DLR transport researchers win JEC Asia Innovation Award with new honeycomb tank for compressed gas

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The Lightweight and Hybrid Design Methods research area at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) Institute of Vehicle Concepts has been awarded the 2014 JEC Asia Innovation Award in the 'Storage' category for the DLR honeycomb tank – a gas storage tank made of fibre-reinforced composites that can be constructed in various shapes. The Stuttgart-based transport researchers received the prize in Singapore on 17 November 2014 at the JEC Asia Trade Show and Conference.

Greater range from flexible design

In the automotive industry, natural gas is currently stored as CNG (compressed natural gas) under high pressure in cylindrical gas tanks, which take up a lot of space in the vehicle. To increase the volume of the tanks and thus the range, DLR researchers have developed a new type of high-pressure tank. This tank is constructed on a modular basis, using multiple cylinders arranged in a 'honeycomb'. This means that not only circular cylinders can be used, as in previous high-pressure tanks, but also cylinders with rectangular, semi-circular or three-quarter-circular surfaces. "This method enables us to make optimum use of the installation space available in the vehicle and increase the tank volume by around 30 percent compared to conventional CNG storage systems," says project leader Diego Schierle, describing the key advantage of the honeycomb tank.

Stable and light with innovative production process

The transport researchers have also made innovations in the manufacturing process. To make the honeycomb tank as light as possible but with the same high level of safety, fibre-reinforced polymers have been used wherever possible because of their high potential in lightweight construction. The basic structure of the individual cells consists of a gas-tight aluminium core with a wall thickness of 0.5 millimetres. In order for the finished tank to withstand an operating pressure of 200 bar, each individual cell and then the entire tank are first covered in carbon fibre-reinforced polymer. This robotic, three-dimensional covering process has a lot of potential because the fibres are positioned in such a way that they provide the best possible stability for the entire tank design. The DLR researchers demonstrated the feasibility of this manufacturing process in November 2014 and have produced an initial demonstrator model that they plan to put through functional tests in the coming months. "The prize is a testament to our years of research work, during which a team of design, construction, simulation and test engineers has successfully worked on the honeycomb tank project,' summarises Gundolf Kopp, who heads the Lightweight and Hybrid Design Methods research area.

Scenarios show that the use of gaseous fuels such as CNG will increase in the near future. The DLR researchers rate the market potential of their development among aviation manufacturers and vehicle suppliers correspondingly highly. The development of the already patent-protected DLR honeycomb tank is sponsored by DLR Technology Marketing and the Helmholtz Association.

About the JEC Asia Innovation Award

The JEC Group is the world’s largest network in the composite materials sector. The best innovations in the fibre composite materials sector are awarded JEC Asia Innovation Awards. Assessment categories include the technical significance, market potential, environmental

impact and originality of the contributions. Prize winners in the other JEC Asia Award categories include teams from Taiwan, South Korea, Australia, Japan, Singapore and the United Kingdom.

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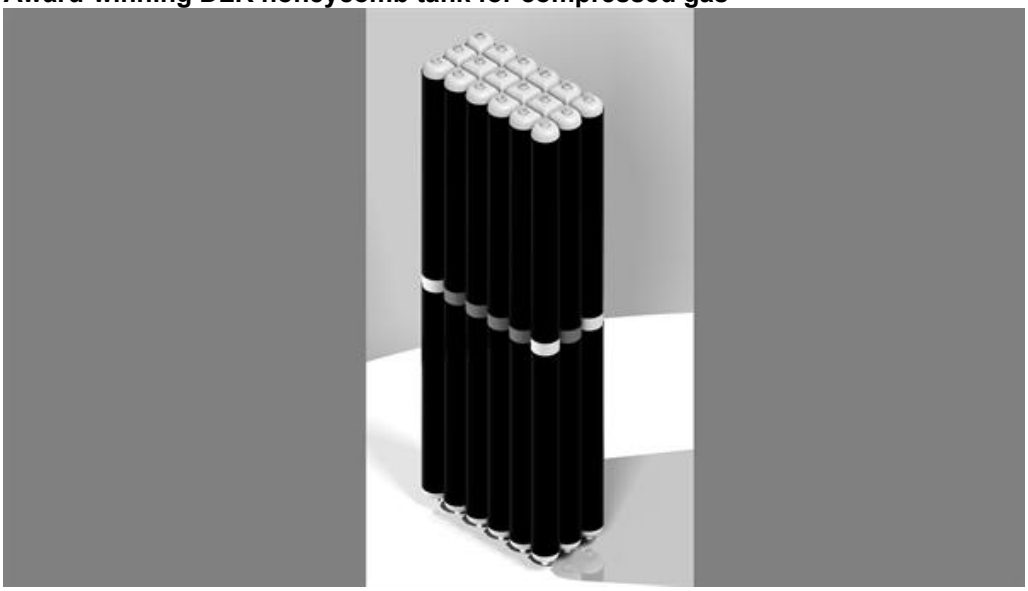
DLR transport researchers win JEC Asia Innovation Award

DLR has been awarded the 2014 JEC Asia Innovation Award in the 'Storage' category for the DLR honeycomb tank. In this image, Sascha Kienzle, Head of Science Affairs at the Embassy of the Federal Republic of Germany in Singapore (left) with Diego Schierle and Gundolf Kopp from the DLR Institute of Vehicle Concepts.

Credit: DLR (CC-BY 3.0).

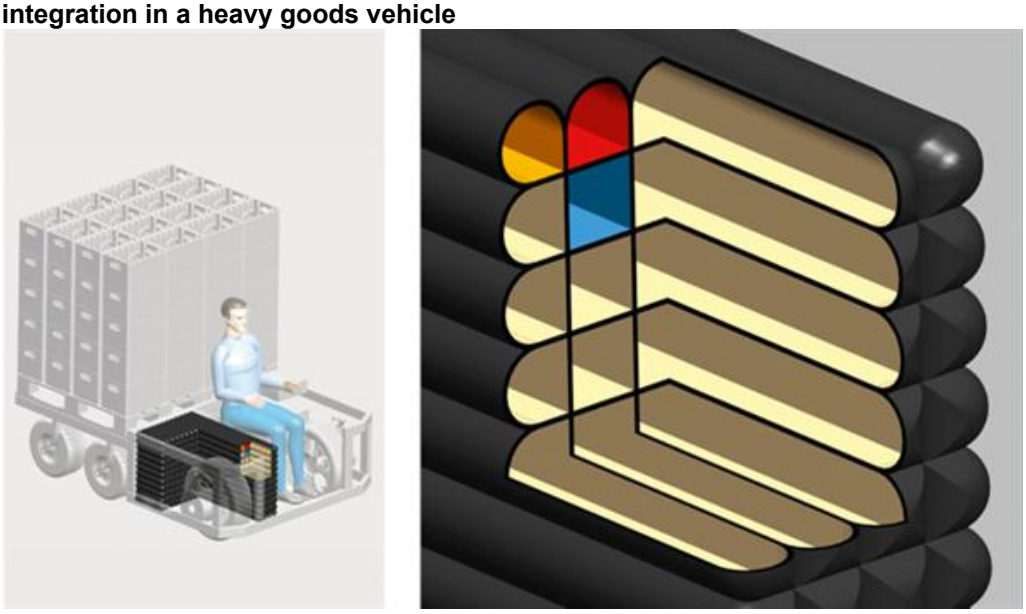
Award-winning DLR honeycomb tank for compressed gas



To make the best possible use of the installation space in a vehicle, the DLR honeycomb tank consists of multiple individual cells that have different shapes and lengths.

Credit: DLR (CC-BY 3.0).

Construction principle of the DLR honeycomb tank in cross-section and integration in a heavy goods vehicle



The surface shape of the tank can vary greatly; it can, for example, be rectangular, semi-circular or three quarters-circular. In this way, best use is made of the available installation space.

Credit: DLR (CC-BY 3.0).

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