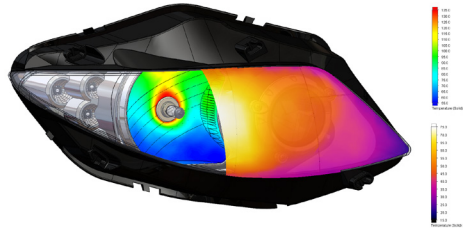


FloEFD LED Module



The Mentor Mechanical Analysis Division has been a leader in electronics cooling since 1989 and has pioneered thermal characterization and analysis of ICs and LEDs. FloEFD, its award-winning frontloading CFD software, was designed to work inside CAD software so you can simulate fluid flow and heat transfer using 3D CAD models, without any need for data translations or copies.

The LED Module for FloEFD is an industry first providing a unique set of additional analysis capabilities for lighting engineers and designers. Capabilities added to FloEFD are:

Correct temperature prediction and condensation/icing:

- Monte Carlo radiation model for simulating absorption of radiation in semi-transparent solids such as glass as well as taking into account effects such as refraction, specular reflection and wavelength dependency (spectrum properties of the radiation).
- Condensation model capable of simulating film condensation, evaporation and icing/de-icing and a water absorption model that allows for solids to absorb humidity and release it again at the right environmental conditions

A combined thermal and photometric model for LEDs:

- Import of RC-ladder compact thermal models created by Mentor's Transient Thermal Tester 'T3Ster' (Ref. 1) with optical data from TeraLED (Ref. 2)
- 'Starter pack' of LEDs for popular lighting applications: Cree XT-E, Osram Golden Dragon, Seoul P4 and Philips Luxeon Rebel
- Import your own LED models into FloEFD's Engineering Database

Lumen output from your design ('hot lumens'):

- As part of the analysis FloEFD calculates the light output (lumen) of the LEDs in your design so you can see whether these meet your design goals for light output and uniformity.

Benefits:

- High accuracy of radiation simulation through advanced Monte Carlo radiation model with spectral absorption, reflection and refraction characteristics.
- Ray visualization of the Monte Carlo based calculated rays.
- Transient condensation/icing film simulation.
- Import detailed thermal and photometric models from T3Ster TeraLED, fully compliant with relevant CIE and JEDEC standards (Refs 3,4).
- Ensure the LEDs operate within the limits of the vendor's specs and avoid reliability issues and warranty recall costs.
- Specify forward current for your LEDs and FloEFD calculates the correct thermal heating power, and hence the correct operating temperature.
- Predict accurate operational light output (hot lumens) and temperature for your LED in situ.

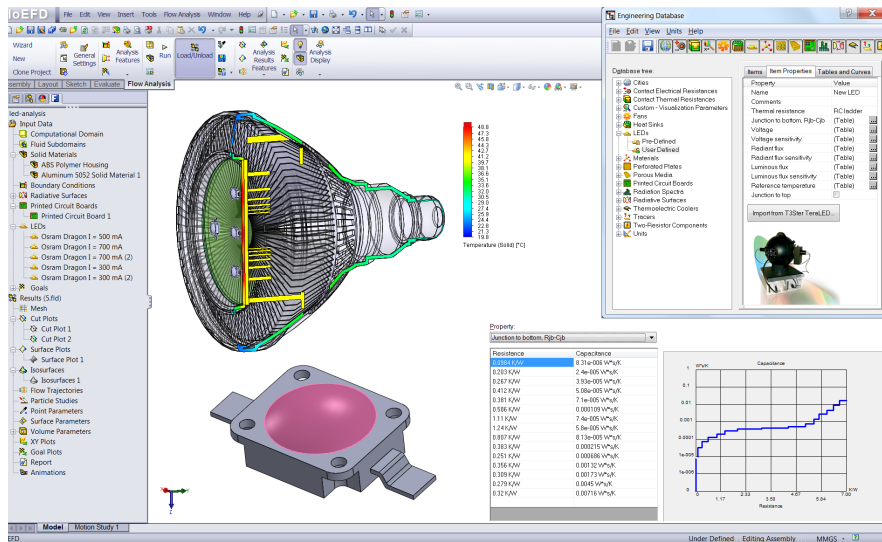
"What-if?" Testing Made Easy

One of the most powerful features of FloEFD is the ease with which you can conduct "what-if?" analyses. FloEFD makes it simple to modify your models and analyze design variations. The process is very simple. Create your base model and analyze it. Then create multiple variations of your design by modifying the solid model without having to reapply material properties etc. Using its parametric study and design comparison functionality, you can easily compare the results among the various options to choose your best possible design.

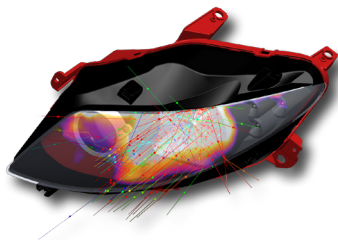
When you are satisfied with your design, publish your report at a touch of a button. You can even publish a fully interactive 3D dynamic plot and share it with colleagues or customers.

FloEFD is a general-purpose frontloading CFD solution embedded in CATIA V5, PTC Creo, Siemens NX and Solid Edge for use by design engineers within the design flow. FloEFD's user interface and help are available in Japanese, Chinese, French, Korean, Russian and German. By providing a deeper understanding of design performance earlier in the product creation process FloEFD reduces risk, design rework and time and ensures a right first time design, speeding up the start of volume manufacture.

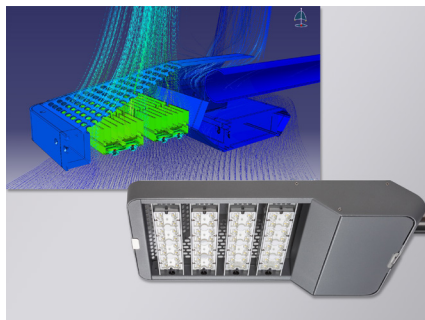
LED Module Interface



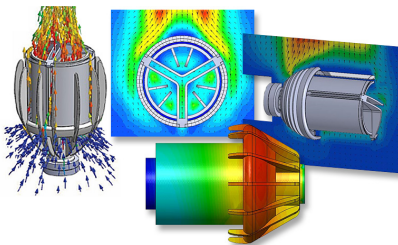
Automotive Lighting Headlights, Tail lights, DRL...



Architectural & Signage Exterior, stadia, videowalls, advertising...



General Lighting Indoor residential, office, commercial...



LCD Backlighting TVs, Tablets, SmartPhones...



Customer Testimonial

"FloEFD from Mentor helps us to understand and optimize headlamps. Even very complex geometries and test conditions can be investigated with a minimum of effort. New features such as Monte Carlo radiation and the LED module are especially helpful in speeding the development of very complex products."

— Automotive Lighting

References

1. <http://www.mentor.com/products/mechanical/products/upload/t3ster.pdf>
2. <http://www.mentor.com/products/mechanical/products/upload/teraled.pdf>
3. "Implementation of the Electrical Test Method for the Measurement of Real Thermal Resistance and Impedance of Light-Emitting Diodes with Exposed Cooling" JESD51-51, April 2012
4. "Guidelines for Combining CIE 127-2007 Total Flux Measurements with Thermal Measurements of LEDs with Exposed Cooling Surface" JESD51-52, April 2012

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