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Why Mentor Graphics is the Right Choice for Electronics Cooling Analysis



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Mechanica

8 Reasons to Consider When Choosing the Right Tool

The Mechanical Analysis Division of Mentor Graphics (formerly Flomerics Ltd) has an unmatched pedigree in electronics cooling that dates back more than 20 years. During that time it has developed a number of tools to meet the needs of different users and match the differing ways thermal design is done as a part of the overall product design flow.

Let's take a look at why Mentor's tools are the right choice for your thermal design needs and why customers choose Mentor tools time after time.

1. Razor Sharp Focus on the Electronics Industry

This is perhaps the key reason that Mentor is the leading supplier for electronics cooling. Mentor has developed PCB thermal tools for electrical engineers since the early 1980s, recently acquiring BetaSoft to produce HyperLinx Thermal. And today, Mentor Graphics has approx. 80% of the PCB thermal design market [1]. The company is continuing to invest heavily in electronics cooling through the acquisition of Flomerics Ltd to create Mentor's Mechanical Analysis Division. With Mentor's backing, substantial investments are continually made in electronics cooling software tool development.

"After reviewing the advancements that have been made recently in CFD software, we selected FloEFD from Mentor Graphics' Mechanical Analysis Division. FloEFD is tightly integrated with the two CAD packages that we use at Azonix, SolidWorks and Pro/ENGINEER. The skills required to operate the CFD software are simply knowledge of the CAD system and the physics of the product. So we can focus our energy on optimizing the thermal performance of our products."

James Young, Design Engineer, Azonix

Since 1989, the Mechanical Analysis Division has pioneered the use of CFD for electronics cooling

by developing software specifically fort his application; thus leading to the introduction of FIoTHERM, the first commercially available product. The Mechanical Analysis Division converted major multinational companies from build-and-test to virtual prototyping. Use of its software in its major corporate accounts continues to grow.

Over the years, the division has led collaborative research efforts that have produced thermal modelling methodologies for many electronic parts. Some are now internationally accepted through our involvement in JEDEC's JC15 committee while others remain proprietary. The organization's knowledge goes way beyond the software it sells and continues to allow the division to provide technology in its tools that is appropriate to the needs of the industry. Developed by thermal engineers for thermal engineers, its products are designed to map onto the electronics design flow, covering component, PCB and system design up to and including data centers. The knowledge of its technical staff, many of whom have been with the division since the start, is part of the key to its success and explains its exceptionally high level of customer satisfaction.

To be competitive, electronics manufacturers, first and foremost, must get to market first – without sacrificing product reliability and performance. According to the Aberdeen Group, a leading provider of market research data, leaders are, on the whole, more than twice as likely as their poorer performing competition to meet their get-to-market targets. With fewer design re-spins, market leaders spend less time in verification because they are almost 40% more likely than other companies to use advanced verification technologies and principles [2].



As products become more complex, businesses are seeing a rise in "lateness" of products making it to market. The underlying reasons are shown below, with verification taking too long being the top reason.



In a recent independent study, due to mounting business pressures, companies are no longer relying on single suite provider tools. 85% of users utilizing system-level electronics cooling specific CFD and 79% of users utilizing PCB-level CFD, opt to choose the best single tool in the design process - Mentor's [3].



Market leaders gain their sterling reputation for a good reason. Why would you want to invest in tools from anyone but the market leader?



2. Effortless Model Preparation and Pre-Processing

Thermal design exists at the interface between the ECAD and MCAD worlds. Chassis and casing designs need to be brought in from the MCAD system. FIoTHERM.MCADbridge supports a wide range of import options, including native import from SolidWorks, Pro/ENGINEER Wildfire, CATIA V5 as well as DXF, IGES, STL, SAT, STEP and has an extensive range of preparation features.

With direct interfaces to Allegro, BoardStation, CR5000 and support for IDF import, FloEDA provides more direct EDA interfaces and more component import/display capabilities than any other software tool on the market making it easy to import and prepare detailed PCB data. It's also designed to make it easy to manually mock up a PCB. What's more, FloEDA with its direct EDA interfaces is *free* for Mentor Graphics Mechanical Analysis tool users.

Mechanical Analysis

> "FloTHERM offers a wide range of features such as an automatic optimizer and compact models that make it possible to improve cooling performance and reduce engineering time. These and other capabilities of the software made it possible to optimize the design of the heatsink which was important because the overall weight of the linear synchronous motor was a critical concern to MagneMotion's customer."

> > Michael Rigby, AnJen Solutions

Mentor is pioneering MCAD-ECAD interoperability, having recently delivered the industry's first bi-directional MCAD-ECAD collaboration capability based on the ProSTEP iViP Association-approved electromechanical interchange standard [4].

With Mentor, your investment in current tools and data is protected.

3. Powerful and Robust Gridding Capable of Handling Real World Geometry

CFD practitioners prefer to use structured Cartesian meshes wherever possible for their accuracy, solution stability, and robustness. And it has been proven in the industry that Cartesian-based meshes are very well suited to the majority of electronics-type geometry -- their use of partial cells makes meshing of complex shapes easy. Using other approaches, meshing is often found to be the most time-consuming part of the entire CFD process and poor mesh quality can result in slower convergence and impact the final results.



Electronics products are characterized by highly cluttered geometries. Thermal design is all about making geometry changes often and early during the design process. While other tools offer a range of mesh options, requiring skill and experience on the part of the user to mesh the model, meshing is a 'non-issue' for Mentor's customers.



Mentor Graphics' mechanical analysis tools use Cartesian-based meshing. They also support object-associated mesh, so when an object is moved the settings that define the mesh in and around the object move with it. Meshing in other tools is often so time consuming that their use is relegated to verification late in the design, by which time problems are much harder and costly to fix, and invariably delay the product's release. By contrast Mentor's Cartesian-based meshing is able to cope with 'industrial strength' models, effortlessly handling the data for the many thousands of objects that make up a modern electronics system.

4. Fast, Powerful and Accurate Automatic Design Optimization

Design optimization refers to a process whereby the model geometry is changed to optimize it for form, fit and function. This process usually takes place early in the design cycle. True and automatic design optimization is only really practical with Cartesian mesh-based tools as noted above. Mentor Graphics' sophisticated space-filling Design-of-Experiment software functionality, linked to powerful Response Surface optimization enables users to optimize their designs easily. Users specify a design goal and then let the software do the hard work of finding the right combination of design variables that meet the goal. Common applications of this feature include optimization for heat sink design, PCB component placement, fan/blower selection and other common design scenarios.



In addition, Mentor Graphics' CAD-embedded tools take

advantage of the power of CAD to help users create multiple variants of a design for "what-if" analysis. Since analysis is embedded in the CAD software, users can use CAD features such as Pro/ENGINEER Wildfire's Family Table, to create multiple design variations of their geometry. Then by simply manipulating the solid model and without having to reapply loads, boundary conditions, material properties etc, they can analyze and compare the results to choose the best possible design.

5. Results Visualization

Users of Mentor Graphics thermal simulation tools have an extensive array of results visualization capabilities at their disposal.

Thermal design is a collaborative effort. To ensure that design engineers can communicate design intent with customers and suppliers effectively and without requiring additional outlay "Thermal simulation was a critical process in our product development. Thermal simulation is like having X-ray vision. It lets you see inside the box to look at airflow, pressures and temperatures at any point. A single thermal simulation gives you a detailed understanding of what is going on inside the box and helps you quickly identify the root causes of the problem."

Dave Watson, Thermal Design Team Leader, Simclar Group

of cash, the Mechanical Analysis Division offers its customers FloVIZ, FloTHERM's postprocessing module – at no additional cost. As a result, any team member can explore the 3D temperature and flow fields, plot surface temperatures, identify hot spots and regions of poor air flow, etc. In addition, FloTHERM.PCB provides a highly automated PCB-level thermal simulation with automated plots giving immediate identification of thermally critical components to facilitate communication with PCB designers.





And lastly, Mentor's CAD-embedded tools offer powerful results visualization capabilities including animation within the mechanical CAD environment. And users can quickly generate reports in Microsoft ® Excel and Word, including results images at a touch of a button.

6. Return on Investment

Investment in a thermal design tool consists of more than the cost of the software tool itself, or the hardware on which it runs. The bulk of the cost is in the staff needed to run it and their resulting productivity.

According to Aberdeen Research [3], 'best-in-class' companies choose the best tool for the job. Using a general-purpose CFD tool adapted for electronics cooling comes with the hidden cost of lower productivity. Ultimately more software seats will be needed, increasing software costs; however, the main cost is the staff costs in terms of number of personnel and expertise needed to drive the software. Frequently this leads to a bottleneck in the design flow, with tool use relegated to verification late in design. Mentor's thermal design tools are developed for use by mechanical designers, not analysis specialists.

Do they work as well as the specialist tools?

No, they work better.

"... Long before the prototype stage, we began simulating alternative printed circuit board approaches and so we were able to optimize the design from a thermal standpoint in only six months. This approach made it possible in the space of a single day to model a complex electronic system to a high level of accuracy and predict cooling performance. I don't think there's any doubt but that the product reached market six months early because thermal simulation solved the problems prior to the prototyping phase."

Frank Mortan, Packaging Engineer, Texas Instruments

Aberdeen Research also compared companies that use other thermal analysis tools with those that use Mentor's tools. They found that in comparison, companies that use other thermal analysis tools are likely to spend nearly 3 times longer in thermal verification than Mentor's users.





This massive reduction in time spent in thermal verification helps Mentor's customers get their products to market first, while others spend time and money in late design rework.

Even ignoring the competitive advantage, when times are tough, as they are now, businesses are seeking ways to reduce cost; therefore, it stands to reason that reducing design re-spin should be at the top of most priority lists. When comparing Mentor Graphics' users with the rest of the industry, Aberdeen Research [2] found that Mentor's customers are 5 times more likely to re-spin their design only once with the rest of the industry averaging nearly 3 re-spins per design.

7. Mentor Graphics – The Electronics Cooling Experts

When you invest in software, you also invest in the company behind the software:

De Facto Standard in the Industry: The Mechanical Analysis Division's customer list speaks for itself. Due to the ubiquitous nature of electronics, many of its customers actually fall outside the pure electronics industry in industries such as automotive, aerospace, etc. However, a review of the Electronic Business Top 300 list (2007) [5], reveals that 19 out of the top 20, 75 of the top 100, and well over half of the entire list of companies use Mentor's mechanical analysis tools. It should be noted that the cut off for the list is annual revenue of around US\$1.4bn so many other companies who are using the company's tools have been excluded from this list.

Extensive industry validation: Over 300 technical papers have been published providing evidence of the quality of the work performed using Mentor's electronics cooling software. These technical papers report on research results, case studies and validation against experimental data. Papers are published by Mentor Graphics staff, by its customers, and jointly; thus demonstrating Mentor's industry knowledge and expertise in thermal design, the usability of its software for real industrial problems and the partnership the company fosters with its customers.

Devoted and satisfied customers: Perhaps the most compelling case for Mentor's electronics cooling tools made by its customers. In a customer survey conducted by the Mechanical Analysis Division, over 95% were either satisfied or very satisfied with FloTHERM as a thermal design tool, and 98% would either recommend or strongly recommend Mentor Graphics tools to others.



8. You Are Backing a Proven Winner

Mechanical Analysis

In this day and age, organizations are under intense pressure to perform with fewer resources: time, money and staff. Sometimes the easiest and most cost-effective improvement that can be made is one of simply changing the way you do business. And that is using the right tool, for the right job and at the right time.

With designs becoming more complex, Mentor's users are way ahead of the industry curve when performing thermal analysis reviews, most commonly performing these in real time, as and when needed.



Frequency of Thermal Analysis Reviews

And you can too! To see how Mentor Graphics can assist you take advantage of this technology, please contact your regional Mentor Graphics, Mechanical Analysis Division office.

... We have used FloTHERM for 16 years and have developed a high degree of confidence in its accuracy. Most of our larger customers also use the software so we can easily exchange models with them."

Trevor Moody, Thermal and Mechanical Engineer, Antares Advanced Test Technologies

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About Mentor Graphics Mechanical Analysis Division

The Mechanical Analysis Division of Mentor Graphics Corporation (formerly Flomerics) is a world leader in the computer simulation of engineering design processes involving heat transfer and fluid flow. Our customers eliminate mistakes, reduce costs, and accelerate and optimize their designs by applying our simulation software and consultancy services before building physical prototypes. Using our advanced Computational Fluid Dynamics (CFD) software, we help increase efficiency in your mechanical design process, saving valuable time and money. For more information, visit www.mentor.com/mechanical or contact:

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