

# DSM helps 7x solar car race champions overcome acute weight and aerodynamic challenges

With a few grams or tiny surface ridges separating winners and losers in championship solar car racing, every vehicle part is vital to success. When the Vattenfall Solar Team needed covers for its car lights - particularly headlights where air flow is critical - 3D printing delivered the ideal solution.

#### Customer

Vattenfall Solar Team

#### Challenges

- Compete in world championship solar car races
- Work within extreme weight and style limits
- Produce clear parts resistant to sunlight and road wear and tear

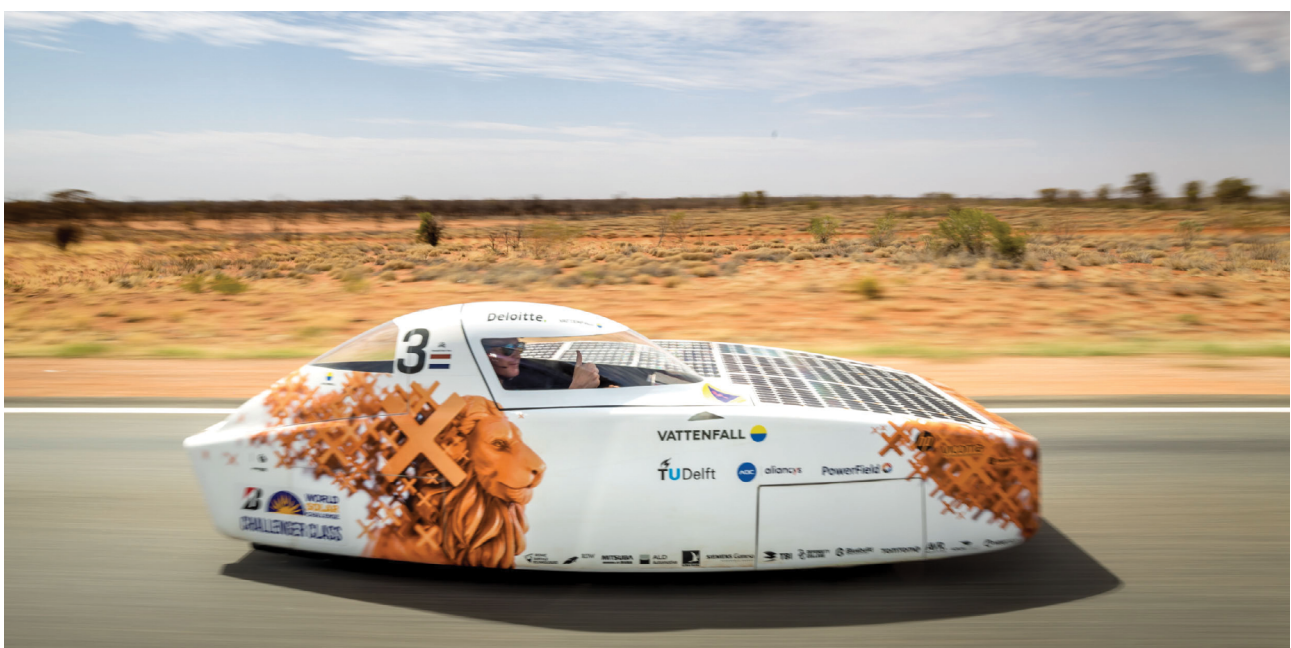
#### Solution

- Somos® WaterClear Ultra 10122
- DSM 3D printing expertise

#### Benefits

- Delivers minimal impact on car weight and aerodynamics
- Additive manufacturing only viable solution for part production

- Material transparency increases luminosity and minimizes weight increase
- Helps shorten production time by weeks
- Excellent resistance to extreme race conditions in Australian outback



*“Somos® WaterClear Ultra 10122 was used for the Vattenfall solar car’s transparent light covers where a millimeter surface ridge or gram weight increase makes a huge difference to performance. 3D printing with the strength-to-thinness ratio and producibility of the DSM material was ideal.”*

Tom Salden, Electrical Engineer, Vattenfall Solar Team

### Challenges

NunaX is a solar-powered racing car made by the Vattenfall Solar Team and designed to compete in events like the 3000-kilometer Bridgestone World Solar Challenge from Darwin to Adelaide in Australia. The car is up against 40 vehicles from various international university teams. The team has won the world championship seven times, but each year the competition gets tougher.

Since 2001, every two years 16 students from the Netherlands Delft University of Technology refine the car to race, but also to advance solar-powered technology. Former team members have gone on to work in industry to help develop technologies to improve the NunaX vehicle and solar power generally. For example, some students are working with a Dutch company developing a family car powered partly by solar panels.

During solar car races, NunaX will run at around 90km/h with a top speed of 130km/h. To achieve this and remain competitive, the team works within extremely tight parameters. NunaX is the lightest car so far at just 135kg, 4cm thinner than its predecessor and designed to act like a sail to harness wind, as well as solar power. The aerodynamic shape is so acute that air resistance is similar to a car wing mirror.

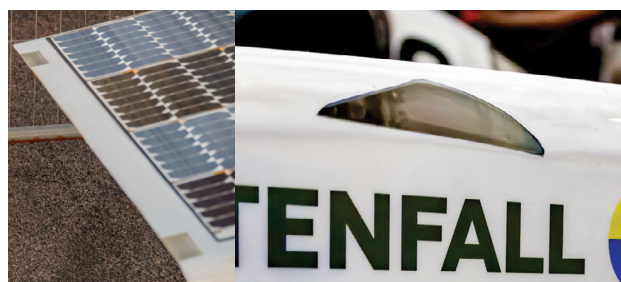
Against these demands, the team’s electronics engineer, Tom Salden, had to find a way to house the vehicle’s lights with minimal impact to weight and aerodynamics. The vehicle needs lights because it races on public roads. Salden realized that because of the car’s unusual shape, making customized, molded light covers would be difficult. The only viable solution was additive manufacturing.

### Solution

DSM is one of several organizations - including main sponsor Vattenfall - that support the solar car project. The Vattenfall Solar Team, which has used DSM materials in the past and found them effective and easy to use, chose DSM Somos® WaterClear Ultra 10122. This stereolithography material produces colorless, acrylic-like parts that are water and temperature resistant. On the NunaX, Somos® WaterClear Ultra 10122 was used for headlight and indicator light covers and the rear tail incorporating brake lights.

The team designed the light covers and used a university 3D printer for test parts. CAD files were sent to DSM to

produce final products in Somos® WaterClear Ultra 10122. Salden says, “The DSM production service was an easy process and the parts fit perfectly. We had expected to wait one or two months, but DSM produced them in a week, which was impressive.”



Light covers printed in Somos® WaterClear Ultra 10122

### Benefits

Every part and design element of the Vattenfall Solar car is vital to race performance, even small parts like light covers. Headlights are especially important because they are at the front of the vehicle where air flow is critical. 3D printing parts for NunaX meant little impact on overall weight and aerodynamics.

Salden says, “We design to the edge of what is possible; and every gram lost or aerodynamic refinement is a victory. The benefit of the DSM material and 3D printing is producibility - molded parts can’t match the finely tuned aerodynamic shapes we need. Otherwise we’d have to do some serious redesigning to body shape and that would add weeks to production time. DSM’s material is very strong and sturdy - especially for thin parts - and resistant to sunlight.”

The team considered several alternative transparent materials but found that with a UV coating for sunlight protection, DSM Somos® WaterClear Ultra 10122 outperformed the other materials. The clarity of the DSM material was also important for weight control since it meant smaller, and therefore less weighty, LED units.

DSM Somos® WaterClear Ultra 10122’s strength-to-thinness ratio allowed the team to produce lightweight parts that were still strong enough to withstand the harsh conditions and intense sunlight of the Australian outback environment.

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