

## Cost-effective partitioning of a composite bus structure from the perspective of adhesive joints

TAKÁCS, László <sup>1,2</sup>

[laszlo.takacs@econengineering.com](mailto:laszlo.takacs@econengineering.com)

<sup>1</sup> Department of Polymer Engineering, Budapest University of Technology, Hungary

<sup>2</sup> eCon Engineering Ltd., Budapest, Hungary

Vehicle weight is a key driver for lightweight composites. However, such high-performance parts can only be used in very exclusive and narrow segments because of high manufacturing costs and uncertainty in the design and analysis process in demanding mechanical situations. In automobile industry composites are still waiting for the real breakthrough. In the past years several researches were done searching for methods to find optimal thickness, layer distribution [1] even including sandwich structures [2] to obtain the best performance with respect to weight, cost and stiffness. Further researches identified that an integral design solution is not necessary the most cost-effective option. Depending the size and the complexity of the part a divided structure may minimize total cost [3]. The focus is now to find an optimal partitioning strategy with respect to structural performance and manufacturing cost [4].

The articles published in this topic come either from aerospace or in the past few years from automotive industry. Composite vehicle structures are already present in the autobus industry as well. This paper shows a case study from this segment.

The partitioning of a bus sandwich structure was investigated by modifying the joint lines and the adhesive joint types. Butt joint, scarf joint and a special joint type were taken into account. The objectives were maximum stiffness and minimum costs. As mechanical restrictions composite-and adhesive failure were considered. Simulations were performed with a commercial FE-software. Adhesives were modelled with connector elements for which the input parameters were carried out from physical tests.



1. Figure: Some possible variations of structure partitioning

The costs were broken down into material cost and processing cycle time under fixed assessment and production volume. Trade-offs among mechanical performance and manufacturing cost were investigated.

### References

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