

# Richard Petty Motorsports

Speeds new designs to the track 50% faster with Dassault Systèmes PLM



## Overview



### ■ Challenge

*To achieve excellence through engineering, NASCAR team Richard Petty Motorsports needed a full suite of powerful 3D tools for virtual design, engineering and manufacturing*

### ■ Solution

*The team chose CATIA, ENOVIA SmarTeam and DELMIA for their engineering power, flexibility and collaborative capabilities*

### ■ Benefits

*Richard Petty Motorsports can quickly respond to NASCAR rule changes, exploit simulation and analysis to maximize performance, program production robots and cut cycle times by as much as 50%*

### An engineering-centric philosophy

In the competitive world of NASCAR racing, the difference between first and last place is only fractions of a second per lap. Even minor improvements in the race car can make the difference at the finish line. But these improvements must be made at lightning speed, so there is no time for trial and error in the shop.

Officials at Richard Petty Motorsports therefore believe mechanical prowess, the sport's traditional source of advantage, is being surpassed by engineering excellence. The company, created in 2008 from two of NASCAR's most successful teams – Gillett Evernham Motorsports and Petty Holdings – is one of the sport's most engineering-centric organizations.

"I have an 'open wheel' mindset that constantly pushes our teams, whether racing or engineering, to go further, faster, with better technology," says Mark McArdle, vice president and managing director of competition for Richard Petty Motorsports. "Dassault Systèmes Product Lifecycle

Management (PLM), including CATIA, ENOVIA SmarTeam and DELMIA, is an important part of our win-through-engineering strategy."

The Petty organization owns 268 Sprint Cup victories since its first race in 1949, while Gillett Evernham Motorsports tallied 15 victories since 2001, when the team ushered in Dodge's return to NASCAR under the leadership of Ray Evernham. Richard Petty Motorsports, owned by George Gillett and Richard Petty, has four Sprint Cup teams, with drivers Kasey Kahne, Elliott Sadler, Reed Sorenson and AJ Allmendinger and world-class sponsors that include Budweiser, Stanley Tools, Best Buy, Allstate, McDonald's and the US Air Force.

### An integrated solution for an integrated strategy

In NASCAR, the need for speed on the race track is rivaled only by the need for speed in engineering. Kellen Brown, senior project engineer at Richard Petty Motorsports, says the engine development team turns out a minimum of ten engines each week. Body



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Mark McArdle, Vice President and Managing Director of Competition, Richard Petty Motorsports





“CATIA is the way we work. We’re cutting about 50% off our development time.”

Steve Oliver, Deputy Technical Director of Design & Engineering, Richard Petty Motorsports

configurations change rapidly, too, lasting no more than two months each. “The only certainty in our sport is change – and it’s fast, it’s real time,” says Tommy Wheeler, director of engineering services.

The team chose CATIA and ENOVIA SmarTeam in 2002 to replace a mismatched set of engineering tools that could not keep pace. Richard Petty Motorsports now uses CATIA for virtual 3D modeling of every aspect of car development and production, from engine and car design to tooling and manufacturing. ENOVIA SmarTeam intelligently stores and tracks all of the team’s CATIA product designs and related engineering data for quick access and reuse, enhancing Richard Petty Motorsports’ ability to iterate from existing designs and freeing time for innovation.

In 2008, the team stepped up its capabilities with the addition of DELMIA Robotics as its 3D welding simulation solution. DELMIA allows the team to capture best practices and automate the repetitive work of robot programming, accelerating the speed at which it moves new designs onto the track.

### CATIA: Where engineering excellence begins

Steve Oliver, deputy technical director of Design & Engineering, says his team designs nearly all of the components of a new engine using CATIA – right down to nuts, bolts and o-rings. “We’re using it to be sure we have good fits and good documentation of all the components. CATIA is cutting about 50% off our development time.”

The savings come in many forms, but knowledge capture and re-use is at the

heart of most of the benefits. For example, the design of one critical valve train component is frequently tweaked to improve performance, with 58 unique designs developed to date from a single base design. Reusing analysis cases, the new designs are quickly looped through analysis, revision and reanalysis until target structural parameters are met. Existing machining and processing data is then updated in seconds. When components are designed in the context of a total assembly, fit and function are achieved with minimal prototyping and mockup, saving substantial time and money.

Seamless integration of Dassault Systèmes’ suite of solutions makes all the difference, Oliver says. “Staying in one user interface for design, analysis and manufacturing really is a huge productivity gain. We just couldn’t imagine going back to any other kind of system.”

Because Richard Petty Motorsports’ automotive OEM sponsor Dodge also uses CATIA, its models are immediately usable when they arrive at the team’s shop. “There’s no translation required,” Oliver says. “They’re fully functional models, and I think we’re one of the only teams that can really leverage that. Other teams are transferring data to other systems, which involves translation time or broken data, or limits use.”

Almost every critical component is analyzed with CATIA’s Finite Element Analysis (FEA) module, helping ensure top, safe performance with minimum weight. “When we test with FEA, we have a better understanding of what a part is capable of,” Oliver says. “We can go into an engine test with a very

predictable stiffness and mass, instead of only getting a feel for how they’ll perform for the first time on the test benches.”

Oliver believes other teams rely more on “cut and try.” Although necessity demands they be good at it, Oliver is confident Richard Petty Motorsports is moving forward faster, more intelligently, and at less cost with the virtual analysis capabilities of FEA.

### Knowing what you know

The use of CATIA also carries over to manufacturing, Oliver says. “The designs of all the accessory components that are now manufactured in house, and a lot that are manufactured outside, are based on CATIA models.”

CATIA also captures critical knowledge gained on the shop floor. “One of the big reasons we chose CATIA is that it allows you to do CNC programming within the same software we use for design and engineering,” Design Manager Eric Kominek says. “Before CATIA, if we had to make changes on the shop floor we didn’t have a way to reverse engineer and that knowledge would be lost. Now, that’s all captured automatically in real time.”

Once a part has been designed, getting it to manufacturing is simple and efficient. With ENOVIA SmarTeam’s built-in revision control and management, everyone on the Richard Petty Motorsports team is assured of having the most current, up-to-date copy of part drawings.

“When we save a design model in ENOVIA SmarTeam, the machine shop can pull that same part file into their software and create tool paths on the

model we actually designed,” says Kelton Sprinkle, the team’s design/manufacturing engineer. “Accuracy just doesn’t get much better. There’s no chance that things get ‘lost in translation.’”

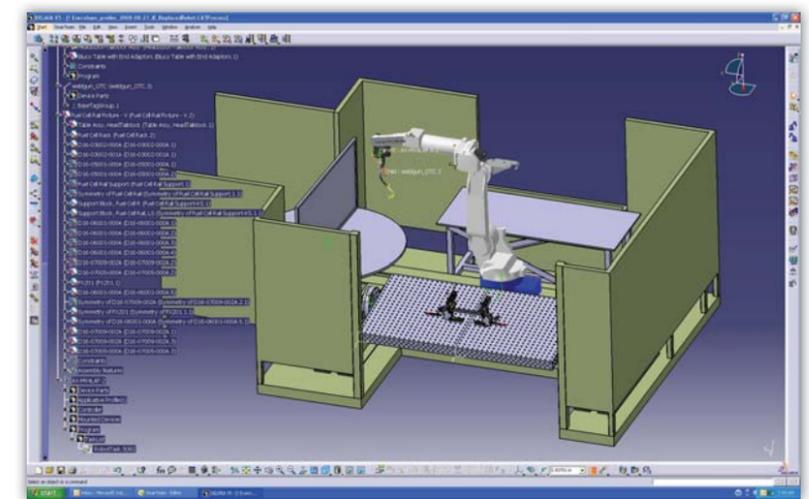
The team also relies on ENOVIA SmarTeam to track its ongoing design projects. “Every design idea gets documented, and we create a statement of work that is logged in ENOVIA SmarTeam as a searchable entity,” Kominek says. “This helps us tie everything together and efficiently assign projects to designers.”

Before ENOVIA SmarTeam, the organization lacked a strong process for prioritizing design and engineering projects. “When you don’t have visibility into all of your projects, you end up putting out fires and doing seat-of-your-pants design work to solve problems,” Kominek says. “When you’re in pure reaction mode, you’re not doing development work that puts speed in the car. With ENOVIA SmarTeam, we can rank and track projects. We can see and ensure that people are doing the right things – things that will move the team forward.”



“With DELMIA Robotics, all reconfiguring and iterations can be done in a virtual environment, where the only investment is the software operator’s time. We have cut our programming time by 40-50%.”

Kelton Sprinkle, Design/Manufacturing Engineer, Richard Petty Motorsports



The pace of change demands best-in-class PLM solutions like ENOVIA SmarTeam. "Things evolve so quickly that sometimes we can't remember what we know," Wheeler says. "Sometimes, we literally have to search our past experiences and look at past results in a new light to create a new development path. It's all an evolution – and that's where ENOVIA SmarTeam really shines."

Perhaps nowhere is visibility more important than in aerodynamic testing with computational fluid dynamics (CFD), says Chris Woodward, CFD program manager. "The only way to be sure what we're testing is an accurate reflection of what's being used on the racetrack is through good PLM programs," he says. "For Richard Petty Motorsports, CATIA and ENOVIA SmarTeam have ensured that there is excellent continuity between the design and simulation environment and the cars that we build and race every weekend."

### **DELMIA makes robotic control a snap – virtually**

Richard Petty Motorsports also is moving forward using DELMIA's robotic simulation capabilities to save time and cut costs in the design of welding fixtures. DELMIA allows the team to program its robots virtually and visualize their motion to check for collisions or space restrictions before anything is built in the physical world.

"Before we machine a fixture or work on a holding part, we can simulate the tool path of the welder and avoid any interference issues," Sprinkle says. "We can try a new part, check the fit, change the design on the fly, check all

our motion ratios and sizes, and know it's going to work dimensionally before we ever machine the first piece."

Virtual modeling eliminates scrap and re-machining of parts while avoiding time-consuming reprogramming. "No machinist time is wasted, and no CNC time is used," Sprinkle says. "All reconfiguring and iterations can be done in the virtual environment, where the only investment is the software operator's time."

The ability to create a program in DELMIA Robotics and then download it to the robot, versus manually programming the robot, is another notable savings. For a 100-step program, it can take ten hours to physically teach, tweak, maneuver, and adjust the robot. Utilizing DELMIA Robotics, Sprinkle estimates programming time has been cut 40-50%, and could increase to 60% by the time Richard Petty Motorsports realizes all of the software's capabilities.

### **The nuts and bolts**

"The reality is we compete against a lot of race teams that are probably equal to us in terms of talent," Wheeler says. "What it comes down to is this: the one who makes the best choices and does it in the least amount of time wins."

To have a company on the Richard Petty Motorsports team like Dassault Systèmes, which leads in its area of expertise, makes a difference at the finish line, Wheeler says. "We design race cars, not software and code. Knowing Dassault Systèmes is far out in front of us in terms of developing its product offering gives us confidence."



"What fuels our success is time-to-market and doing it for the best cost we can, so that we can iterate more times and bring on more products. DS PLM is an irreplaceable part of that success."

Tommy Wheeler, Director of Engineering Services, Richard Petty Motorsports



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