



Changing the paradigm of transportation: Lightweight composites used in solar car in intercollegiate competition

INTERVIEW

Elizabeth Howell, Dylan Neal and Dakota Kieffer

Reinforced Plastics spoke to Dylan Neal, the Project Director of Team PrISUM Solar Car from Iowa State University, and Dakota Kieffer, Director of Sales and Marketing, Plastics Unlimited, about the PrISUM solar car project.

I understand that Plastics Unlimited has been working with Iowa State University PrISUM solar vehicle team for the past few months, could you explain more about the project?

Dylan: PrISUM at Iowa State University is constructing the world's first fully, consumer oriented solar electric vehicle. The team of 120 members ranging from engineers, designers, education, and business are dedicated to changing the ideal of transportation. In the current automotive industry, there is a shift to sustainable and electric solutions. The vehicle will be a four door, practical vehicle that never has to hit the plug in but maintains the efficiency of your standard plug in EV (Fig. 1).

Dakota: Plastics Unlimited has been helping out the PrISUM team by cutting foam patterns that will be used to make fiberglass tools. We have also worked on changing the designs so we could cut the patterns and then verify that the molds and parts would be able to release. We had to make sure there were no die locks or parts of the patterns that would be difficult to produce reliable end products. We are able to use our large CNC's to cut patterns up to 10 feet wide by 12 feet long. Cutting very large patterns helped the PrISUM team assemble the SUV in fewer pieces (Fig. 2).

Plastics Unlimited has also been helping the PrISUM team by Thermoforming parts for them. We have been working with the Iowa State University students to teach them about the thermoforming process including why molds have to have draft, what happens when the tools get too warm, the importance of getting a good seal so the vacuum can form the plastic, and many other tips and tricks.

What is PrISUM's main focus?

Dylan: The main focus of the program is to shift the paradigm of transportation. However, to continue innovation, there needs to be people ready to face the challenge. The program strives to not only innovate and perform advanced material, integrated system, and automotive research, but teach and inspire younger generations through outreach.

What new materials and technologies are currently entering the sector and what do you foresee on the horizon?

Dylan: We foresee composites, carbon fiber and lightweight plastics, taking over the industry. As research furthers and manufacturing methods become cheaper, the average vehicle

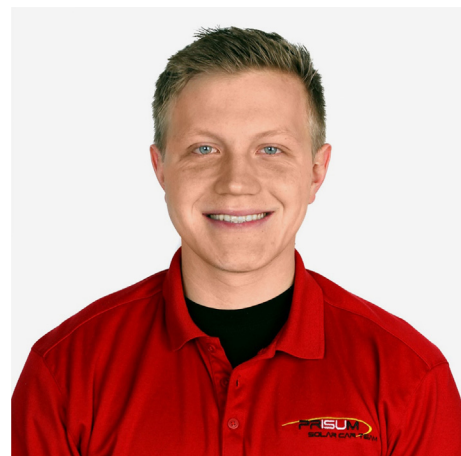


FIG. 1

Dylan Neal, Team PrISUM Solar Car Project Director.

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FIG. 2

Dakota Kieffer, Director of Sales and Marketing of Plastics Unlimited.

begins to incorporate more advanced materials. For example, Ford vehicles have moved to Aluminum chassis. Other vehicles from a range of manufacturers are using lightweight composite for paneling and structure. PrISUm's four door incorporates all of the aforementioned materials and aims to bridge the gap between fiction and reality.

Dakota: We believe materials that are light weight and strong will continue to replace steel in the automotive sector. Composites including carbon fiber and fiberglass are a great fit in the high

performance automotive sector currently. High performance cars like the Ford GT, Corvette, Koenigsegg, McLaren, Ferrari, Lamborghini, and many others are using an increasing percentage of composites all of the time. Once composites can be manufactured quicker and more cost competitive, I think we will see them used and may more vehicles and other products as well. We see advanced honeycomb and other highly engineered lightweight materials continuing to be used more often (Fig. 3).

How are fiberglass tools and carbon fiber parts being developed to meet market needs?

Dylan: The idea with fiberglass tooling is to do more with less. Carbon tools are incredibly expensive yet allow for high tolerance parts to be pulled. Fiberglass and open molding is much less time intensive, cheaper, and more commonly used in other applications. As a solar car program, and a development group, we are constricted to find creative methods to still achieve good, accurate parts. As we have utilized fiberglass tooling for our various panels and body of the vehicle, we have found that it is feasible to make carbon parts from fiberglass tooling that fit the design criterion.

Dakota: Fiberglass tools can be much cheaper option compared to cast aluminum or machined aluminum tooling. This can make the tools cost competitive for low volume production. The carbon fiber parts can be produced in a way so all of the fibers in the carbon fiber are positioned or oriented for optimal performance and extremely light weight. The designs in carbon fiber are not limited as much as most other materials so designs and engineers have more potential. As more designers and engineers continue to learn about the design characteristics and possibilities of carbon fiber, the more potential advanced composites will have. One of the largest factors that limit composites and plastics is that not as



FIG. 3

The PrISUm Solar Car and its team members.

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