Case study

Factory Five Racing

Fulfilling car enthusiasts' dreams using HP Z Workstations

Industry
Custom auto design and manufacturing

Objective
Enable flawless execution of highly detailed, 3D automotive designs

Approach
Factory Five Racing has standardized on HP Z Workstations

IT matters
- Increased processing power, memory facilitates creation of larger, more detailed models
- HP Performance Advisor enables FFR to optimize SolidWorks performance and reliability on HP Z Workstations

Business matters
- Design time from idea to prototype cut by half
- Virtual testing enables FFR to identify and fix design issues early, reducing problems in prototypes
- Highly accurate 3D modeling results in improved fit and finish in final parts

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– David Smith, founder and president, Factory Five Racing

Factory Five Racing gives "car guys" around the world the ability to build their dream car at an affordable price. Both the quality and affordability of its car kits are due in part to the fact that all start as designs on HP Z Workstations. "Our partners at HP and SolidWorks have enabled us to engineer better, faster, easier-to-build cars," says David Smith, founder and president of the company. "Without their technology, what we do here would be impossible."

The kit car industry has long been grounded in the idea of hand-made cars, says Smith, a former QC engineer. But he decided that with emerging 3D CAD and digital manufacturing technology, Factory Five would trade some of that tradition for better quality and lower costs.

It was the best decision he ever made. Today, Factory Five has grown into the leading provider of build-it-yourself car kits in the world. It now offers six distinct car kits, from the original Mk4 Roadster (a racing Cobra) to a hot rod modeled after a '33 Ford Coupe and its current best-seller, the 818 S&R.

The company was built on Smith's "car guy" instincts. He understands that for many FFR customers, building a car — and especially a replica Cobra or other racing supercar — is a lifelong dream. For too many, that dream was deferred or thwarted by poorly engineered or overly costly kits. He wanted Factory Five to overcome those problems with technology.

"3D digital design of our cars is integral to fulfilling our mission here," he explains. "We couldn't have met our goals for cost without a cost-effective design process and full integration of design and CNC machining in manufacture. We couldn't have done it without HP and SolidWorks."

Idea to prototype in half the time

When Factory Five Racing opened its doors in the 1990s, the company started with basic 2D design software. But as it progressed over the years, it sought the benefits of 3D design. And in order to run powerful 3D design software that would also drive the manufacturing process, it needed workstation-class hardware.

"We're designing the chassis and the body completely on our HP Z Workstations," explains Jim Schenck, director of research and development for Factory Five Racing. "It speeds up the development process dramatically. We can go from idea to prototype in about half the time."

HP Z Workstations are not only faster than the company's previous technology, but also more reliable, and they enable the company to deal with larger CAD files than ever before.

Because HP Z Workstations enable Factory Five Racing to work with larger, more complex files, the company can integrate subassemblies into a larger, integrated virtual design. "We can model a whole car with a body on it," says Schenck. That means FFR identifies and fixes potential problems earlier in the design process, speeding progress toward the final design and reducing the number of issues discovered during prototyping.

Virtual testing identifies issues early

"Maybe there's interference in fit, or the steering doesn't turn as far we would like, or the driveshaft angles aren't just right," continues Schenck. "There are lots of systems that all have to work together, with very tight tolerances. Being able to test those things ahead of time, in the virtual design world, really speeds up the process."

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SolidWorks running on an HP Z Workstation enables Factory Five Racing to run several different simulations: flow simulation on the aerodynamics of the body and suspension geometry and torsion testing on the chassis using Finite Element Analysis, among others. In the company's early years, engineers would actually build a frame, test the car's rigidity and strength to resist bending, then revise the design, rebuild the frame, and test again. Now most issues are resolved right in the virtual model before prototyping begins.

In addition, the larger, more complex files that Factory Five works with on its HP Z Workstations are also more accurate than previous generation models.

"The more accurate the model is, the easier it is for us to reproduce it in the prototype and later, in the production parts for our kits," explains Schenck. That leads to an easier building experience for the company's car enthusiast customers, and a better fit and finish when the cars are ultimately built.

Reliability

HP Z Workstations and SolidWorks have also proven to be a reliable combination.

"Our HP Z Workstations have worked flawlessly, without crashes," says Jesper Ingerslev, director of engineering at Factory Five Racing. So there is never a loss of design data, or a hiccup that leads to unanticipated delays.

Ingerslev uses HP Performance Advisor software to optimize SolidWorks and other complex software packages that run on HP Z Workstations at Factory Five.

"I've used SolidWorks on other systems that were not always compatible," Ingerslev explains. "On other computers, there might be technical problems that were difficult to diagnose and slowed down the design process. But SolidWorks running on HP Z Workstations with NVIDIA graphics cards all work together in harmony."

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Jeremy Luchini, certification manager for SolidWorks, says he switched to running SolidWorks on HP Z Workstations a few years ago and hasn't looked back. "I'm very confident running SolidWorks on my HP Z Workstation, and the new Z1 is even more amazing."

Luchini says Factory Five's high level of efficiency can be attributed to leveraging the 3D model effectively. "They are leveraging 3D the way it's supposed to be. They design it once and get it right. So they can go to production feeling confident they're going to get perfect parts."

Designing an 'elemental sports car'

How do all of the benefits—increased speed, reliability, model size and accuracy—translate to success for Factory Five Racing? The best answer might be its latest design, the 818 S&R.

The 818 is a mid-engine design that accommodates a widely-available Subaru drivetrain. "It's designed to be a car that you can build affordably anywhere," says Dave Smith.

At 818 kg in weight (hence the name), the 818 is very light and very fast. But straight line speed isn't its only attribute. "We designed the 818 to be an elemental sports car with aggressive race handling," explains Schenck.

Rather than simply designing the car's body in-house, Factory Five decided to build interest in the new car among car enthusiasts by opening itself up to ideas from its community. It held a design competition in collaboration with Grassroots Motor Sports, with judges from throughout the industry.

"We ended up with a lot of great ideas," Schenck says. "Blending the ideas and making them work together was a fairly involved process. But in the end, we were able to

Customer at a glance

Application
CAD

Hardware
- HP Z Workstations

Software
- SolidWorks
- HP Performance Advisor

combine elements from several different designs. And then we put it into SolidWorks and were able to mate it to the chassis."

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The result: Factory Five's greatest success story yet. The 818 is the company's best-selling and most affordable racer, with a kit cost of less than $15,000. Factory Five is selling five or more kits each week, with a backlog of orders.

Delivering on the promise of Digital Design

"We couldn't have designed the amazing car we have today, or met our goals for cost, without HP Z Workstations and SolidWorks," says Smith.

In fact, he says, the marriage of powerful software with HP Z Workstation technology is the realization of a dream for designers and small companies like Factory Five Racing.

"A decade ago, there were places where the design software made promises that the hardware couldn't always keep," he says. "What we're doing today—3D modeling and surfacing, with full design of a car like the 818 on an HP Z Workstation, that's been an enormously positive change.

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