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1 *Veneer-based multi-material formed part.*

DEVELOPMENT OF VENEER-BASED STRUCTURAL COMPONENTS FOR THE AUTOMOTIVE INDUSTRY

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As a result of rising energy costs and ever-stricter climate-protection guidelines, lightweight construction is becoming increasingly important in the development of vehicles. In particular, the use of renewable raw materials can fulfil the requirements concerning enhanced resource efficiency and improved recyclability.

Wood as a material

By virtue of its special mechanical, ecological and economic properties, wood as a material offers an extraordinary potential for lightweight construction. Until now, however, a lack of experience has prevented it from being used in technical-structural and crash-relevant applications in vehicle construction.

Multi-material / Hybrid lightweight construction

A simple substitution of high-density materials by lighter materials is, unfortunately, not effective. The individual properties of the materials as well as their integration into assemblies and the overall structures must be taken into consideration and optimized. A particularly promising approach is hereby multi-material or hybrid lightweight construction. The application of metal-wood layer composites in structural assemblies, for example, can achieve a significant reduction in mass whilst simultaneously providing high rigidity, good availability, low production costs and a pronounced sustainability. Furthermore, through selective modifications, higher local stiffness can also be achieved.

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The assemblies must be designed to meet the essential requirements of the respective vehicle industries (automotive, rail or marine) with regard to fatigue strength, properties in crash situations, fire protection and weather resistance. In addition, the requirements concerning the thermal and acoustic insulation of the component must be fulfilled, as the utilization of insulation materials should be avoided.

Wood-based multi-material systems

The production of the three-dimensional wood-based multi-material systems is based on the bonding of thin wood veneers and differing functional layers such as metallic materials and technical textiles as well as their simultaneous forming. As in the manufacture of other sandwich structures, a stable composite component is thereby created.

Our expertise

The Technology for Wood and Natural Fiber-Based Materials department at the Fraunhofer WKI addresses the entire process chain of molded-part production. The specialist department utilizes not only classic technologies but also adopts new techniques such as vacuum and high-frequency pressing.

In the technical center of the department, it is possible to illustrate the complete manufacturing process, from the peeling of the veneer through to the pressing of the three-dimensional hybrid component.

Testing of structural components:

- Mechanical and hygric properties
- Dynamic component behavior
- VOC emissions (volatile organic compounds)
- Odor emissions

2 *Veneer press-molded parts.*