DASSAULT SYSTEMES

SOLIDWORKS

APERIA TECHNOLOGIES

CREATING AN AUTOMATIC TIRE INFLATION SYSTEM WITH SOLIDWORKS SOLUTIONS

Using SOLIDWORKS design, analysis, CFD analysis, plastics injection-molding analysis, and technical communication solutions, Aperia Technologies has developed a revolutionary automatic tire inflation technology that utilizes a wheel's rotational motion to maintain optimal tire pressure.

Aperia TECHNOLOGIES

Challenge:
Develop a revolutionary automatic tire inflation technology that utilizes a wheel's rotational motion to maintain optimal tire pressure, thereby solving the commercial trucking industry's tire underinflation problem.

Solution:
Implement integrated SOLIDWORKS product development solutions, including SOLIDWORKS Premium design, SOLIDWORKS Simulation Premium analysis, SOLIDWORKS Flow Simulation computational fluid dynamics analysis, SOLIDWORKS Plastics Professional injection-molding simulation and analysis, and SOLIDWORKS Composer technical communication software.

Results:
- Increased design efficiency by 10 to 15 percent
- Reduced time-to-tooling by 30 percent
- Cut prototyping requirements in half
- Improved recruiting of designers and engineers

Over half of the commercial trucks on the road travel on underinflated tires, and roughly 10 percent of them have tires that are down by 20 psi or more. Tire underinflation is an ongoing problem in the trucking industry, increasing costs related to lower gas mileage, frequent tire replacements, blowouts, and maintenance by an average of more than $1,800 per truck annually. Aperia Technologies intends to eliminate trucking costs related to tire underinflation, including unnecessary energy consumption and creation of preventable tire waste, through the development of its Halo® Tire Inflator system.

Aperia Technologies was founded by Chief Executive Officer Josh Carter and Chief Technology Officer Brandon Richardson. The two entrepreneurially minded engineers with backgrounds in automotive, aerospace, automated-machinery, and medical device product development met at Stanford University while pursuing master's degrees in mechanical engineering design methodology and energy systems. "In grad school, we were looking for an interesting project and zeroed in on tire underinflation as a significant issue for commercial trucking fleets," Richardson recalls. "Once we understood the size of the problem, we saw an opportunity to start a business."

The pair launched Aperia Technologies in 2010, and immediately began work on the proof-of-concept prototype for the Halo, which utilizes the wheel's rotational motion to maintain optimal tire pressure. The device installs over an existing wheel hub. By automatically maintaining the correct tire pressure, the Halo increases fuel efficiency; extends tire life; reduces blowouts; reduces tire maintenance; and cuts oil consumption, emissions, and waste.

While the company began its work using another CAD software, it soon decided it had to move to a better development platform. "We experienced difficulty recruiting designers and engineers," Richardson recounts. "Most of the people we wanted already knew how to use SOLIDWORKS® software. We also were more comfortable with the robustness of SOLIDWORKS integrated tools and the stability of the platform."

In July 2011, Aperia switched to integrated SOLIDWORKS product development solutions, implementing SOLIDWORKS Premium design, SOLIDWORKS Simulation Premium analysis, SOLIDWORKS Flow Simulation computational fluid dynamics (CFD) analysis, SOLIDWORKS Plastics Professional injection-molding simulation and analysis, and SOLIDWORKS Composer technical communication software.

"Moving to SOLIDWORKS enabled us to ramp up development, which allowed us to get product on the road more quickly," Richardson says. "With more than 90 percent of development completed in SOLIDWORKS, we are scheduled to introduce the product commercially in 2014."

IMPROVED DESIGN EFFICIENCY

After switching to SOLIDWORKS, Aperia enjoyed a 10 to 15 percent improvement in design efficiency—partly because of the availability of trained SOLIDWORKS professionals and partly because of the more intuitive nature of the software. "The move to SOLIDWORKS enhanced our workflow and made us more efficient," Richardson stresses.

"If you were to count the mouse clicks required to perform a task, SOLIDWORKS requires fewer," Richardson adds. "SOLIDWORKS let us scale up the types of simulation that we can do, which helps minimize prototypes. We also like the way that SOLIDWORKS handles files. Using Pack and Go and cloud storage, it's easier and more efficient for us to share and collaborate."

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— Brandon Richardson, Chief Technology Officer

SIMULATING EFFECTS OF HEAT AND VIBRATION

Using SOLIDWORKS Simulation Premium analysis and SOLIDWORKS Flow Simulation CFD analysis tools, Aperia has cut physical prototyping requirements in half. By studying design performance characteristics using simulations, the company can refine and optimize designs in a virtual simulation environment instead of relying solely on expensive physical experiments.

"We use SOLIDWORKS Simulation tools to conduct thermal analyses and assess the impact of airflows," Richardson notes. "Braking generates significant heat, which is transferred to our product through the wheel hub. In addition to heat, we must account for vibration so we use SOLIDWORKS dynamics analysis capabilities for that. With SOLIDWORKS, we test our design on the computer, dramatically reducing the number of prototypes that we need."

MAKING TOOLING MODIFICATIONS A SNAP

Aperia also saves time in transitioning from product design to the creation of tooling. "Using SOLIDWORKS, we can go almost right to production tooling because we can predict what tooling changes may be needed," Richardson says. "SOLIDWORKS reduces the number of tooling iterations required and helps us get to final tooling more rapidly."

"We will save three to six months—that's 30 percent faster—in creating production tooling because SOLIDWORKS lets us streamline tooling modifications," Richardson continues. "By helping us save time and increase the number of things that we can do ourselves, SOLIDWORKS is enabling us to decrease time-to-market."

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With SOLIDWORKS Simulation Premium analysis and SOLIDWORKS Flow Simulation CFD analysis tools, Aperia can study thermal and airflow effects, allowing the company to optimize design performance while reducing prototype cycles.

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