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PRESS RELEASE

ThinKing February – Combining lightweight high-tech materials with bionic design results in a groundbreaking logistics concept: CIKONI develops lightweight CRP shelves for the Mercedes-Benz Vision Van

Loading and unloading of transport vehicles can often cost valuable minutes – and of course time is money. With traffic jams becoming commonplace and the traffic in inner cities more crowded new concepts are needed to ensure rapid delivery times. The German startup CIKONI is making an impressive contribution towards this goal with its lightweight shelves which are featured in the new Vision Van by Mercedes-Benz Vans. The shelves combine high-tech materials with bionic design.

The Development Agency for Lightweighting Baden-Württemberg is presenting this innovation as its ThinKing for February 2017. Leichtbau BW GmbH presents this title each month to provide a free promotion platform to innovative products and services in lightweighting sector of the German Federal State of Baden-Wuerttemberg.

Mercedes-Benz Vans presented a revolutionary transporter concept study for urban areas in 2016 with the Vision Van. The van integrates a number of innovative technologies for the final end-point deliveries of products – even using on board drones for the final stretch of the delivery. The manufacturer itself states that it is setting new standards for performance requirements and solutions for future generations of delivery vans.

One-shot loading saves time and costs

The centerpiece of the vehicle is the intelligent cargo space management. It provides assistance both in loading at the logistics center as well as in making the final delivery of packages to the recipients more efficient. The so called one-shot loading helps save the operator time and money during the loading procedure.

The lightweight shelf system developed by CIKONI is designed to be placed into the cargo area after being fully loaded. At the point of delivery, the packages are automatically removed by machines and handed over to a courier or to a delivery drone for the final delivery. This process reduces delivery time as well as the time required for the vehicle to be parked. All in all, the throughput of the vehicle can be significantly increased.

The shelf itself is made of an intelligent material mix of carbon fiber reinforced plastic (CRP), aluminum and sandwich design concepts. This design guarantees high stability under hard braking conditions and sharp curves while at the same time keeping weight low. The designers cleverly took advantage of the attributes of the different materials. Weaknesses of the individual materials can be targeted and eliminated by combining different materials. Integrated support points for the load bearing elements using integrated functional surfaces minimize wear from friction and shock absorbers protect the shelves while reducing the need for additional components.

Racks must be practical and visually appealing

The shelves are expected to fulfill several difficult requirements. They must be designed to make the most out of the van's cargo space while at the same time keeping weight to a minimum and maintaining stability under a load of up to 500 kilograms each while the vehicle is in motion. The racks must also be easy to handle to meet the robust requirements of the logistics industry. A bold new design was also requested in order to fit visually with the futuristic look of the Vision Van. Despite all these difficult requirements, the CIKONI shelves were designed and built in an extremely short time.

The design of the shelves was based on a bionic principle inspired by the structure of a tree. Topology optimization and computer aided optimization (CAO) were used intensively to finalize the design. The shelves were then crafted using the bionic design out of an aluminum hybrid blend and numerically optimized by utilizing the degrees of freedom of the fiber reinforced construction. The completed structure is extremely anisotropic, integrating material only where it is needed to bear specific loads.

The construction of the shelves was carried out in close collaboration with established companies such as UBC and Hermann Blechtechnik, both from the same region. The manufacturing process depends on adaptable development methods and rapid concept turnaround. Dr. Farbod Nezami, managing director of CIKONI, commented on the project noting, "Everyone involved was open for innovative developments and that is not always a given."

Startup forming partnerships with established companies

Thanks to the use of high-tech materials, CIKONI was able to make optimal use of the available cargo space. Both volume and weight have a direct influence on the efficiency of the system. The startup company from Stuttgart was able to use its expertise in the area of multi-material lightweight construction throughout all stages of the process from conception, numerical optimization and function validation to detailed construction, FE calculation and the final delivery of the installation ready rack and loading system.

In order to cover all of these bases, CIKONI had to build up a wealth of know-how. According to Nezami, "We have highly specialized development engineers who supervise the entire process from conceptualization to simulation, construction and manufacturing processes for small and largescale serial production. This know-how is coupled with creativity and clear customer focus. Our primary goal is always to spark excitement – with our customers and the customers of our customers."

Info Box: Development of CEP services in Germany

With the boom in online shopping, courier, express and parcel services (CEP) have become a fixture of the roads. If all the packages that were shipped in Germany in 2015 were laid end to end, they would circle the Earth almost 30 times. The growth of shipment volume in the CEP market continued its growth in 2015 with over 2.95 billion shipments for the year – an increase of 5.9 percent over the previous year. This represents an increase of nearly 75 percent more shipments than in the year 2000. By 2020, current forecasts are predicting even more growth with an increase of 5.1 percent to nearly 3.8 billion shipments. (Source: KEP-Studie 2016 – Analyse des Marktes in Deutschland Eine Untersuchung im Auftrag des Bundesverbandes Paket und Expresslogistik e. V. (BIEK), Link: <http://www.biek.de/index.php/studien.html>)

About CIKONI

CIKONI is a development partner for lightweighting solutions. The young company was formed in 2015 by former employees of Mercedes-Benz, Audi and the German Aerospace Center (DLR) with the aim of bringing together interdisciplinary development know-how in all phases of production from conceptualization to manufacturing. The innovation awards that the team has already one are a testament to their creativity, engagement and expertise in the development of exciting innovations.

Video

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