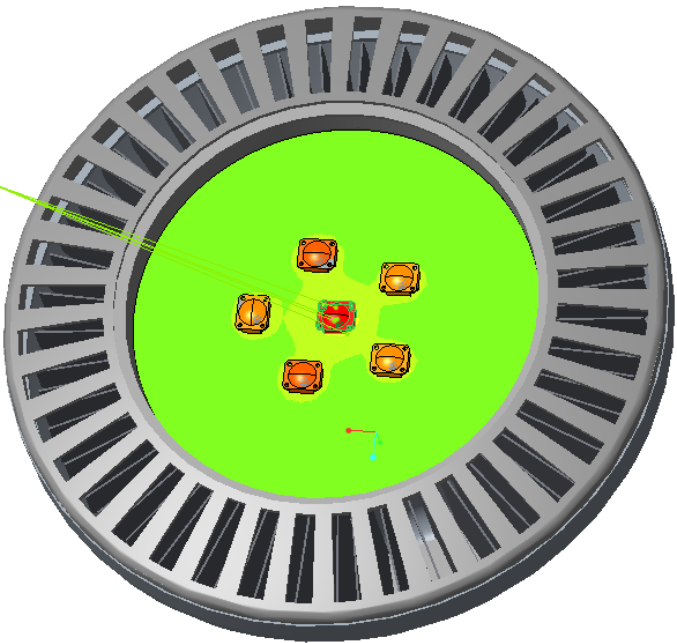
# Feature Goals for LED, 2R, NA.

Select a node (Junction, Bottom, or Top) to display in Postprocessor.

New Feature Goals for nodes of compact model set a part of feature definition.



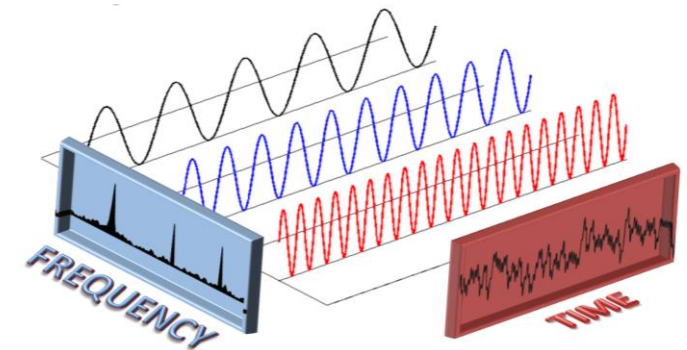
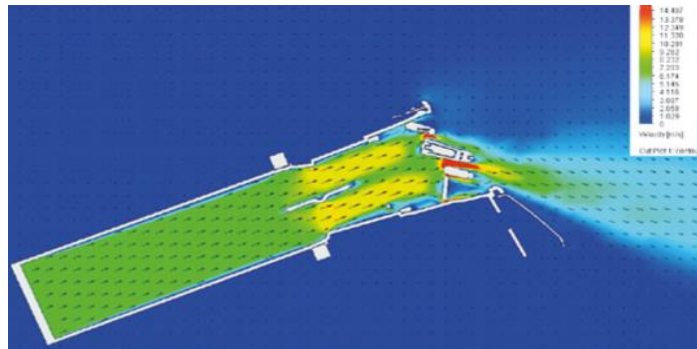
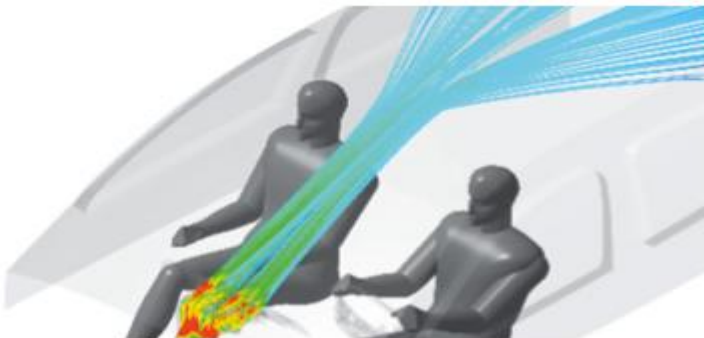
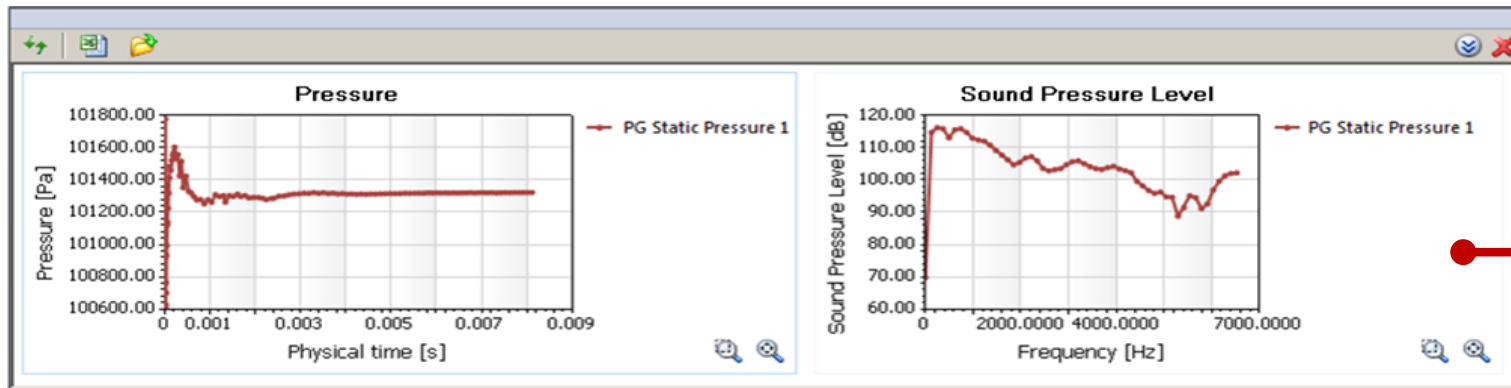
LED (Input)	
Type	Osram Golden Dragon
Current	500 mA
LED (Output)	
T junction	59.7 °C
LED Heat Generation Rate	1.2 W
Luminous Flux	128.08 lm



Goal Plot 1									
Summary									
Goal Name	Unit	Value	Averaged Value	Minimum Value	Maximum Value	Progress [%]	Use In Convergence	Delta	Criteria
Osram Dragon LED 500 mA Temperature (Junction)	[°C]	59.7	59.6	59.3	59.7	100	Yes	0.4	0.7
Osram Dragon LED 500 mA Temperature (Bottom)	[°C]	50.6	50.5	50.3	50.6	100	Yes	0.3	0.7
Osram Dragon LED 400 mA (1) Temperature (Junction)	[°C]	55.6	55.5	55.2	55.7	100	Yes	0.4	0.7
Osram Dragon LED 400 mA (1) Temperature (Bottom)	[°C]	47.0	46.8	46.5	47.0	100	Yes	0.5	0.7
Osram Dragon LED 400 mA (2) Temperature (Junction)	[°C]	55.7	55.5	55.3	55.7	100	Yes	0.4	0.7
Osram Dragon LED 400 mA (2) Temperature (Bottom)	[°C]	47.6	47.6	47.4	47.8	100	Yes	0.5	0.6
Osram Dragon LED 350 mA (1) Temperature (Junction)	[°C]	53.5	53.4	53.2	53.6	100	Yes	0.4	0.7
Osram Dragon LED 350 mA (1) Temperature (Bottom)	[°C]	46.0	45.8	45.6	46.0	100	Yes	0.4	0.6

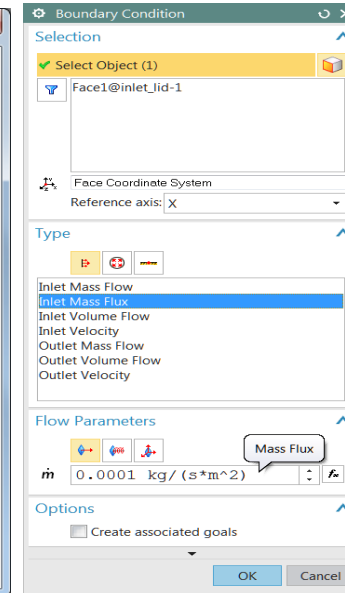
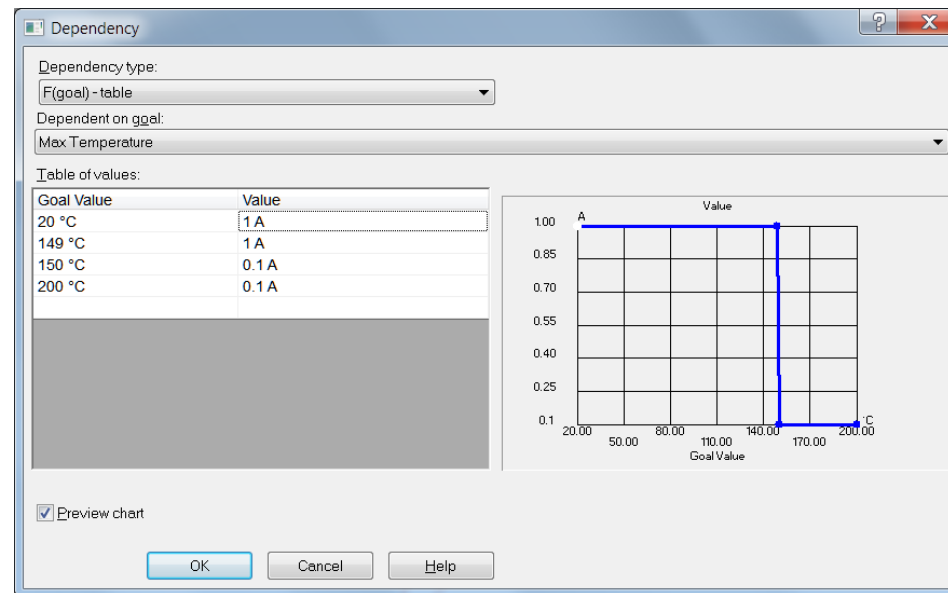
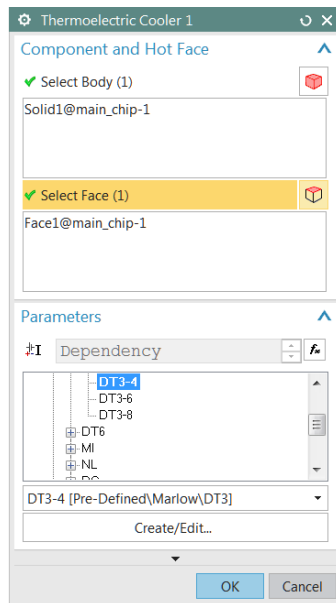
# Fast Fourier Transformation

Fast Fourier Transformation allows to convert a time signal to the complex frequency domain. A parameter oscillation (e.g. Pressure) can be represented as Sound Pressure Level [dB]-Frequency plot.



# Extras

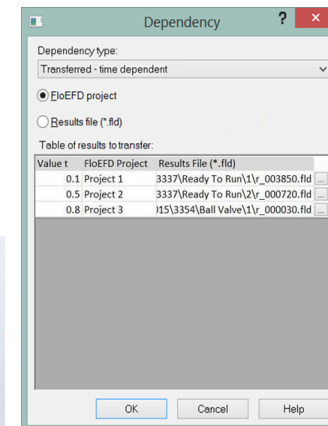
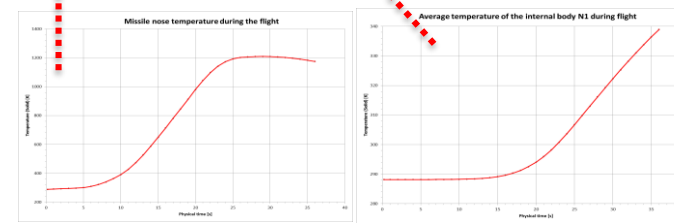
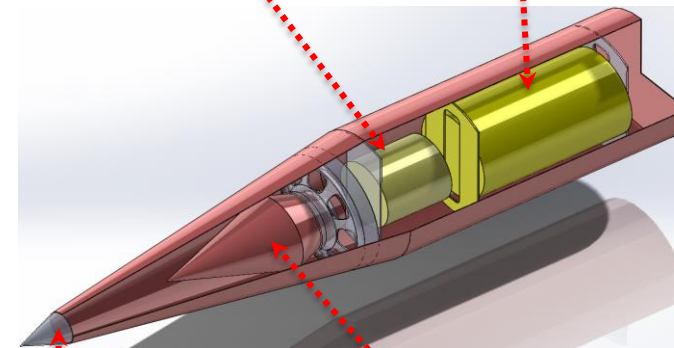
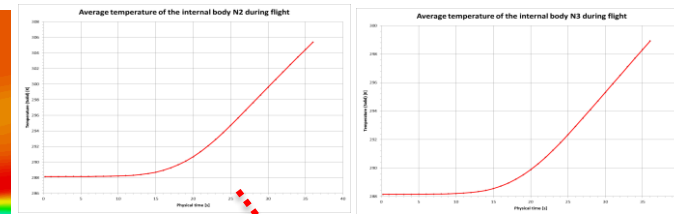
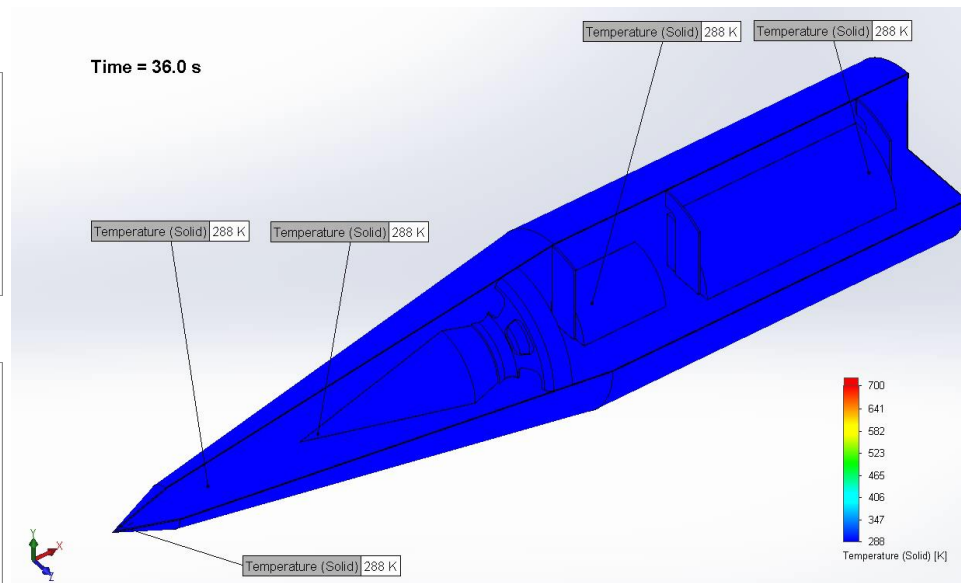
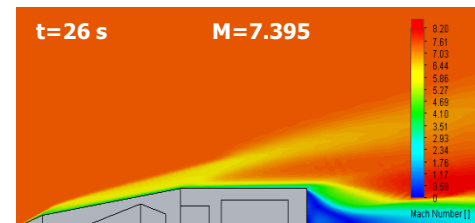
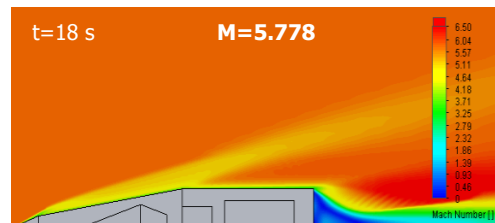
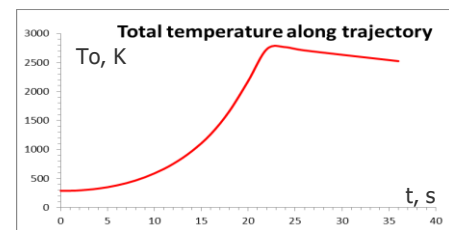
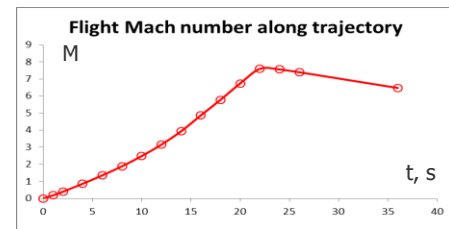
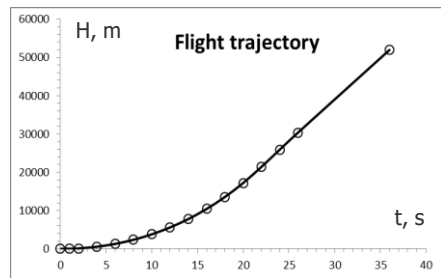
- TEC driving current as a function of Goal.
- Mass and Volume Flow as a function of Goal.
- Inlet Mass Flux.
- Dynamic viscosity can be set as Point Goal (to get Re as equation goal).





# Transferred HTC

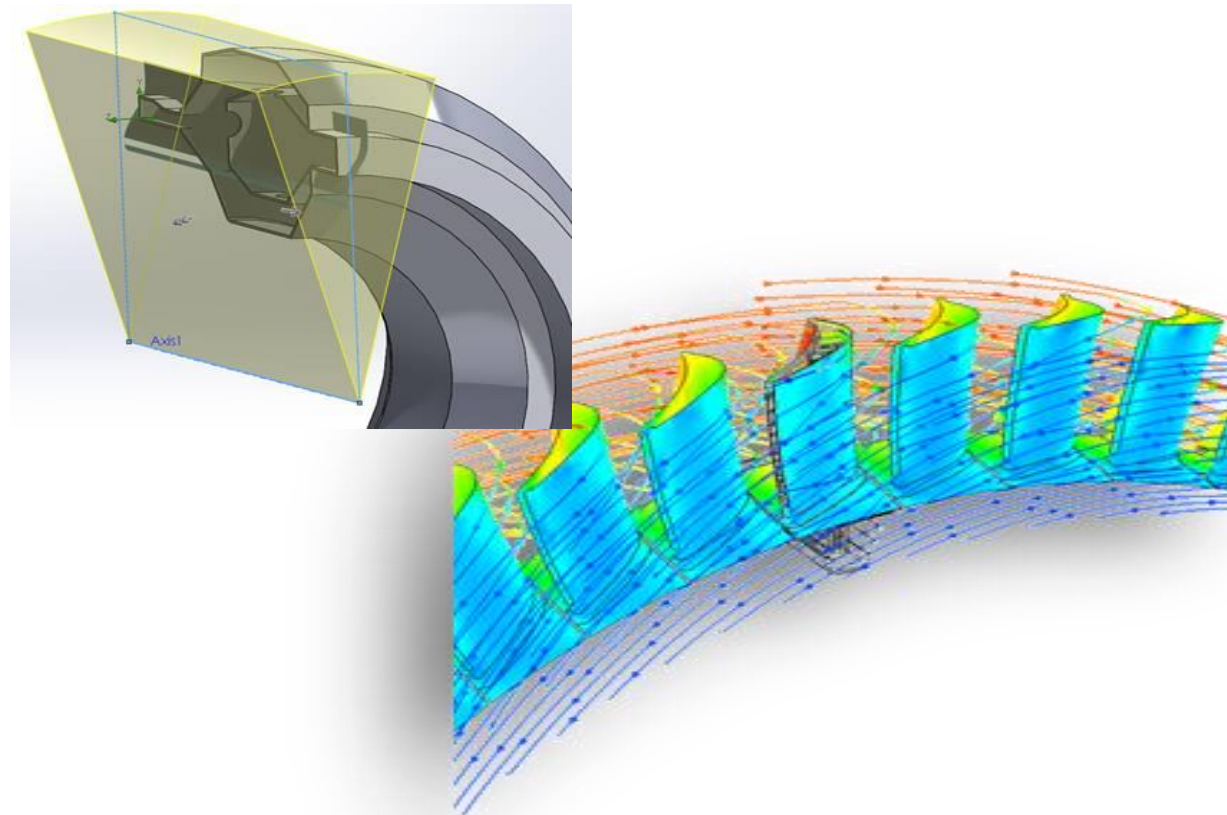
Heat Transfer Coefficient can be transferred from other results (fld) file, or set of files (in case of transient simulation).



# Sector Periodicity

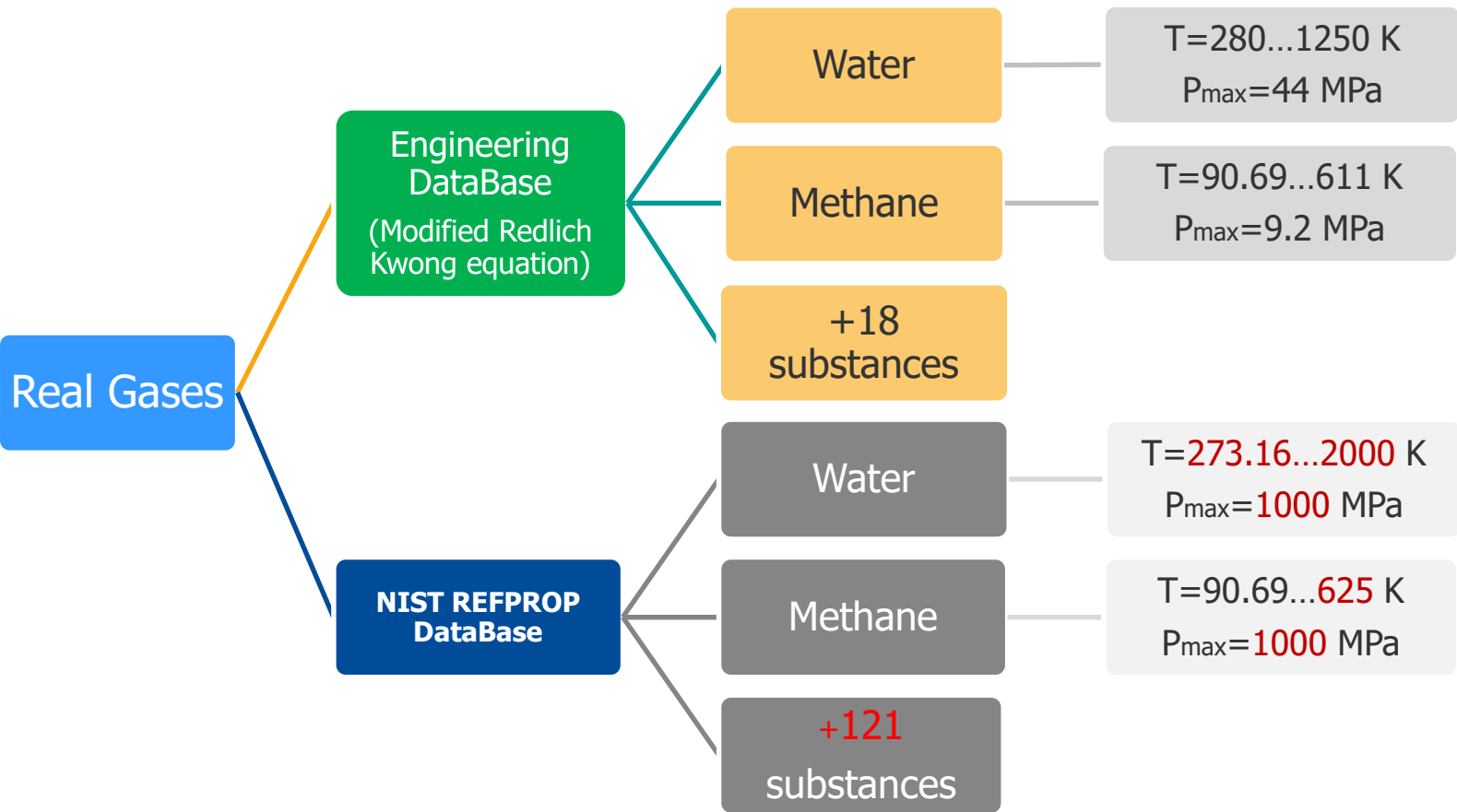
**Sector periodicity allows to decrease mesh size in case of sector periodic tasks (nozzle guide vanes for example).**

- Single periodic domain only
- Not supported:
  - Porous Media
  - High Mach Number
  - Radiation
  - Rotating
  - Cavitation
  - Fluid Film, Sorption.

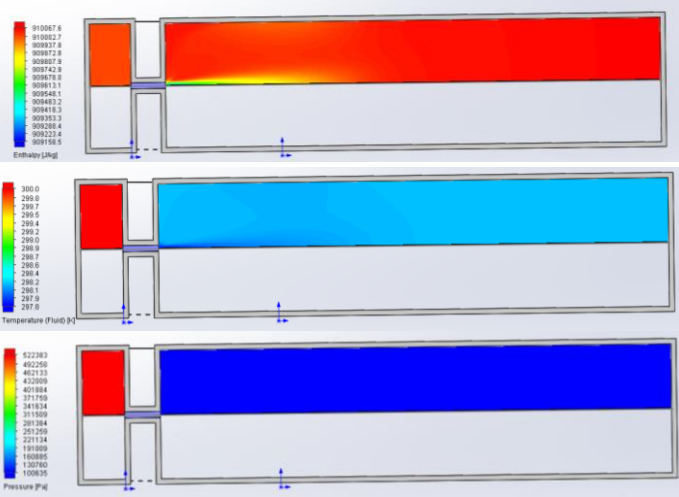


# Extended Real Gas Properties

NIST Database with extended properties of Real Gases is included (available for Advanced license).



**Joule–Thomson effect** describes the temperature change of a *real*/gas when it is forced through a [porous plug](#) while kept insulated so that no heat is exchanged with the environment.

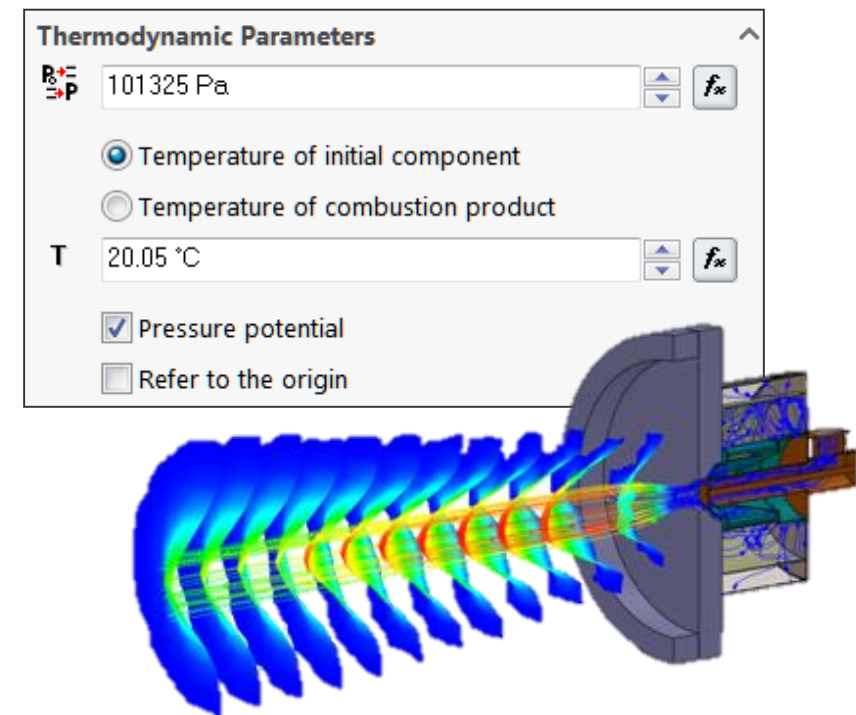
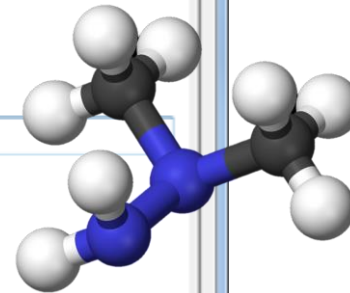
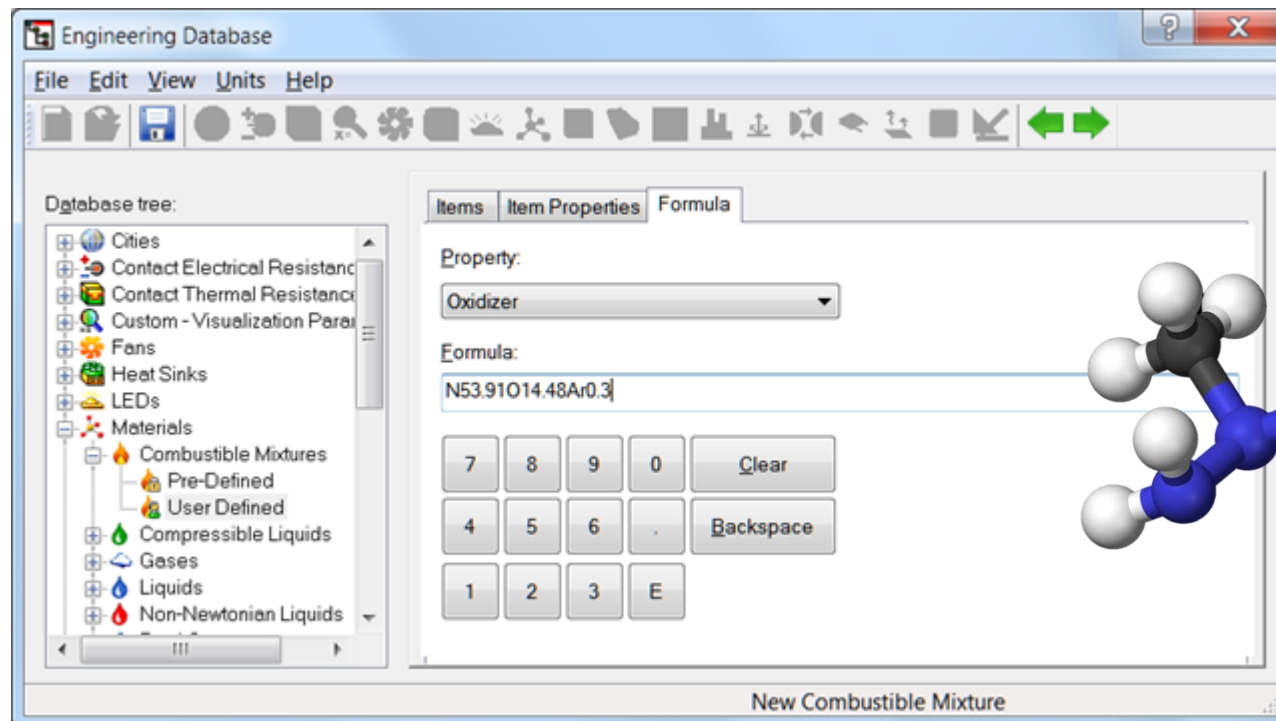


Relative error in Joule-Thomson Coefficient calculation:

	EDB	NIST REFPROP
Water	2,49%	1%
Methane	18,11%	1.21%

# Combustion

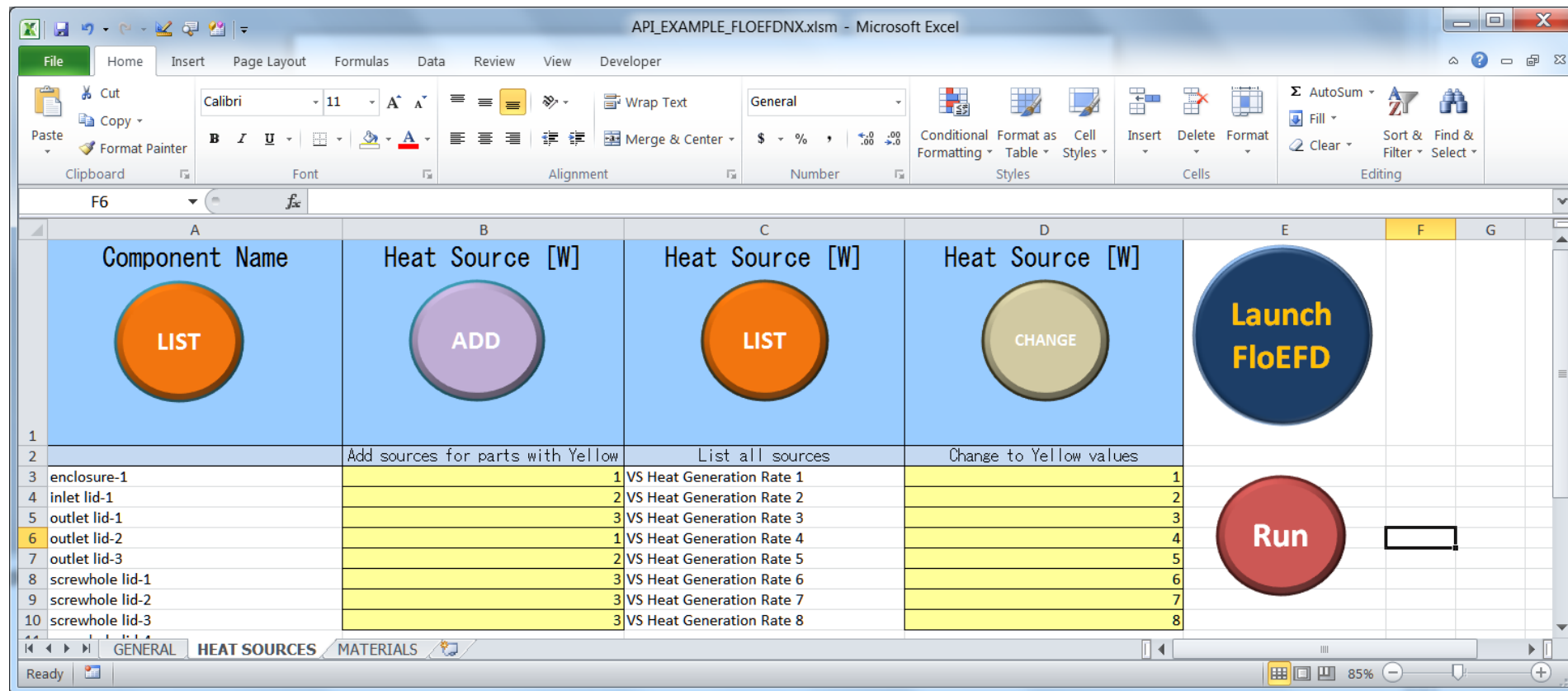
- Possibility to set Fuel or Oxidizer as a brutto formula.
- You can choose to set input Temperature as Temperature of initial components or Temperature of combustion products.





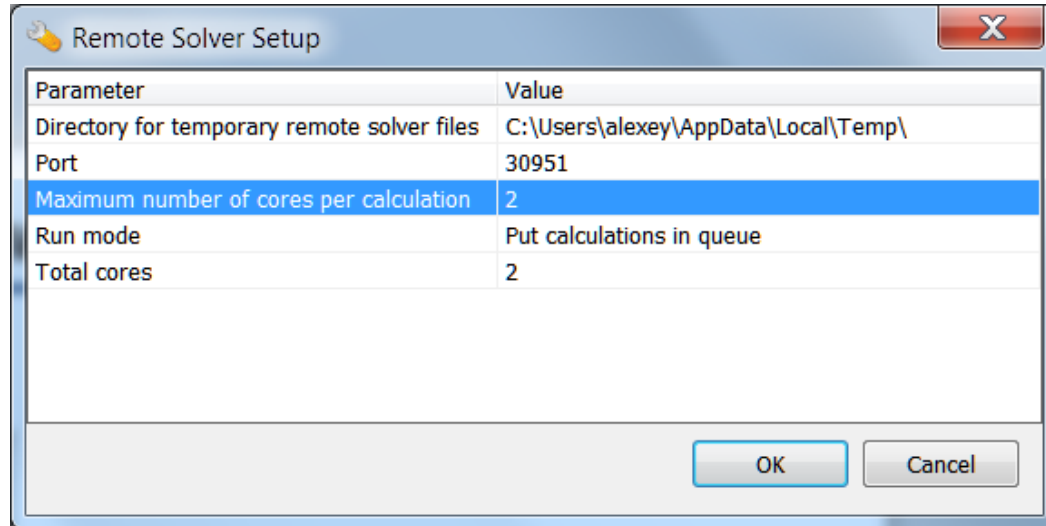
# API

**Possibility to add heat sources and solid material to a component by name or pre-selection, delete material or heat source condition using API (VBS, C++).**



# Calculation Manager, Microsoft HPC Job Scheduler

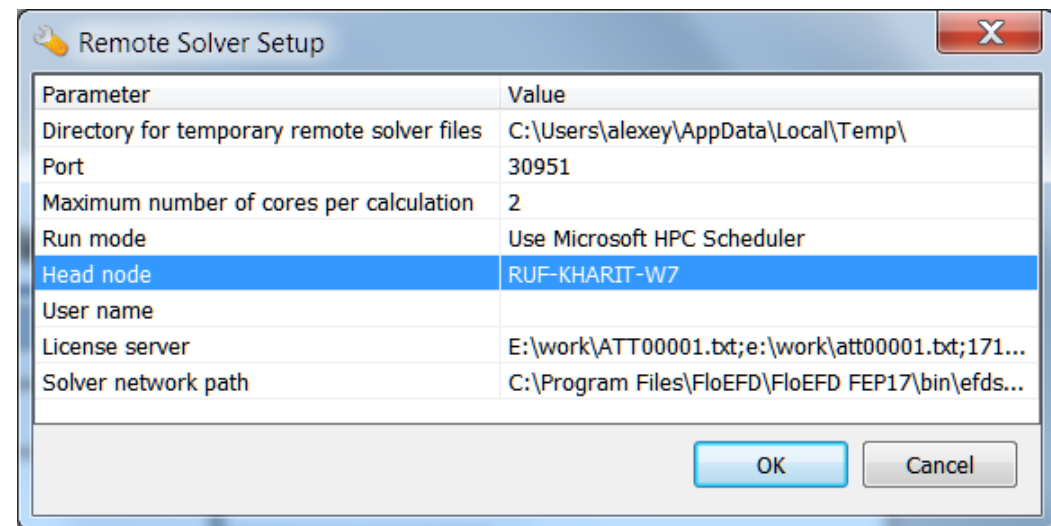
- Possibility to define queue of calculations on the server.
- Restrict maximum number of server's cores used for a calculation.
- Using Microsoft Windows HPC Job Scheduler to manage calculations on the server.



Remote Solver Setup

Parameter	Value
Directory for temporary remote solver files	C:\Users\alexey\AppData\Local\Temp\
Port	30951
Maximum number of cores per calculation	2
Run mode	Put calculations in queue
Total cores	2

OK Cancel



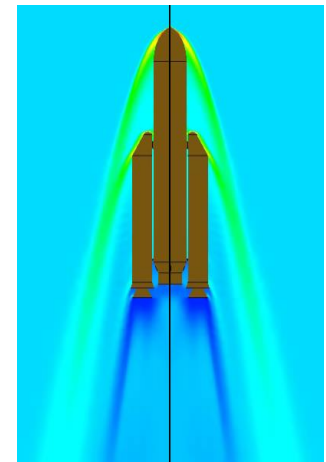
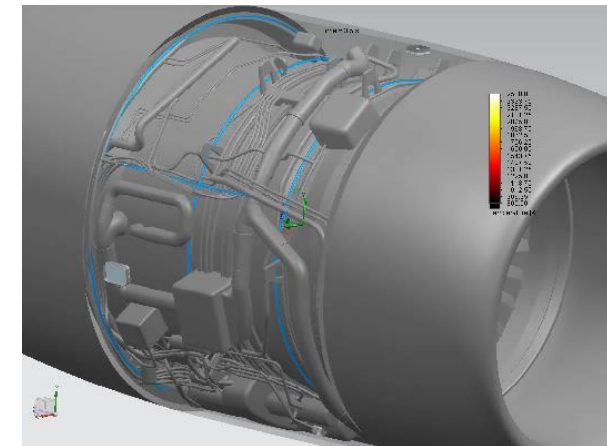
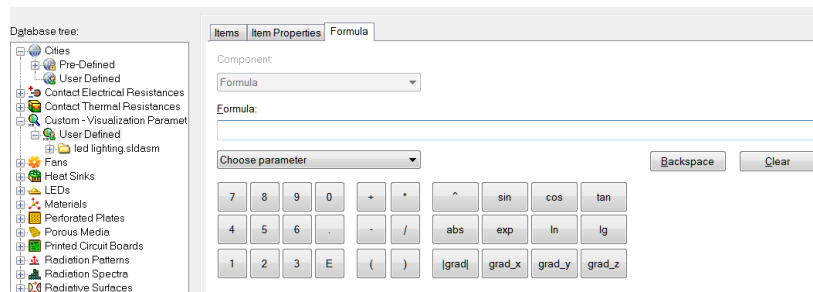
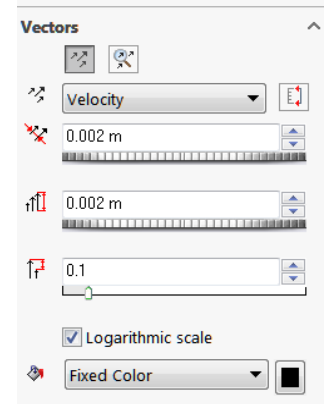
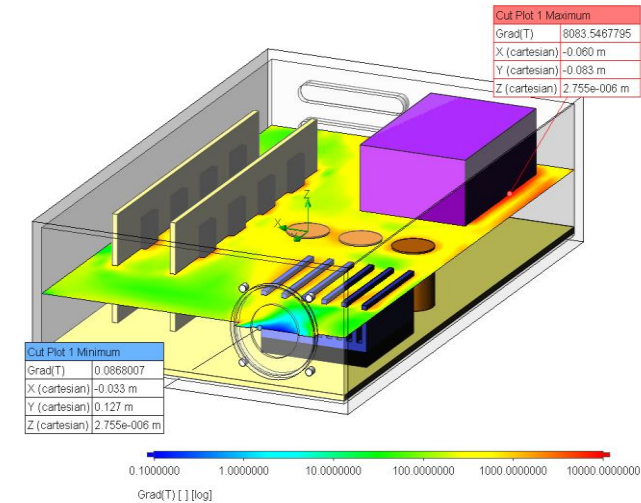
Remote Solver Setup

Parameter	Value
Directory for temporary remote solver files	C:\Users\alexey\AppData\Local\Temp\
Port	30951
Maximum number of cores per calculation	2
Run mode	Use Microsoft HPC Scheduler
Head node	RUF-KHARIT-W7
User name	
License server	E:\work\ATT00001.btx;e:\work\att00001.btx;171...
Solver network path	C:\Program Files\FloEFD\FloEFD FEP17\bin\efds...

OK Cancel

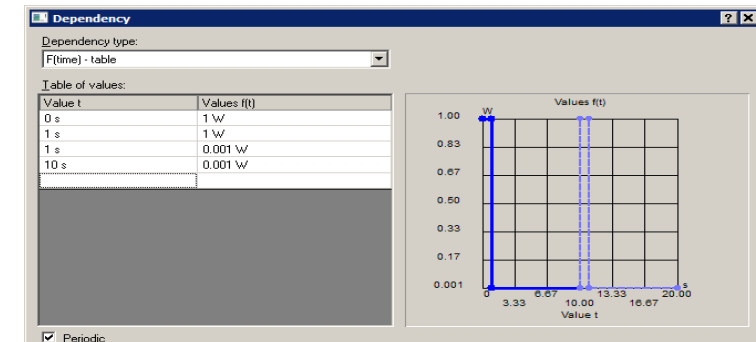
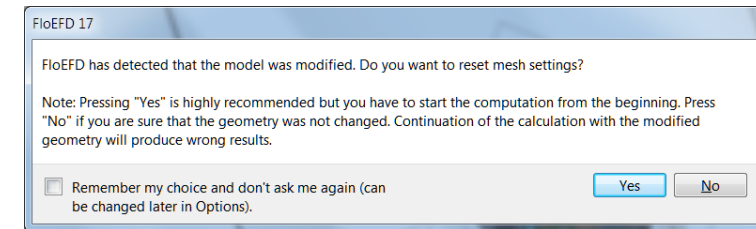
# Postprocessing

- Min Max callouts on plot
- Logarithmic scale for contours and vectors
- Horizontal legend
- Isosurface: number of values in a range
- Cut plots: Normal to plane view
- Parameters: Specific and Absolute Humidity
- Parameters: Gradient custom parameter



# Usability

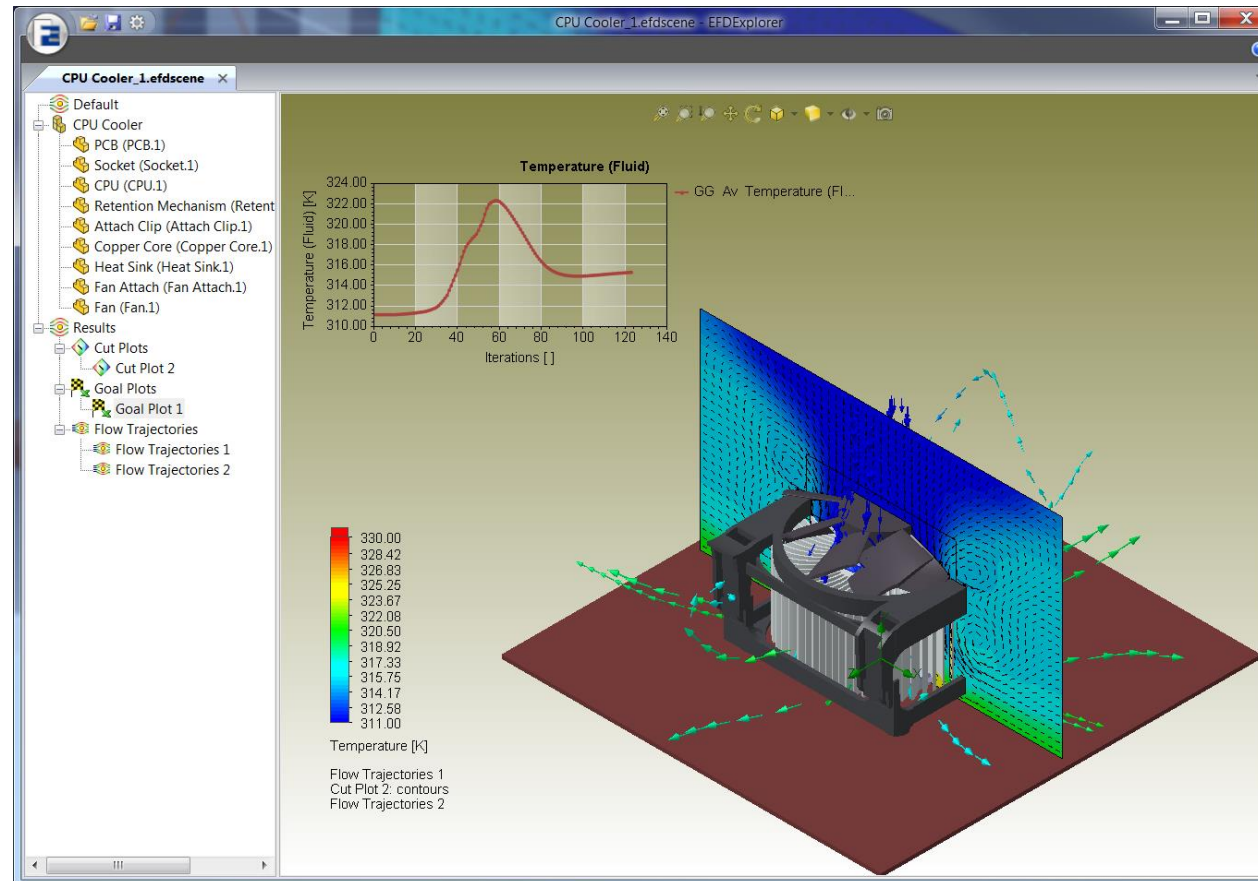
- Full Template: all data is saved in template (not only General Settings)
- Display linked condition in the main project tree
- “Don’t ask me again” for reset mesh and reset computational domain
- Parametric Study: Vary Thermal Conductivity and Specific Heat
- Rebuild Error don’t block boundary condition creating
- Display used cores in Monitor and logs incl. for Linux
- Toggle to set periodic (cycling) time dependence
- BC name is displayed in the caption of dialog
- TEC driving current as a function of Goal
- Damping factor for Goal dependent parameters (to avoid oscillation in steady-state)





# FloEFDView

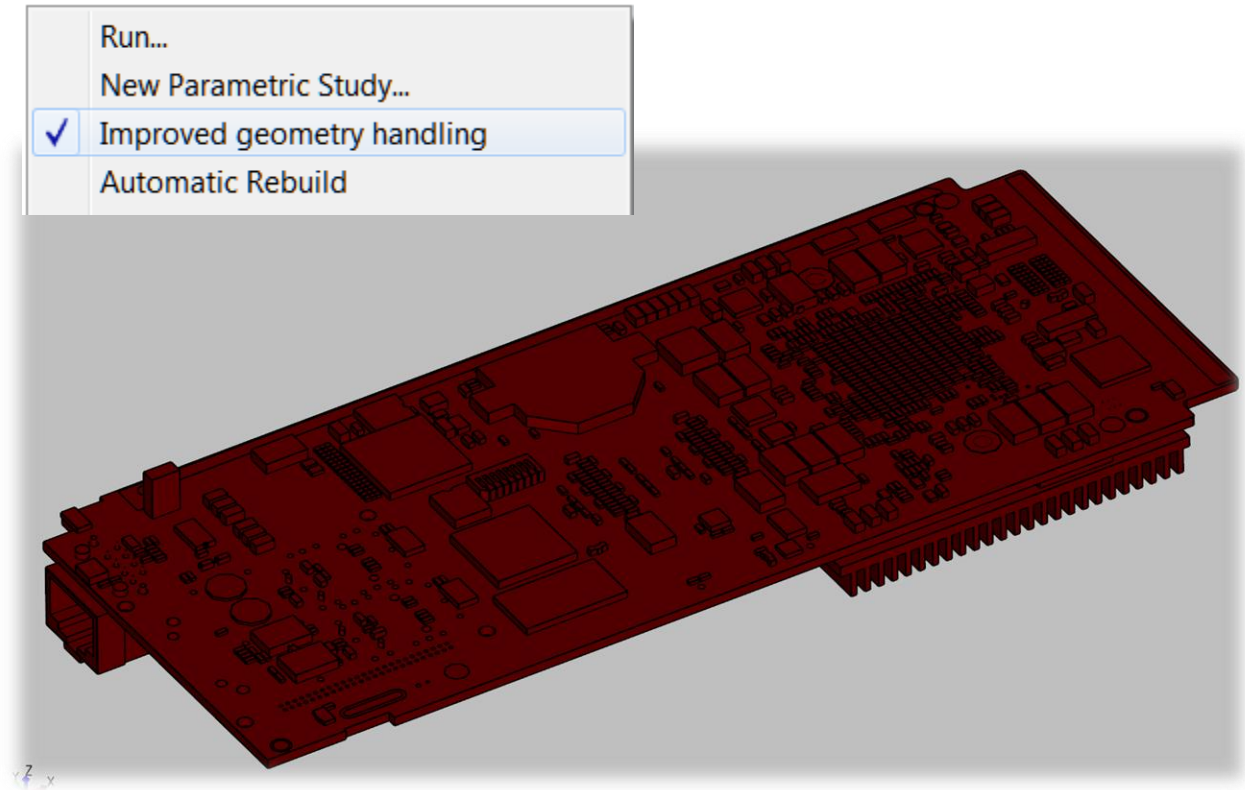
Standalone viewer to explore FloEFD results optionally including original CAD geometry.



# Improved Geometry Handling (Beta)

**Own Boolean Kernel (internal name is NGK) to automatically heal geometry and significantly speedup CAD geometry extraction.**

- The current procedure is based on CAD Boolean operations which are slow and not parallelized (use 1 core).
- The new Geometry Handling procedure assumes creating solid and fluid bodies using topology information by means of FloEFD internal mathematical kernel = FloEFD Boolean operations.
- As a result the preparation process can be shared among many cores.
- The new algorithm will coexist with the current version for a few years.



# Orbital module (Non-Documented Beta Feature)

## ■ Planet parameters and location:

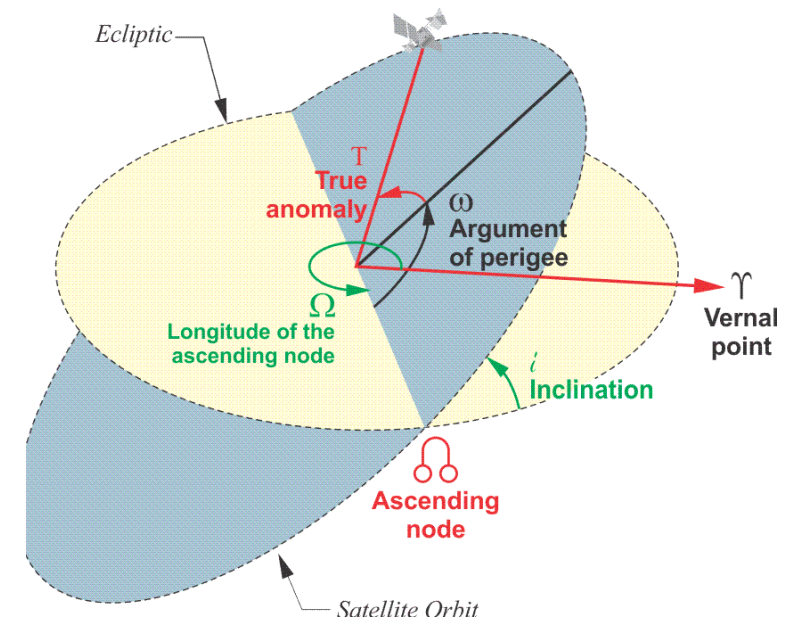
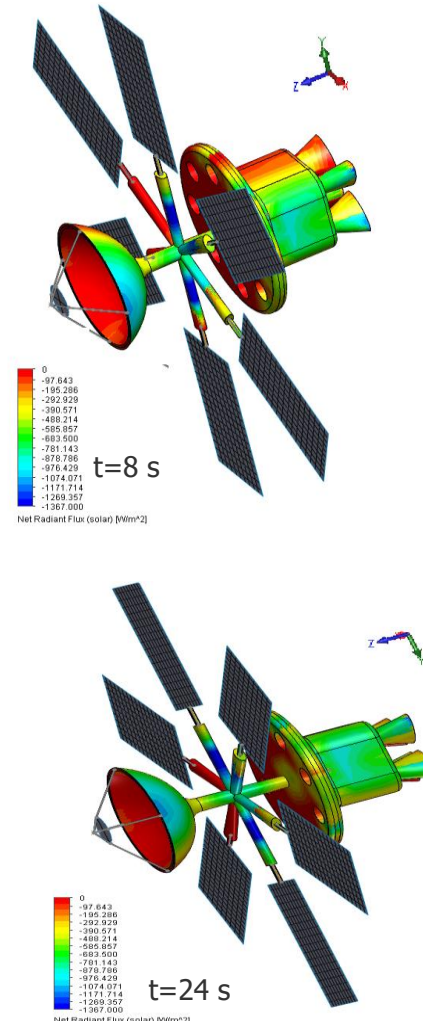
- ❑ Planet mass and radius
- ❑ Average distance to sun
- ❑ Longitude from vernal equinox point
- ❑ Period of rotation around sun

## ■ Parameters of satellite orbit:

- ❑ Orbit eccentricity, main half axis
- ❑ Orbital inclination
- ❑ Longitude of the ascending angle
- ❑ Argument of perigee
- ❑ Initial point on the orbit

## ■ Satellite orientation parameters:

- ❑ Orientation on the planet center
- ❑ Orientation on the sun
- ❑ Orientation on satellite velocity
- ❑ Orientation on vernal point
- ❑ Rotation around specified axis





[www.mentor.com](http://www.mentor.com)