

## Upfront CFD Helps Daktronics Light Up the World

By Bob Cramblitt, President, Cramblitt & Company

In Brookings, South Dakota, a town of about 19,000 people, big things are happening; things that touch millions of people in nearly 100 countries, from Liechtenstein to China to Brunei.

Brookings is the home of Daktronics, a supplier of electronic scoreboards, computer-programmable displays, digital billboards and large-screen video displays and control systems.

Out of its 500,000 square-foot manufacturing and office facilities come the displays that show sports fans scores and video replays, advertise new offerings for all types of businesses, tout the stars appearing in Vegas nightspots and help drivers navigate highway systems. In the case of the new Grand Lisboa Hotel and Casino in Macau, China, a Daktronics display is a calling card that heralds the excitement to be found inside.

### Complexity Behind the Lights

Daktronics products require integration of complex multiple displays showing real-time information, graphics, animation and video. They have to be built to withstand all types of weather, to dissipate heat generated by LEDs and look good even when directly opposite an unforgiving sun.

The tool that helps Daktronics analyze these complex factors early in the design process is CFdesign upfront CFD software from Blue Ridge Numerics. Over the course of three years, CFdesign software has become an integral part of Daktronics' product development workflow, giving the company a picture of how designs will perform before major commitments of time and resources are made.

"We use CFdesign in order to thoroughly understand complex electronics cooling situations and make comparisons among different designs before we start to build," says Shannon Mutschelknaus, thermal product development engineer at Daktronics.

### Benefits vs. Cost Upfront

A typical project at Daktronics starts with a Pro/Engineer model of the display. Native geometry from Pro/E is used by CFdesign to create the analysis model, eliminating the time-consuming translation process required for traditional CFD.

"The CAD/CFD integration is very important to us," said Mutschelknaus. "We want to spend our time exploring design options, not preparing files for CFD."

CFdesign is opened directly in Pro/E using controls within the CAD software's interface. Flow volume, volumetric boundary conditions and material properties are assigned automatically. After that, all that is left is selecting flow and heat-transfer analysis options. CFdesign automatically generates the optimal mesh and provides access to initial simulation results within minutes.

For less demanding designs, Daktronics runs an airflow/ventilation analysis to compare different design options and

optimize the airflow through the system. For designs incorporating complex thermal cooling systems, Mutschelknaus and his colleagues, Sunil Gaddam and Kurt Peters, run natural convection and airflow analyses. Associative data between CFdesign and Pro/E makes it easy to run a simulation, do a 3D design review, make appropriate design changes and see the impact of those changes in minutes.

"We use CFdesign in the early stages of the design to compare benefits vs. cost for different combinations of components, fans, heatsinks, enclosures and materials," said Mutschelknaus. "With this information, we can narrow our options to two or three different designs that we'll physically prototype."

New solar loading functionality in CFdesign has also played a key role in Daktronics' design work. Solar loading depicts radiation through transparent media and even shows shadowing based on the sun's movement. Set-up is simple: specify the time of year, time of day and location on the globe using a database within CFdesign or by assigning specific latitude/longitude coordinates and click the mouse to see the simulation.

"Time-stepped solar simulation has enabled us to optimize display contrast by varying sizes and shapes of shading louvers on the display face," said Mutschelknaus. "It's another way that upfront CFD has helped us determine performance in the early design stages."

### Widespread Impact

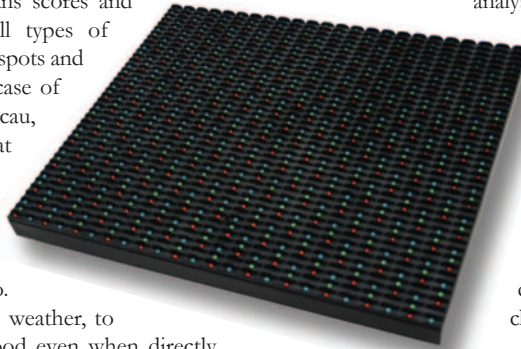
According to Mutschelknaus, nearly every project at Daktronics benefits from moving CFD upfront in the design process.

"We've been able to make key improvements such as fan hoods with lower pressure losses, more efficient combinations of fans, tighter pixel pitches for outdoor use, improved display contrast, and reduced operating temperatures of electrical components. We've even been able to design some displays without ventilation fans."

Although Mutschelknaus acknowledges that upfront CFD has probably saved Daktronics substantial time and money, his focus is on the greater opportunities it has opened up.

"It has helped us engineer higher-quality products that are superior to our competition, break down existing design barriers, and define realistic expectations of a product earlier in the design process."

**Bob Cramblitt is a consultant and freelance writer specializing in computer-aided design and engineering. He is the founder and former editor of *Computer Graphics Today*, and has written many articles related to computer graphics and CAD/CAM/CAE. Cramblitt is based in Cary, N.C. He can be reached at [info@cramco.com](mailto:info@cramco.com).**



An animated Daktronics display provides a spectacular calling card for the Grand Lisboa Hotel and Casino in Macau, China.