# The future of composites in wind, hydrogen applications: CW Trending Episode 5

In this episode of CW Trending, sponsored by Claude Despierres, sales and marketing manager at carbon fiber and composite materials specialist Hexcel (Stamford, Conn., U.S.), talks to CW editor-in-chief Jeff Sloan about current and future demand for composite materials in the wind energy industry. Despierres talks specifically about the attributes and application of Hexcel's new HexPly XF surfacing veil for wind turbine blades and the prospect of higher modulus carbon fiber being applied in pultruded spar caps for blades. She also discusses the emergence of the hydrogen storage market, what type of carbon fiber it might consume, cost and performance dynamics, and how they hydrogen economy might constrain the supply of carbon fiber in pressure vessels.

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## Composites World - transcript

**Jeff Sloan**

Hello, Claude. Welcome to CW Trending. I'm glad to have you here.

**Claude**

Hello, Jeff. Thank you. And I'm indeed glad to be here.

**Jeff Sloan**

All right. Well, look, tell me a little bit about yourself. What is your role at Hexcel? How long have you been there?

**Claude**

I'm vice president of sales and marketing for all industrial business at Hexcel, and I've been with Hexcel for quite a while, about 30 years, dealing with industrial business in different roles.

**Jeff Sloan**

Okay. How did you come to the composites industry initially? What's your background?

**Claude**

So, in fact, a very long time ago in my studies, I was studying the engineering of thermoplastics and composites, and very quickly, I found out that I preferred composites. It's a little bit more diverse in terms of an application, and a bit higher tech, maybe a smaller market, but I thought it would be more fun. And indeed, I think I made the right choice.

**Jeff Sloan**

You're based in France? So, did you go attend university in France as well?

**Claude**

Yeah. My engineering degree is from a French school. And I went to high school over there.

**Jeff Sloan**

So, it's relatively unusual for somebody 30 years ago to come out of university with some knowledge of composites. How did you first learn about them?

**Claude**

Yeah, in fact, it was pure chance. I think it was the first course, at the time, giving an engineering degree for composites. And when I joined the school, I was not sure I would do that. But I knew it was there. And from the beginning, I wanted to go in that direction. Thermoplastics were quite tight. I mean, thermoplastics were a type of material where there was a lot of development. I was a little bit less aware about composites during my studies. Then I realized what it was, and I really liked it. And then, of course, I also realized that I like to have more interaction with the outside world, so with customers and suppliers. And so that's why I needed an MBA to be able to have more of a commercial role, rather than just be in production or in engineering. And that's how it started.

**Jeff Sloan**

That's great. I want to talk a little bit about a new product that Hexcel introduced earlier this year. It's called HexPly XF. Can you tell us more about it? What is it? And what's its application?

**Claude**

Yes, so HexPly XF. It is a pre-preg, or a semi-preg, which is making the braking surface solution to customers. We always try to bring a new solution to the customers; we always look at what they are doing. Where are their issues? Today, there are existing solutions, but what can we do better? How can we help customers? And so, we found out that applying gelcoat, having a nice surface from the beginning, decreasing the amount of sanding, finishing was really something valuable. So, we worked on that, and we decided to develop this solution. In fact, it started five, six, maybe even more years ago. We had a similar problem in the automotive industry, and we developed a gelcoat for automotive, which is quite different from the one we just launched, which is more for very large structures, like wind energy, or like marine. So, this is a pre-preg or semi-preg, it's a very thin material, very light, I would say it's typically 70 grams. And again, Hexcel is a solution provider. So, we love when we can help the customer with a tailor-made product for a customer to fine-tune. So typically, it's very light and it can be adjusted. Yeah, I think that's all there is to say. It's using our unique know-how in terms of epoxy chemistry. We have developed specific resin for that. It can as well be adjusted lightly to what customers need. More specifically what are their processes that are curing cycles, but fundamentally, it's a resin system suitable for very large structures with a minimum were only a vacuum bagging. And it's also suitable for companies using pre-preg to be in that structure, but also for companies in choosing, and that's what I think is unique.

**Jeff Sloan**

So, you say it's a semi-preg. You mentioned epoxy. I assume the fiber is carbon. Is the format?

**Claude**

Absolutely not. The fiber, you must understand what we're replacing: gelcoat. So, the fiber is there as a reinforcement to help handle that material and lay down in the mold. And secondly, it's there to give the trick, let's say, and, in the end, allow a really nice surface when you demold the part.

**Jeff Sloan**

Okay.

**Claude**

So, there's a veil of glass and other things and that's it. It's the fabric more than anything else is absolutely no use in the structure. It's really for replacing gel coat with another solution. The other thing that we bring, and maybe I'm jumping ahead there, is that fundamentally we believe, and we see that we can replace a certain weight of gelcoat by slightly less weight. There is weight saving there for our customers when they move from gelcoat to Hexcel solution.

**Jeff Sloan**

So, it's non-woven.

**Claude**

It's non-woven but again it can change. In fact, we should say Hexcel, but it's arranged right? So, and we're quite sensitive about what's in there about our magic that makes it work, so there are some very light reinforcements.

**Jeff Sloan**

Okay.

**Claude**

And a few other things that make it work. But no carbon, that's for sure.

**Jeff Sloan**

Yeah. So, you mentioned that this is a replacement for gelcoat. So, the surface of the HexPly XF by itself must be paintable then?

**Claude**

Absolutely. It is not meant to be finished as you know. Yeah, you need to paint after that. Absolutely.

**Jeff Sloan**

So, what was the genesis for this product where you're getting feedback from your customers that they wanted to replace gelcoat? Like, what was the opportunity here?

**Claude**

No, not really. They said it's more with some customer intimacy you realize where the issues are. Well, I could say also at some point I whether we were trying to expand our product range and we were wondering whether we should make gelcoats as well. We were approached to provide the full solution and so at some point, we said yeah, should we play in that area. But it's not really our area. Looking at the limitations of gelcoats in the edges just came. Yeah, we thought we had a better way. We had a different way to approach it and by partnering with some customers we realized they had really an interest in spraying, instead of spraying gelcoat. So having a different format of the solution was interesting. And as I said, many years ago, we started in automotive where we found a solution that worked for them and then they had to paint it and then we started to think okay, let's see if we can do something for the wind energy, which was then our prime business as well. Again, investigating the limits, we could see that very often the finishing of the gel coat and finishing of the blades is a bottleneck in operation. So, we thought, "Okay, do we have a solution that would help them?" And that's why we developed in that product.

**Jeff Sloan**

Okay, so you mentioned the wind energy industry and blade manufacturing. So just walk me through how HexPly XF is applied in wind turbine blade manufacturing, and what kind of operations maybe are not needed yet, because you mentioned that you're currently sanding is messy. So maybe that's something that the fabricators don't have to do. So just walk me through that.

**Claude**

So yeah, the beauty of the XF service is it's very easy to use. So, it just comes in a roll. The width can be selected or determined with the customer so it's the most suitable for them. And it's just like any pre-preg. You lay it down on the tool directly, you put the sticky surface on the tool and it holds there and then you go and apply your standard layup for the structure of the blade. No other change for the customer so that's really nice and easy to integrate into a current process so it also doesn't require debulking it. It's really easy and we really always like to make things easy for customers that's how you get a greater adoption, I think. Then what? So does it remove completely the need from sanding? Well so far, I would say unfortunately not. I could say again it depends on so many things. What construction you have behind you, reinforcement you have behind how the customer is, you know, his own process. I would say unfortunately we can't say we have little hope to completely replace the sanding. But usually the sanding, plus then you'll have to reapply some finishing. So you need to put more material, repair and sand again, and so on. And that's where we think we add value because you said you can sand less and with less repair. That's the overall idea. And that's with more experience then we will see that will also help us to continue to improve the product so that it's kind of bulletproof to anything that can happen during the process of the customer, so that it really means minimum work for them.

**Jeff Sloan**

So, you mentioned it's a semi-preg. You must have some out time limits, but you know the wind energy industry is large molds, a lot of material, a lot of time. So how does that work?

**Claude**

Yes, so I like that question because it gives me the opportunity to break the idea that prepreg or semi-preg is fragile and it needs fridges. It's not true anymore. I mean it depends of course, but we have some systems with extremely long out times like this one. You can put your material in rooms for six weeks at room temperature, so as long as you have a room temperature control and you don't reach 50°C, you know, as long as you don't go, I think it's over 30°C, you'll find it can go for six weeks. So, it's really, nothing special. And again, we're back to the fact as well that in a lot of cases, I mean the composite has now become a real industry in the sense of we took just in time that embraces and XF can do that. The customer is not supposed to store material for ages in the shop floor where there as well to report to bring a service where the rolling of you know or let's say the time the customer will have the product in hand will be a week, two weeks. I mean I guess it's a bit longer for energy because they have so many materials it takes so long to build the blade. But for smaller components, they kind of have it for a day or two days and then we replace.

**Jeff Sloan**

So, you talked a little bit about sanding, so sanding I guess is less or minimized with HexPly XF. What other benefits are you seeing that this material conveys to a wind blade?

**Claude**

So, one of the benefits we see is that it's lighter as well. As I started to mention, I think we have the impression that we should be able too, I mean we've demonstrated a few times that we're bringing 50% weight saving. If you don't need it for weight-savings, you also have overall material and waste savings. I think that's a great advantage. You have an even application of your surface solution which is not the case of gel coat. Or on the contrary, if you want to be sure to have more gel coats in certain areas you can as well do it. I mean, you have perfect control of the distribution of your surface solution, which you don't have the same way in a gel coat. Finally, as well of course for a newcomer, for all of a company growing its equipment to is the spraying it's all the mixing equipment that you don't need to invest in. You don't need anything special, anything different than what you already use for your driver enforcement or your pre-preg. So again, it's an investment saving, and fundamentally overall it's saving time, so it takes less time to deposit that material. And then as I said, as well, the sanding time as well. So overall, the same thing, if you're in a ramping phase, you can offer a little bit more throughput to your customer than the standard gelcoat.

**Jeff Sloan**

This must have application in other end markets that use gel coats like in marine. Are you seeing applications there as well?

**Claude**

Yes, so marine? Because it's so similar. Of course, the parts are a bit smaller, but not that much. And we've already had a few successful applications in luxury yachts in sun canopy. So absolutely. And again, it's a very similar product. A very, very similar product to the one that we supply in the wind energy. Because of course the type of resin system with long open time. And the time of performance is required or expected is the same. And yeah, it's very encouraging, and it can work with epoxy infusion as well as with pre-preg, whatever the customer utilizes already.

**Jeff Sloan**

And what is the thickness of this HexPly XF? Does it range? Do you have a thickness range, or what is the standard thickness?

**Claude**

I say typically, I'm not sure there, I would have to check. But I would say typically it's a 70 GSM material.

**Jeff Sloan**

Yeah, pretty light. Okay.

**Claude**

Another thing again, because it's a surface solution, one thing I mean, it is not provided today. We just need to have, again, the demand that fits with a customer. You apply it to the first layer, the customer again saving time to the customer, right? So instead of having two layers to put in the mold, they would only need one. All of this is already an elevation, and many other things are an elevation in Hexcel. And then how can we continue to enhance that product forum, which is very, very, very promising.

**Jeff Sloan**

Finally, one of the challenges of a wind blade in operation is coping with leading-edge erosion and degradation over time, from ice and wind and rain and sand and everything. Does this material help in that performance at all? Or is that maybe another application you're looking to help with?

**Claude**

I would love it. But I would say no. You raise a point where of course we're looking into that, but the product as it is today, no. You need special chemistry, you need much more than just what it gives today. Just like gel coat, just gel coat - the same gel coat as in the blade - doesn't fit, just doesn't solve it much into the tip. And the erosion at the tip is the same for that product. But yeah, it's certainly an area that we're looking at. It's helping to find a solution for these tips, these in the leading edge where you have more and more erosion and more and more challenges with these bigger blades.

**Jeff Sloan**

Alright, so stay tuned there, I guess.

**Claude**

Exactly.

**Jeff Sloan**

I'd like to talk more broadly about the wind energy industry. Now, wind turbine manufacturing I think is one of the bright spots of the global economy through the pandemic in general. So, just weighing what your view is of wind energy, its application, its growth, and what do you see happening here in the next few years?

**Claude**

So yeah, for sure. I think wind energy was not too much impacted by the pandemic, I will say well, they were a bit because of the restriction in travels and so they couldn't access sites to be able to begin to implement the blades. I also want to say that the industrial business in general did very well during the pandemic. And of course, it went down but it went up back up quickly, much faster than aerospace. So, yeah there's a bright future in the industrial business. The wind energy that's clear I mean, with all this trend for renewable energy it has a bright future. I mean, I'm quite sure I remain of course cautious maybe because I'm French and so I hear so much negativity in France, but that's the person I'm not. It will also will boom. And what we really like, again, as in Hexcel where we are really a provider, as I said, high-end solution technologies, is these longer blades, you know, turbines that can, you know, it seems that there's no end to the number of megawatts by a turbine. It all creates demand for new solutions, right? Because of these gigantic blades. Yeah, drive for new solutions. And so, I can't share more. Say more, I mean. It's more a turbine manufacturer that you need to question. But I'm sure there will continue to be an evolution of the demand of the technology, still composite. But it is not a market which will stay with the same solution forever. And, yeah, there are new challenges, like split blades, like the fact that they have to integrate more carbon because the blades are longer.

**Jeff Sloan**

Yeah. So, let's talk a little bit about that. Because right now, standard blade manufacturing is primarily glass, foam and balsa. And then typically, if carbon is used right now, it's in the spar caps. And most of those spar caps are now pultruded. Carbon fiber consumes a lot of material. But as you noted, blades are getting much longer. And do you foresee any substantial change in material architecture? Is it possible we'll see carbon used in place of glass in certain places? What do you think is a fair expectation looking at how this is evolving?

**Claude**

I think the wind business and the blades will continue to use as less carbon as they can, in the sense of as soon as they can avoid it, they will avoid it. Having said that, I was just mentioning these issues with the size of the blade. I'm not the expert, but probably also a dilemma between your structure your weight. So other costs that you have in your whole turbine cost if you choose to make a longer, heavier blade, or if you put carbon in it, like there's, we know that some of the big players. Some of the players had made the bet to go carbon quickly and some just dragged on their feet, but they're also coming to carbon, I think simply because the magnitude of the blade. So yes, carbon. Carbon in the spar cap will develop more and more. It is today pultrusion, the most preferred option. I think it's a very good option. I think, in fact, fundamentally, why is it a good option is of course, but fundamentally what the blade manufacturer wants is something pre-cured, they don't want to have to bother. It's curing, carbon, curing injecting, whatever. Consolidating carbon with resin is much more challenging than glass. So, it makes their life easier to buy something which is resolved short, let's say. So, today pultrusion is the solution. Will it stay? Probably I can bet for them. I'm sure they're looking at other things. Eventually, we will see but it's a smart solution. Yeah. Now the big question is the carbon fiber, carbon fiber. So it's a massive consumer, this application is a massive consumer of carbon. But again, I'm not sure where it's going to go. There is a different option between today with mostly like kind of very low-end carbon, lower performance carbon, the cheapest you can get commodity fiber. Maybe I put a little bit more of the laminate, but it's commodity fiber or I kind of fine-tune and go to a higher-end carbon fiber a little bit you know, you add a little bit of GPA. So, a little bit of price, but then you can design differently and maybe design differently and offers other solutions. I am convinced that both options are being looked at. I'm not sure which one, I hope the one which will go for which we show that a little bit higher-end product will find it will be a better solution in the end. I hope

it will win. But what I cannot guarantee, you know, is that the designers will tell, but for sure it's also the resin. It's the fiber ratio. You know how far you can go and so on. There is an I would say some OEMs turbine. We can go for commodity kilometers. Same basic product you can buy from anywhere and some are going more for fine-tuned performance. Yeah, you know you can still have a basic commodity plus and a little bit of pipe. Let's see what happens where we're looking at it.

**Jeff Sloan**

Okay, so a lot of opportunities there and so it sounds like OEMs are doing a lot of cost-benefit analysis and trying to decide where that line is for each of them and how they want to apply this fiber.

**Claude**

Yes, and if I may add something, I'm very curious to see what's going to happen in the next years. Because of the boom in the hydrogen market, using the low price fiber used by the end the massive capacity used by the wind energy market is going to be competing now with other emerging markets looking for higher end fibers. Still cheap but much higher-end, and there is not enough capacity for everybody, so what will happen with the lower end? Will they run out of fiber and then will new players appear? which will be focused on that only will they go for an alternative fiber even you know, there's? I don't know. But I'm very curious to see what's going to happen in the next years.

**Jeff Sloan**

Alright, so you mentioned hydrogen, so let's just talk a little bit more about that you know. The hydrogen economy is growing extremely quickly right now. And this is across the board. This is aerospace, ground transportation, rail applications, buses, trucks, passenger vehicles. So, we're talking about the storage of hydrogen primarily for fuel cell vehicles. And we've been reporting on that quite a bit and there's just a lot of activity there. The challenge here is storing the hydrogen, and that's typically done with a pressure vessel, and if you're going to use composites then it's going to be carbon fiber, as you mentioned. What kinds of carbon fiber that you know, or what types of carbon fiber are you seeing demand for these applications? And you know, you mentioned that there's a potential shortage that could be a potential supply problem. So just talk to me a little bit about what kind of demand you're seeing and what you what the supply situation might look like.

**Claude**

Yeah, so the hydrogen economy. I mean, what the hydrogen economy is creating here for the composite market is very exciting, and I'm really thrilled about what's going on, because again its high-end. The hydrogen and oxygen storage market is yet the most obvious one the most the one impacting the most composite world, but that's not all. And indeed the time and fiber I mean it's typically sorry again a news European metrics that it's a 5000 to 6000 MPa fiber type. Again, wherever you go I think there's going to be for sure this dilemma between performance and quantity of fiber by tank, and today the main issue is the capacity constraint. There is no way - there is fantastic projections of demand for 2030 and beyond - there is no way I don't see any reasonable way to reach capacity able to meet that demand right now, but I hope people will find the solution. I hope there will be solution, but right now it's such a challenge because of the time it takes to invest, the time it takes to get the equipment to build the lines and so on. So I think being reasonable and reducing the amount of fiber within a time, but maybe thanks to a better performing by fiber or fiber with better performance translation and the tank will be very useful. So indeed, so I said it's a 5000 to 6000 MPa. They're more 5000 maybe. So pushing more to 6000 in the future I don't know for sure but yeah, my guess is telling me would probably go a little bit higher or if not

higher, it's a better translation in the under composite which is a today not so great. So yeah, it's definitely a market we're looking at. We are much more in a courtyard comfortable to Hexcel. Right? It's our today, it's where we're where we like to play because it's much more similar to what is used in what is needed in the aerospace industry. It's similar, not the same. Of course, we're not, for instance, in the same token, you know, you need bigger fibers. But again, I was also mentioning translation, which means you need to think of the surface treatment, the sizing of your fiber, all this and again, Hexcel likes to play on chemistry and likes to find the right solution. So it's something we're excited to look at. As I said, I think until now, that market was fundamentally owned by only a few players, few fiber players, which, were so good at it. But now I think the market we need kind of all the big players to come in to have a chance to meet the demand that they want. That's my view.

**Jeff Sloan**

Yeah, I don't think anybody can stand on the sidelines when you look at the amount of fiber that's going to be demanded in this application. You mentioned tow count. Are you typically seeing like 24k? 50k? What do you expect?

**Claude**

Yeah, it's typically 24k. I think we should not talk in Nestle in K; we should talk in linear weight because that's what's important. But it's typically a high strength fiber 24k. Yeah. And yeah, the heavier you get, so there's probably a limit, you know, with the 48k are being useful? I'm not sure. I'm not sure I'm not able to answer that question yet.

**Jeff Sloan**

Okay. And there's a cost sensitivity here too. Obviously, a carbon fiber pressure vessel is going to be much more expensive, it's also going to be much lighter. And when you're talking about electric fuel cell electric vehicles, the weight really matters. So, what are the dynamics there?

**Claude**

Yeah, there is a costly matter. So, we'll see where I mean, where this will end up for it, but it is not at the level, again, where the wind energy went, I think, because of unique performance. But I think that'd be a solution. I mean, again, there is today in the cost of a tank, much more than, again, the cost of the material. So, it's true that the cost of the fiber is a big part of that. But I'm back to the same logic as that when we develop XF right? What you want is to provide a solution to the customer, that we need to invest less to be able to manage this ramp-up. Because they're in a ramp of Phase II, they're in an exploding phase. And what do you want? The first fundamental is you want to plant with 100 lines, or you want to plant with 50 lines, or with 20 lines. And here, there is a lot to play. That's why there's a lot of discussion today, between what technology and the top right technology. Until now, it was mostly wet. But I think if you, when you're here, Tropic is being investigated by everybody. And of course, as a fundamental composite player, I believe that Tropic is going to bring a lot of benefits, and it's going to be the solution because of that massive volume coming in. And because it can offer so much more.

**Jeff Sloan**

Okay. So to be clear, you're talking about the possibility of increasing the efficiency of manufacturing by using Tropic to wind these pressure vessels and potentially offering the opportunity for somebody who's making these pressure vessels to have fewer lines that are more efficient, even if the material itself is

maybe slightly higher and or higher performing. The attributes in the material allow you to be more efficient and productive and manufacturing these tanks.

**Claude**

Yeah, absolutely. And we've always been very cautious at checking that we have the same. In the end, what matters is the cost of the time, as I said, and so the way we like to work is a with the customer to have that target of the cost. What's the end cost and how can we help to still be at the same or below in terms of the final cost for the tank. And I strongly believe that the Tropic can do that. Not everybody will say resin plus fiber is always cheaper, that's clear.

**Jeff Sloan**

So, you mentioned that if I recall, it takes about two years to manufacture and bring a carbon fiber line into service. So, for anybody watching, okay, do you have any thoughts about what kind of milestones? Or what kind of information points we might look for, say over the next five years that might tell us where this market heading? Are you watching the application of fuel cells and passenger vehicles the most? Or are you paying more attention right now to say trucks and buses? Or what kind of data points do we keep an eye out for?

**Claude**

Yes, of course. We prefer to focus on what we think is the most promising. I can't say much more. You're totally right. You're spot on. So, it's very difficult for me to give advice. I think almost every year it is going to be a milestone. I mean, there are already programs when you look at the orders coming in for electricity. Yeah, electric vehicles, but also hydrogen vehicles. Yeah. The system manufacturers must have a solution now. And it's like, how often will they change a solution? And, you know, in a sense, they must go with whatever is available now. Right now, for the first orders, and then incrementally, they will make improvements. Maybe every year, the changes, you know, I'm not sure we're right. It's a surprise. I mean, this market exploded within COVID. So even though we knew it was a big market. Even though I must say 10 years ago, I thought, "Wow, that's a fantastic market." I bet one day it is going to come. I was not expecting that wave to come now, thanks to COVID. So yeah, probably in a year. If we speak then we'll have a better vision. But it's really a very training market.

**Jeff Sloan**

Well, yeah, I think you're right. It's been a pleasant surprise. And we'll just have to keep in touch and see what happens.

**Claude**

Exactly.

**Jeff Sloan**

All right, Claude. Well, I appreciate you joining me here. This is really good information. I really enjoyed your comments. So, thanks again for joining me here on *CW* trending.

**Claude**

You're welcome, Jeff. That was a pleasure for me.

**Jeff Sloan**

Have a good day.

**Claude**

Thank you. Bye.

**Jeff Sloan**

Bye.