

What's New in Composite Engineering?

Edited by Michael Moser

The JEC Composites Show, an international meeting of technology users and suppliers on the latest innovations in composite engineering held in April 2010 in Paris, was the occasion to get an update on technology and the state of the industry.

To get their expert view, I called on my colleagues **Philippe SAVIGNARD** and **Laurent DELSART**, who work on PLM Composites solutions at Dassault Systèmes.

Question: Which were the highlights at JEC'10?

The 2010 JEC Composites Show Paris (<http://www.jeccomposites.com/>) was a great success and showed a record attendance with 27,500 visitors (+33% compared to 2009). This demonstrates that the composites industry is healthy and growing quickly.

This year focused on the continuous search for even lighter and stronger materials, environmental requirements and production methods, with the increasing use of automation to industrialize manufacturing processes.

Dassault Systèmes once again had a large booth with the CATIA, SIMULIA and DELMIA brands represented alongside our partners Simulayt and Coriolis. Proof that our PLM Composites solution is more and more attractive: we doubled the number of contacts at the booth compared to 2009 with more than 330 visitors, representing 250 companies from all over the world and from most industries.

For instance, the all-composites racing bike from Cyfac at our booth brought a lot of interest from several sports & leisure industry prospects eager to understand how our solution could help them solve their challenges.

The presentation delivered by Remi Dornier on "What Wind Energy Companies Can Learn from Aerospace Composites Best Practices" was well-received and led to interesting leads within wind turbine providers.

Question: How do you view adoption of composites in today's manufacturing industry?

If we look around us, composites are now everywhere ... they are no longer only the future; they are as ubiquitous as structural materials. Advanced composites are replacing more and more basic plastics and metals for anything that's high-performance. Whether it's aerospace, wind turbines, golf clubs or car bodies. For their reduced weight, higher performance and strength, and corrosion resistance, they are today's best-in-class materials.

And as always, this material evolution is driving a major shift in business, changing the way we live and manufacture, requiring new solutions and business transformations for manufacturers. Now that this shift has occurred, there is no turning back.

Question: Which are the most active industries and application domains to adopt composites?

Globally today, the most active industries are those where composites are considered a strategic advantage for a more sustainable world; a key facilitator for environmental challenges.

They are strategic for “eco-friendly” aircrafts, to enable significantly lower fuel consumption and therefore reduce the carbon footprint. The Boeing 787 and Airbus A350 are both made of more than 50% composite materials.

Composites and their material properties are a strategic way to push the limits for energy efficiency with mass production cars, which are constrained by the limits in engine and alternative powertrain technologies.

For the wind energy industry, composites enable cost-effective and profitable solutions to generate renewable energy, as demand for oil and fuel prices continue to rise.

The shipbuilding market, from yachts and pleasure boats to naval defense applications is also undergoing significant business transformation to comply with environmental regulations and to benefit from composites applications.

Composites are also promising in the sports and recreation market. This industry has become a serious business with many large manufacturers that are long-time users of advanced composites - specifically those with carbon fiber reinforcement. Whether for weight-saving, remarkable stiffness, higher performance or simply cosmetics aspects, carbon’s use in sports soon will set new records.

Of course, as mentioned earlier, other industries are impacted and there is also noticeable evolution with many other applications from medical devices to pipes and tanks or housing and construction.

Question: What are the largest benefits - the biggest challenges?

The largest benefits in using composites come from two areas: the composites material properties and the process of how to create parts with it.

It is easy to understand why many applications may be interested in these materials due to reduced weight, high stiffness and strength, high thermal and corrosion resistance as well as a good fatigue life properties.

Further, the design of such composite structures can be tailored to have strong and stiff fibers in the right direction, at the right location and with the right amount; more easily achieved than with metals. This provides flexibility and versatility of materials, geometries and manufacturing techniques.

Last, the use of composites allows for a reduction in the number of parts in an assembly: a large composite structure can be built and co-cured from one single process - instead of being assembled traditionally from many small pieces.

But using composites also creates many challenges, such as the upfront investment in manufacturing facilities and equipment, long cycle time due to a complex process to implement, lots of data to manage, and a lack of concurrent engineering and process integration between the different teams.

Without structural simulation capabilities, the difficulty to predict the behavior of such parts, result either in overdesign, cost increase and less weight reduction, robustness issues or increased failure rates.

Most industry leaders have therefore chosen to maintain full control of their composites activity, as they consider this technology as core know-how, sustaining success for current and future projects. Best-in-class composite products require to establish methods and tools, in a way that supports a single end-to-end composites process with a single toolset for the OEM and its supply chain.

Question: What’s special about DS PLM Composites solution?

To meet capacity while being compliant with environmental regulations, manufacturers have to revisit the way they produce. They have to move away from basic, manual processes, to remain competitive. And this business transformation requires investment in new hardware and new solutions. Automation is clearly an enabler, but automation alone is not enough.

Experience with customers shows what is needed in addition: integrated processes, efficient feedback and collaboration capabilities, and the ability to anticipate changes. A simple sequential process doesn't meet the requirements. Composites challenges require a PLM integrated solution.

The DS Composites solution is the only PLM composites solution on the market. It leverages - on a unique platform - the power of CATIA Composites for virtual product definition, SIMULIA Composites for realistic simulation and DELMIA Composites for digital manufacturing, along with best-in-class solutions from our partners.

This integrated environment provides unique capabilities for the designer to work efficiently, get accurate feedback from simulation and manufacturing and even better, to anticipate and avoid problems early in the process. It helps to increase productivity and quality, to facilitate innovation and collaboration throughout the process, to reduce risks, costs and time-to-market when developing composites.

Question: Tell us about the partners working with you to complete and extend the solution.

DS is not alone in this. We've worked through long-term partnerships with industry leaders on major composites programs for more than a decade. The reason our composites solution is recognized as a strategic solution by the aerospace community is because we built it for and with the two key aerospace OEMs: Boeing and Airbus. This direct R&D collaboration ensures that we capture clear requirements adapted to the market and that we converge faster towards solution maturity and productive ramp-up.

DS extended the same approach to other key actors from the aerospace industry, and also to leaders in other segments such as sports cars or yachts, to deliver a comprehensive PLM Composites solution that can benefit the entire composites industry beyond aerospace.

We also benefit from cross-fertilization between various segments of the composites industry. We are thus able to propose not only technological solutions but also to help customers accelerate the learning curve by leveraging scalable practices acquired over the past decade.

For instance, best practices developed for the aerospace rotorcraft industry can be applied to wind turbines to design, simulate and manufacture the blades all on a single virtual platform. We can help this industrial segment transform its business from a fully manual process to resin infusion to automated fiber placement, with gantry or robots. Just like we can help boat or train builders evolve from a basic manual process to safer and more automated processes to comply with environmental regulations.

And we can provide support for accelerated ramp-up through advanced composites services to help customers optimize processes, maximize PLM utilization and accelerate PLM deployment of DS solutions for better competitiveness and improved market position.

Last but not least, Dassault Systèmes has taken a leadership role in composites with the support of its strong partner community. DS is working with all major actors in the domain: composites associations, industry clusters, software and equipment providers, material providers, research institutes and independent consultants.

Our goal is to be able to quickly adapt, with a strong and dedicated R&D capacity, to market demand and technology changes, and to be at the forefront of innovation through continuous research and technology programs encompassing the key actors of the global composites value chain.

Solution partners deliver products on top of our CATIA, SIMULIA, and DELMIA infrastructures. They come from different industries: either they are machine vendors (Ingersoll, MTorres, Forest-Liné, MAG Cincinnati, Coriolis) who have invested in software to drive their machines, or highly-specialized software vendors (Simulayt, ESI) that deliver applications for dedicated tasks in the composite process.

Dassault Systèmes will continue and extend the cooperation with leading composite solution providers in the framework of strategic technology partnerships to develop the right technologies and applications necessary for the next generation of optimized, high-volume, low-cost composites.

This concludes the interview. Thanks to Philippe and Laurent for their explanations.