Interview with Bill Maltz, Electronics Cooling Solutions Inc.

Being the CEO of a dynamic Silicon Valley consulting company, Electronics Cooling Solutions Inc., in San Jose, California, specializing in electronics thermal solutions, Bill is a veteran of the electronics cooling industry with nearly 30 years of experience in the field. He developed his interest in the nascent field in the mid-1980s as a mechanical engineering intern at Tandem Computers and then at Amdahl Corporation in the early 1990s. He also worked for short periods at IBM and Westinghouse. He started his own consulting business in 1993 before joining Applied Thermal Inc. in the Bay area in 1996. He started Electronic Cooling Solutions in 1998 growing it from just 3 to 4 accounts a well-respected consulting firm with a large number of well-known companies as clients. Bill has also been an active member of the program committees for the Semiconductor Thermal Measurement, Modeling, and Management Symposium (Semi-THERM) and the International Microelectronics and Packaging Society (IMAPS) Advanced Technical Workshop on Thermal Management. He has also chaired technical sessions for Semi-THERM, IMAPS, the ASME InterPACK Conference and the I-Therm Conference; and played an active role in the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

Q. What was your earliest exposure to Computational Fluid Dynamics (CFD) for electronics cooling?

A. The earliest version of FloTHERM I can remember using was V1.2. I recall using the old pull-down menus in FloTHERM that were to the menus in Lotus 123. In the early days I was heavily involved with testing and analysis especially benchmarking of CFD codes. I spent a lot of time on the thermal design of forced convection boxes when I first started to work in the electronics industry. I also gained experience with Icepak when it came out in the mid-1990s.

Q. How does CFD software today for electronics cooling compare to that you used in your younger days?

A. I would say that CFD software can be used far more effectively today. 20 years ago we could use it to pick up flow and thermal trends. But now we can use it to make more accurate temperature predictions. We only had 64Mb of memory to work

with in the mid-1990s. Today we have up to 32 Gb to play with. This means we can now have multi-million cell simulations. And of course solvers are commensurately quicker. The timescales involved in modern consumer electronics prototyping are such that it would be impossible to do benchmarking in electronics cooling these days using a general purpose CFD tool because the market moves too quickly.

Q. How has electronics cooling design workflows changed over the last 25 years?

A. It took us 4 to 5 years to design a computer system 20 years ago. Today the design cycle is much shorter. 25 years ago we relied mainly on physical testing. But with shorter design cycles the amount of time available for testing has been significantly reduced and we now rely heavily on CFD simulation tools during the design cycle.

Q. Are colleges producing enough mechanical graduates for electronics cooling simulation industry needs today?

A. Definitely not. In addition, I would add that most colleges and universities are not preparing their students to be effective in a product design environment. Students that complete advanced degrees and acquire a good understanding of CFD fundamentals typically lack practical exposure to product design requirements. At the same time there are many engineers with good product experience who lack the background to work successfully with CFD applications.

Q. What is peculiar to Electronics Industry design flows in your opinion?

A. In my view, the electronics industry is not a mechanical engineering centric industry. It is more focused on software and electrical driven product features. If you compare electronics to the automotive or aerospace industry for instance, the product features in these other industries have far more mechanical engineering content.

An electronics enclosure used to house leading edge electronics may be priced at $1,000. The electronics and software housed in the enclosure on the other hand may be valued at over $250,000. Since it is the electronics and software the give the product value, the mechanical design is driven at best by the hardware requirements. In some cases it is treated as an after-thought.

At the same time the trend it to package more electronics in smaller volumes, means that the thermal design has become a more important part of the product design. Higher power density required that more attention be paid to the cooling of the electronics.

Q. How important is multiphysics simulations in the consumer electronics space?

A. The electronics industry for the most part has not adopted a multiphysics simulation approach. Design parameters such as structural, thermal, acoustics, electromagnetic compliance, and safety are often addressed by different sets of engineers using different methodologies. While thermal engineers make extensive use of simulation

tools, several of these disciplines place more reliance on hand calculations and rule of thumb methodologies, engineering experience and empirical testing.

Q. What do you see as the future for electronics cooling?

A. American companies are still at the cutting edge of electronics innovation in both the consumer as well as the commercial space. However, we will need to pay more attention to total power of products, lack of space for dissipating heat, better heat spreading technologies, and the use of new materials for thermal management.

In consumer products "more bang for the same battery space" is needed. The real game changers will be new battery technology and new materials. Phase change materials will help to mitigate some transient heat dissipation concerns. However, the amount of functionality delivered to the end user will always be restricted by Newtonian physics. We will also continue to weigh the pros and cons of natural convection versus forced convection cooling.

Manufacturing has largely moved to Asia in the last 20 years but high end design has mainly stayed in North America, Europe and Japan. I expect more design to move to Asia. This will be especially true as products become commoditized. But we can also expect to see new technologies coming along such as hologram TVs, and TV wallpaper on our walls. There will also be other new horizontal markets that will require thermal design such as wearable consumer electronics.

We can expect to see incandescent and even fluorescent lighting disappearing as LEDs become the more predominant source of lighting in the future. This too will create new thermal design challenges.

In short, new opportunities for electronics thermal will emerge in the future and the electronics cooling market will remain large.

Further Reading:

1. "Thermal Management Challenges in the Passive Cooling of Handheld Devices" by G. Wagner and W. Maltz, 25-27 Sept 2013, THERMINIC 19, Berlin, Germany.

2. "Validation Studies of DELPHI-type Boundary-Condition-Independent Compact Thermal Model for an Opto-Electronic Package" by G. Wagner, W. Maltz, A. P. Raghupathy, A. Aranyosi, 7-9 Oct 2009, THERMINIC 13, Leuven, Belgium.