

SIEMENS

Ingenuity for life

Automotive and transportation

Red Bull Racing

Using Fibersim and Mendix to enhance development of composite parts and low-code applications

Product

Fibersim, Mendix, NX, Teamcenter

Business challenges

Increase quality consistency of carbon fiber parts

Improve lead times

Reduce waste

Keys to success

Build on the existing Teamcenter and NX infrastructure

Use open architecture to write custom code

Use Fibersim to enhance development of composite parts and feed laser projection in clean room

Implement Mendix to develop low-code applications and improve budgetary control

Results

Improved accuracy of carbon parts

Increased consistency and repeatability

Cut build time by 30 percent for some parts

Minimized use of patches that add weight

Reduced waste material

Improved efficiency in trim room

Siemens software solutions help Red Bull Racing achieve efficiency, consistency and cost-effectiveness

New rules aim to level the field

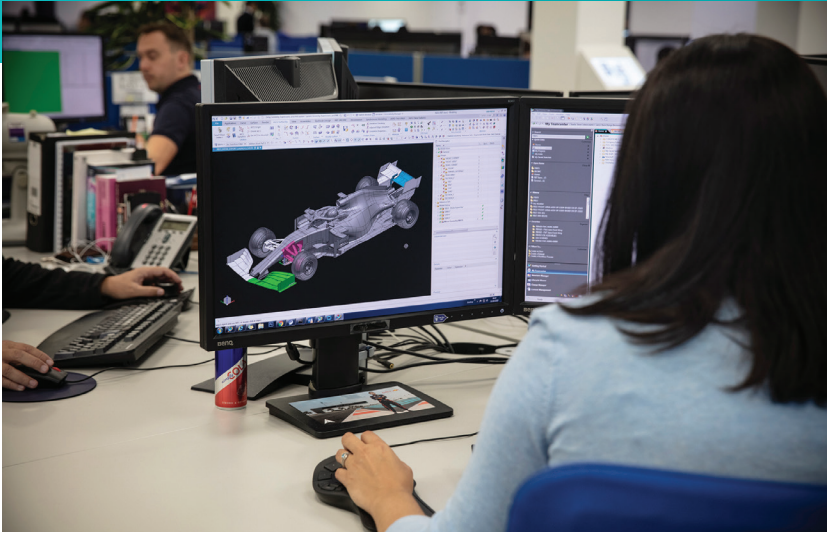
In order to attract new teams and ensure the sport's viability, Formula 1® is revising its rules. In 2021 teams will race cars originally developed for the partially suspended 2020 season, however, they will have to comply with financial limitations. These cost caps are being introduced to enable closer competition between large and

small teams and promote financial sustainability across the sport.

The 2022 season will bring drastically different technical regulations, particularly relating to aerodynamics, and are designed to increase dramatic racetrack action such as overtaking. For Red Bull Racing and other teams, these rule changes create new challenges.

“With cost caps in place we’ll still adjust the car throughout the season, but we will need to be more selective about the number and nature of changes, use simulation even





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Chris Richardson
Manufacturing Engineer
Red Bull Racing

more and rigorously manage our burn rate,” states Matt Cadieux, chief information officer (CIO). “Fortunately, we have the infrastructure in place so that we can make effective data-driven decisions.”

That infrastructure, founded on Teamcenter® software and NX™ software, which are part of the Xcelerator™ portfolio, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, was established in 2004 when Red Bull Racing entered into a partnership with Siemens. “Because we have a small IT team, we originally wanted a high-quality platform with excellent technical support,” continues

Cadieux. “With access to Siemens thought leadership and expertise, we have developed flexible yet streamlined workflows and ironed out bottlenecks. As a result, we have clear visibility into the development process, we manufacture directly from digital models and can easily make changes in order to improve performance in the factory and on the racetrack.”

An adaptable infrastructure

Over the years, there has been a continuous drive to improve the usability of the Siemens toolset. As Dan Watkins, head of computer-aided design (CAD)/product lifecycle management (PLM), explains: “We have a small number of analysts and need them to focus on high priority items. The improved usability of NX, delivered via a more focused and streamlined user interface, has allowed us to bring some of the simulation tools directly to the design engineers, where they can now run a first pass analysis with NX. This helps them assess the relative suitability of a part before forwarding it on for a more in-depth structural and thermal analysis. This has reduced the number of cycles and the cost of iterations, improved optimization and cut the time it takes to get a new part on the car.”

“As the Siemens platforms support multiple programming languages, we can choose the best programming code for any specific job. This serves us extremely well.”

Dan Watkins
Head of CAD/PLM
Red Bull Racing

Rule changes have to be addressed alongside other team priorities, and the main ambition is always to keep the focus on producing a fast car. For that reason, Red Bull Racing assesses and adopts new tools all the time and at the start of 2020 implemented the Fibersim™ portfolio into the main workstream and introduced the Mendix™ platform, both part of Xcelerator from Siemens, in an application development program.

Clean room consistency

The manufacture of carbon parts involves the layering of carbon fiber in a time-consuming, hand-built process. The manual nature of the task may lead to variations between individual composite laminators as they interpret data, measure material and create complex curves using patches and inserts. Manufacturing engineer Chris Richardson notes: "As part of our drive for continuous improvement, we had identified all the benefits of laser projection for transferring information precisely from the design office to the clean room. After assessing software, we selected Fibersim

as the best solution in its own right and because it works in conjunction with NX."

Watkins notes, "The openness of the Siemens NX architecture has allowed us to automate and optimize the geometry preparation workflow before sending it to Fibersim. We streamlined the whole process removing variability and giving repeatable standardized output in around two minutes from what was taking in excess of four hours." There are now multiple users of Fibersim producing carbon fiber parts accurate to within one-half millimeter in a repeatable process guided by the green light of the laser projection.

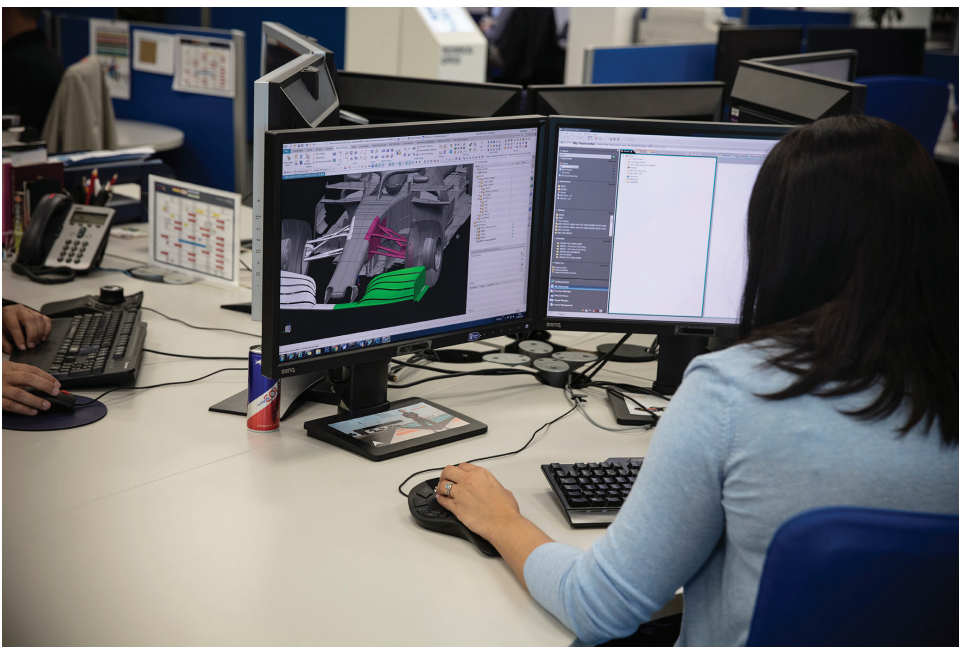
"Correlation between the final part and the original design is extremely reliable," says Richardson. "We never had that accuracy before."

Faster build time, less waste

Trials showed that the process was up to 30 percent faster and parts were right the first time. "Fibersim has been a really big win in a short space of time," continues

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Red Bull Racing



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Matt Cadieux
Chief Information Officer
Red Bull Racing



Richardson. “On one item, a large floor molding that extends from the rear wing to near the front nose of the car, we cut 25 percent off build time, the equivalent of 55 operator hours. We saved 30 percent of build time on a pre-cure suspension half, that’s over six hours work per component and almost 24 hours saved on a complete car set of parts. So we are handing time back to the design office, allowing the team to bring more performance upgrades to the car. In addition, laminators can be sure no additional material is laid into molds. That means that we are also saving weight and every gram counts on a Formula 1 car.”

According to Richardson, there are further potential weight saving gains in the future. “We may, for example, be able to reduce the amount of material required around some inserts. Previously, laminate designers had to call for larger patches of material to allow for human error when positioning the plies.”

The clean room’s main customer is the trim shop, which is reporting faster throughput. Preparation after the cure process is reduced, in one instance the complicated bonding of a part took 10 hours less.

Keeping track of spending

Not only does the team have to operate within new cost caps in 2021, it has to demonstrate it is in full compliance. “We will be audited by the sport’s governing

body, with disqualification a possibility if we cannot account for our expenditures on Formula 1 related activities and those categories that are exempt,” explains Cadieux. “We’ll need to adjust by cutting some budgets and sharing up-to-date monetary information so we can make quick decisions about how to fully utilize our allowance and exactly where to invest in the car.”

The urgent requirement was for a transparent system with a means of identifying different types of expenditures and Red Bull Racing turned to Siemens, which had acquired Mendix, a low-code platform.

“Mendix is another step in our digitalization journey,” says Watkins. “With assistance from Siemens we are now looking at some exciting new opportunities to access information in an agile way by using Mendix as a platform to develop low-code applications that work on all types of devices.”

Continuing the digital journey

“The Siemens portfolio was already one of my favorite products because it gives us modeling, drafting and manufacturing all in one place,” says Richardson. “Our most recent NX upgrade was a further improvement, with a clearer interface and some new features. Now that laminators are using Fibersim, there is scope for its wider use.”

Solutions/Services

NX

[siemens.com/nx](https://www.siemens.com/nx)

Teamcenter

[siemens.com/teamcenter](https://www.siemens.com/teamcenter)

Fibersim

[siemens.com/fibersim](https://www.siemens.com/fibersim)

Mendix

[siemens.com/mendix](https://www.siemens.com/mendix)

Customer's primary business

Red Bull Racing has been involved in Formula 1 since 2005. The dedicated team has grown to over 800 people and has enjoyed extensive racing success. By 2020 it had won eight world championships and 63 individual races. www.redbull.com/int-en/redbullracing

Customer location

Milton Keynes

United Kingdom



Watkins adds: "As the Siemens platforms support multiple programming languages, we can choose the best programming code for any specific job. This serves us extremely well. It is hugely important for us to develop our own tools to try to 'automate out the admin' and focus our engineers on aspects of their work that really add value. We could not do that to the same degree without the Siemens portfolio."

"We have the right foundation, so we are in a position of strength," concludes Cadieux. "Even though the challenges are ever more sophisticated, we know we will get a high level of assistance from Siemens and that opens up new possibilities that were not previously on our radar. We view Siemens as part of our team."

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