POLYRACK TECH-GROUP

Optimizing cooling features for electronics packaging with SolidWorks Flow Simulation

Effective packaging of racked electronic systems involving multiple printed circuit boards and complex heat transfer challenges demands the expertise of a company like the POLYRACK Tech-Group. The German manufacturer is a leading provider of integrated packaging solutions for the electronics industry. POLYRACK offers a range of products and services, including enclosures, 19-inch subracks, microcomputer packaging systems (MPS), industrial PC applications, and backplanes, as well as custom-tailored parts and solutions.

According to Development Manager Bernd Knab, a client approached POLYRACK about providing flow simulation consulting services. "When a customer requested that we conduct flow simulations of our packaging designs, we realized that flow analysis capabilities would become an increasingly important part of our operations," Knab recounts. "We believed that the technology would enable us to save time, reduce costs, and improve performance through the visualization of the behavior within the laid-out construct."

In evaluating flow analysis systems, POLYRACK determined that a CAD-integrated package was preferable. "It's better when the simulation takes place inside the CAD system," Knab stresses. "It takes too much time when you have to write data to another format, and requires moving back and forth between the applications, and duplicating effort."

POLYRACK uses SolidWorks® 3D CAD software and was pleased to learn that SolidWorks Flow Simulation computational fluid dynamics (CFD) analysis software would meet its fluid-flow and heat transfer analysis needs. The electronics packaging manufacturer added the system's Electronics Cooling Module to extend its capabilities for handling heat transfer problems related to multicore chips and heat pipes.

"We liked SolidWorks, so we anticipated a similar experience with SolidWorks Flow Simulation," Knab explains. "SolidWorks Flow Simulation has improved our development efforts by allowing us to better understand and address the heat transfer challenges that are inherent to our work."

Electronics packaging provider POLYRACK uses SolidWorks Flow Simulation software and its Electronics Cooling Module to resolve heat transfer challenges related to its packaging designs.

Challenge:

Optimize electronics cooling and innovate effective cooling system designs for racked electronic systems and components.

Solution:

Implement SolidWorks Flow Simulation CFD analysis software along with its Electronics Cooling Module to simulate heat transfer behavior in electronic systems.

Results:

- Reduced development time from three months to two weeks
- Cut two prototyping cycles
- Generated new flow simulation consulting business
- Innovated new approaches to electronics cooling system design

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Efficient simulation of heat transfer problems

With SolidWorks Flow Simulation, POLYRACK can quickly simulate heat transfer behavior in packaging designs, 90 percent of which are customized for specific applications. These insights enable POLYRACK engineers to improve cooling performance while simultaneously saving time and reducing costs. For example, on a housing that included 10 different highly integrated boards, flow simulations demonstrated that the use of four large fans cooled the system more effectively than the eight small fans initially used in the design.

"The ability to simulate the effect of airflow characteristics with SolidWorks Flow Simulation allows us to address heat transfer issues in software instead of through extensive and expensive prototyping," Knab explains. "Without simulation capabilities, optimizing the cooling system for this racked configuration of 10 boards would have taken three months or longer. With SolidWorks Flow Simulation, we completed the work in just two weeks."

Innovating new approaches, reducing prototype cycles

By simulating heat transfer phenomena and understanding how even small changes to packaging designs impact cooling system performance, POLYRACK can develop innovative approaches and reduce costly prototyping cycles. "The key is achieving the ideal amount of turbulence-free airflow over electronic components," Knab points out. "With racked systems, you often have situations in which the board that is positioned near the fan receives most of the airflow, while the next board down in the rack isn't getting enough."

"With SolidWorks Flow Simulation, we were able to recognize that by placing perforated metal plates in front of the fans and repositioning the PCBs, we could disperse the flow and provide homogeneous airflow throughout the system," Knab continues. "This approach keeps air flowing at the same speed and pressure over each board. We were quite excited by this achievement because we may not have tried it without SolidWorks Flow Simulation. In addition to optimizing the cooling system, SolidWorks Flow Simulation helps us cut an average of two prototypes from each project."

Finding the best heat sink

Because SolidWorks Flow Simulation is integrated within SolidWorks design software, POLYRACK can take advantage of design configurations to efficiently run heat transfer analyses on a range of different components, such as heat sinks. "We use configurations to run simulations on five different heat sink designs, for example, to determine which option will work best," Knab notes. "We only have to define the problem once, and then can run all five simulations at once, which saves a lot of time."

Since implementing SolidWorks Flow Simulation tools, POLYRACK has grown its flow simulation consulting from a single customer to a much more frequent task. "SolidWorks Flow Simulation not only improves our productivity and efficiency, but also lets us tackle heat transfer challenges that we would not be able to resolve without it."

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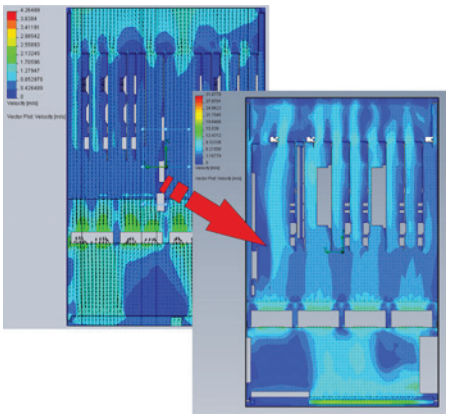
Bernd Knab
Development Manager



POLYRACK uses SolidWorks Flow Simulation to optimize designs for racked electronic systems, producing better-performing designs without the need for extensive and expensive prototypes.

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