**Bridgestone World Solar Challenge**

**With item and the power of the sun through Australia**

**The Bridgestone World Solar Challenge across the outback is the toughest race for solar cars. After winning the title of best newcomer in 2017,** [**the Sonnenwagen Aachen**](https://www.sonnenwagen.org/team/werdemitglied/) **student team once again competed against top-class international competitors in 2019 with a further developed solar race car and support from item.**

Sustainable mobility concepts and the efficient use of renewable energies are already among the most important fields of activity for young graduates in STEM subjects. At the renowned university location of Aachen, a team of like-minded students networked around this idea and founded Team Sonnenwagen Aachen. Together, they developed and built the first Sonnenwagen, a long-distance race car powered purely by solar energy and a backup battery. In addition to efficient energy output, the focus is on the most aerodynamic design and weight reduction possible. During a race, the team members responsible for driving strategy also continuously recalculate the optimum driving speed based on current weather data. In line with their areas of study and experience, other team members take care of maintenance and the optimal adaptation of the Sun Car to the respective conditions on site.

This division of labor and the structure of a professional racing team are the basic requirements for a promising participation in the Bridgestone World Solar Challenge, which runs every two years in the Australian spring from north to south over almost 3,000 kilometers through the Australian outback. This route has to be completed within one race week, with the solar cars having to reach checkpoints every day within a tight time limit. For the teams in the leading group, this means that they have to maintain an average speed of more than 80 km/h with their race cars using only the power of the sun and a solar surface limited by the regulations.

**The complex logistics in the background**

In order to be optimally equipped for the complex technology and the general requirements of a large team in Australia as well as at other international races, efficient logistics are needed in the background. In the process, the young engineers are often confronted with very practical tasks. For example, the Sonnenwagen 1 and its successor are essentially optimized for constant straight-line driving. Tight curves are less to the liking of the race car. This made the car difficult to handle off Australian roads or in the narrow pit lanes of various competitions in Europe. Due to its lightweight construction, the Sun Car can be carried with combined forces. What was needed, however, was a more comfortable solution. Another logistical challenge was the actual transport of the sun trolley to the various races and events.

In particular, loading and securing the racing trolley always proved to be particularly time-consuming. With its comparatively compact dimensions, the Sun Wagon fits into a normal van, but then completely fills its footprint. In addition, the aerodynamic racing car offers only a few surfaces that can be used for a safe grip for lifting. Here, the team was looking for a solution for a transport frame that would fit exactly into a van and with which the car could also be moved outside the van. In addition, the frame for the sun trolley should offer space for further equipment. It was also important to have a flexible design that could be used immediately with the first sun trolley and easily adapted later to the exact dimensions of the successor mode.

**Designing with the item Engineeringtool**

Many different fields of study from the universities at the Aachen location are represented in Team Sonnenwagen Aachen e. V. - for many team members, design in CAD programs is not one of their main areas of training. This was also true for the workshop management, whose area of responsibility included the implementation of the transport solution for the Sonnenwagen. What was needed was an easy-to-use, yet professional design solution, ideally based on a flexible modular system. With this initial situation in mind, the team approached item with a sponsorship request. The customer consultant then suggested to the workshop management that they plan the transport solution online using the [item engineering tool](https://item.engineering/DEde/tools/) for further coordination.

Thanks to the intuitive user interface, the students were immediately inspired to make their first 3D design attempts. The free software offers numerous convenient functions such as rule-supported design, integrated error correction and simple placement of profiles via drag-and-drop. The automatic positioning of machining operations and connectors is also conveniently solved within the item engineering tool. With just a few clicks, the right components could be selected and placed in the three-dimensional workspace. The alignment and dimensions then had to be adjusted.

The current design of the transport solution could also be called up online from any Internet-capable end device via the web browser and could be shared with the other team members via its individual project number. By simply converting the design into a shopping cart, it was also quickly clear which components and profile cuts from item were needed to implement the project. Finally, the application of QR codes on the profile blanks was also convincing, enabling the students to read out directly on their smartphones which component belonged in which place and to which design.

**Component sponsorship by item**

Even before the final design queries were sent to support in the item engineering tool, it was clear that item wanted to actively support the sustainable commitment to renewable energies and alternative drives of the Sonnenwagen Aachen e. V. team. As a component sponsor, item therefore provided the complete shopping basket for the implementation of the transport frame. The engineers took on the assembly of the transport solution themselves, which was possible with minimal use of tools thanks to item's innovative connection technology. The flexible screw connections were ultimately also the key to implementing the innovative two-part transport solution.

The first part of the concept is a flat transport roller onto which the sun trolley can be easily lifted. Transversely installed profiles lock the wheels onto the frame. Rollers bolted under the frame then allow the sun trolley to be easily navigated - in any direction and with minimal effort. For transport between race and PR events, the trolley is simply bolted to the additional transport frame via system groove 8. This makes a large part of the storage space in the transporter available under the sun trolley for additional boxes and other equipment. For the 2019 race, the transport rack was combined with a transport box. For the transport to Australia, the sun trolley and another vehicle cover had to be packed to save as much space as possible. Here it was very useful that the item Engineeringtool allows easy export of the designs to other CAD programs.

**Conclusion**

With the simple design in the item engineering tool and the maximum flexibility of the item MB Building Kit System, Team Sonnenwagen Aachen e. V. was able to construct an ideal transport solution that could also be easily adapted to the specific requirements of the successor model Covestro Solar Trolley. Together with item as component sponsor, Team Sonnenwagen took on the challenge of the 2019 Bridgestone World Solar Challenge, where teams from Cambridge, TU Delft, Stanford University and MIT were among the competitors for the top spots. To support the race strategy, two support vehicles also had to be equipped with various frahling sensors, antennas and reference solar cells. When planning the necessary mounts, however, it was not yet clear which support vehicles would be available in Australia. By using the screw connectors from the item MB Building Kit System, it was possible to adapt the designs to the exact dimensions of the vehicles at short notice.

In any case, the item profile technology was up to the challenges of the Outback. In the event of short-term challenges during the four-week preparation on site, the engineers were also able to rely on the sales network of a global market leader in Building Kit Systems for industrial applications and the support provided by item Australia.

**Scope: 8,875**

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**Photos: 3**

**Caption 1 + 2: The Sonnenwagen 1 reaches an average speed of more than 80 km/h.**

**Caption 3: The students used item's engineering tool to design the transport solution.**

**Über item**

item Industrietechnik GmbH is the pioneer in modular systems for industrial applications and a partner to the manufacturing industry around the world. The product portfolio includes more than 4,000 high-quality components for the design of machine frames, workstations, automation solutions and lean production applications. item has received numerous awards for products with trend-setting industrial design and consistent ergonomics.

As a pioneer in digital engineering, item is driving the digitalization of design processes with software tools developed in-house. The item Academy offers education and training through multilingual online courses and training-on-demand.

item is headquartered in Solingen and is represented internationally by subsidiaries. With know-how and passion, around 900 employees worldwide develop innovative solutions and services. Customer proximity in Germany is ensured by eleven locations. A global logistics chain ensures that all components are delivered at short notice.

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