SIEMENS

Fibersim

Renault F1 Team

Off to the races with new composite diffuser thanks to Fibersim and Siemens PLM Software's professional services

Industry

Automotive and transportation

Business challenges

Develop and deliver complex new composite part in the middle of a racing season

Enhance competitiveness with new car configuration

Learn composite design best practices to optimize part performance

Keys to success

Bring in technical consultant to share best practices for using Fibersim

Provide top quality manufacturing data to supplier

Results

Reduced time to design and produce composite diffuser by 50 percent on the first version and 66 percent on the second

Deployed new composite diffuser two races sooner than would have been possible without Fibersim

2009 Renault F1 Team designs and produces crucial new part in less than half the time

Racing to manufacture new parts better and faster

The Lotus F1 Team is under tremendous pressure to develop and deliver complex composite parts in the traditional 16-week run-up to the season, when it must completely redesign, manufacture, analyze and test its vehicles. But that pressure paled in comparison when the team (then the Renault F1 Team) was asked to design and produce a composite diffuser for the R29 race car once the 2009 season was already underway. Talk about being on the clock!

However, with the help of Siemens PLM Software's Fibersim™ portfolio of software for composites engineering and the experience gained from working with the Siemens PLM Software professional services organization, the Renault F1 Team was able to reduce the time it took to design and manufacture a composite diffuser for its R29 race car from 12 weeks to 6 weeks. As a result, the team was able to get the new diffuser on the track two races sooner than would have been possible without the use of Fibersim, dramatically enhancing its race competitiveness.

"There's a constant battle in F1 to find ways to design and manufacture parts better and faster," says Ian Goddard, senior CAE engineer for the Lotus F1 Team, who formerly worked in the same position for the Renault F1 Team. "Our experience with Fibersim on the development of the composite diffuser once again demonstrated just how critical the software is to our efforts to meet our deadlines and put the best car possible on the starting grid."

Like many other teams, the Renault F1 Team had been working on its own version of the large "double diffuser" floor, which smoothly channels air under and out of the back of the car, increasing downforce, lateral grip and overall performance. The double diffuser was used to great effect by the Brawn GP, Toyota and Williams teams in the first two rounds of the 2009 Formula One season.

Results *(continued)*

Devised and implemented an optimal composites product development process based on input from the Siemens PLM Software professional services organization

Employed an outside supplier to successfully manufacture a critical composite component for the first time in the team's history

"The team found that by having a technical consultant on site, we were able to pick up a lot of tips and tricks on how to best use Fibersim and how to develop the optimal composites engineering methodologies. It moved us away from just using the most basic functions and enabled us to get the most out of the software."

"For the first time, we worked with an outside manufacturer and asked if they'd like electronic templates generated by Fibersim for manufacturing the diffuser. This provided the supplier with better accuracy than they were accustomed to having. In fact, the quality of the manufacturing data was better than anything they'd ever had before."

Ian Goddard
Senior CAE Engineer
Lotus F1 Team
(formerly Renault F1 Team)

However, ambiguity in the regulations led many teams to believe that the double diffuser was not permissible under the 2009 regulations. That Renault F1 Team was one of four teams to appeal its use. The appeal was initially denied by the governing Fédération Internationale de l'Automobile (FIA). Once the FIA issued the ruling allowing the use of the new diffuser, Renault F1 Team turned to Siemens PLM Software for software and services that would enable it to get the diffuser on the car as quickly as possible.

Getting the most out of Fibersim

One of the keys to the lightning-quick solution was Renault F1 Team's decision to bring a Siemens PLM Software technical consultant (TC) on site for a month during the run-up to the season and make her an integral part of the design team. That way, the engineers could learn composites design best practices and develop the optimal approach for designing the race car.

Having the TC on the premises changed the dynamic in a very positive way. For instance, if the team ran into a design scenario that they were not sure how to deal with, it was much better to have the TC right at hand so she could immediately apply her knowledge of Fibersim. While talking to someone on the telephone in technical support is very helpful, it is impossible for that person to have the same depth of understanding of the particular issue as a person who is working on-site with the team.

"The team found that by having a technical consultant on site, we were able to pick up a lot of tips and tricks on how to best use Fibersim and how to develop the optimal composites engineering methodologies," says Goddard. "It moved us away from just using the most basic functions and enabled us to get the most out of the software. It was also valuable to be able to have a two-way dialogue with someone who was so knowledgeable about Fibersim and understood what we were doing. As a result, we were able to get a much deeper understanding of the software.

"There's no question that having the TC spend a month with us during the pre-season helped us considerably when it came time to move quickly to develop the new diffuser."

Renault F1 Team's R29 race car with its new floor diffuser is shown at the 2009 Japanese Grand Prix in Suzuka, Japan with Romain Grosjean at the wheel. With the assistance of Fibersim software and the experience gleaned from working with the Siemens PLM Software's professional services organization, Renault F1 Team was able to reduce the time it took to design and manufacture a composite diffuser from 12 weeks to 6 weeks.

Solutions/Services

Fibersim
siemens.com/plm/fibersim

Customer's primary business

Lotus F1 Team (Formerly Renault F1 Team) is 100 percent owned by Genii Capital. Together with the backing of Group Lotus, the team embodies Enstone's proud motorsport heritage and Genii Capital's vibrant vision for the sport's future, driven forward by a singular goal: Victory in the FIA Formula 1 World Championship.
www.lotusf1team.com

Customer location

Enstone
England

"We normally expect some ambiguity when using ply books to direct the manufacturing process, but our supplier was able to manufacture the part just as we designed it using Fibersim-generated ply books. That makes a big difference in the 16-week period leading up to the season, but it is even more critical during the season when a part needs to be produced and shipped in time for the next race."

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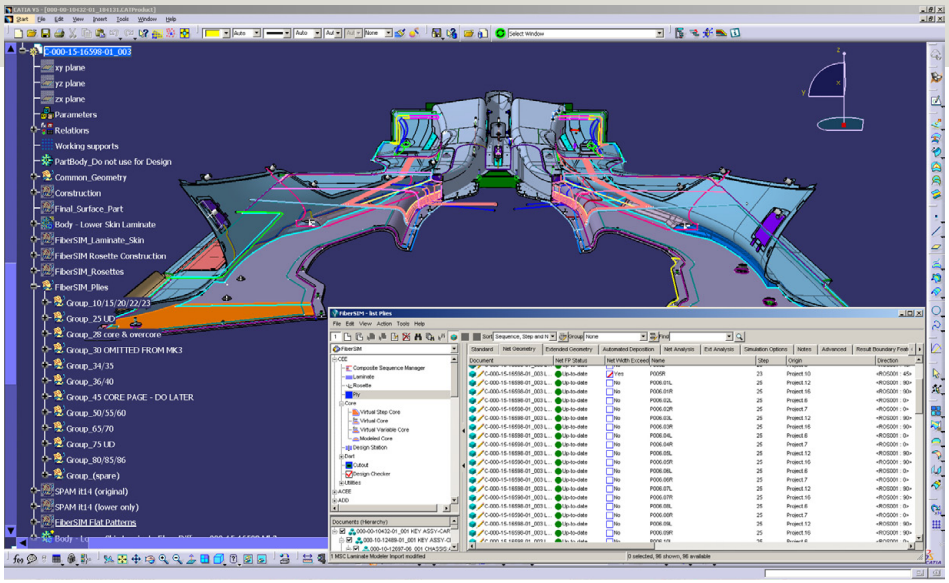

Full aerodynamic design of the floor diffuser for Renault F1 Team's R29 race car during a 3D modeling session using Catia® software. Fibersim software, which is fully integrated into the 3D CAD environment, enables the Renault F1 Team to rapidly define the layup on a complex surface of a large amount of plies with multiple orientations and material types, thus ensuring part manufacturability in a timely fashion. The Fibersim window in the lower right corner shows a list of ply layers sorted by sequence, step and name.

Providing top-quality manufacturing data

The Renault F1 Team had used Fibersim for the last seven seasons to help design and manufacture all its composite race car parts, including the chassis, gearbox, floor, side pods and wing main planes. The team reported time-savings of 20 to 30 percent for the gearbox on the R29, but the 50 percent reduction in time it took to design and manufacture the diffuser, which was comprised of over 100 plies of carbon fiber, set a new standard for efficiently developing composite parts for the Renault F1 Team.

"For the first time, we worked with an outside manufacturer and asked if they'd like electronic templates that we generated using Fibersim for manufacturing the diffuser," notes Goddard. "This provided the supplier with better accuracy than they were accustomed to having. In fact, the quality of the manufacturing data was better than anything they'd ever had before.

"We normally expect some ambiguity when using ply books to direct the manufacturing process, but our supplier was able to manufacture the part just as we designed it using ply books generated by Fibersim. That makes a big difference in the 16-week period leading up to the season, but it is even more critical during the season when a part needs to be produced and shipped in time for the next race, as was the case with the diffuser."

The 2009 Renault F1 Team reported that the 50 percent savings experienced on the first double diffuser design, which reduced the composite laminate design time from 12 days to 6 days, was bettered again on the next iteration. The subsequent double diffuser, an evolutionary design concept, took just 3 days compared to about 9 days for previous developments.

"We found that taking a comprehensive view of Siemens PLM Software's software and services – considering them as a complete solution – gave us the tools and knowledge to maximize our design-to-manufacturing process and significantly contributed to our ability to build the best possible diffuser in the shortest amount of time," says Goddard.

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