

# **TOPOLOGICAL OPTIMIZATION OF TRAM CAR BODY STRUCTURE**

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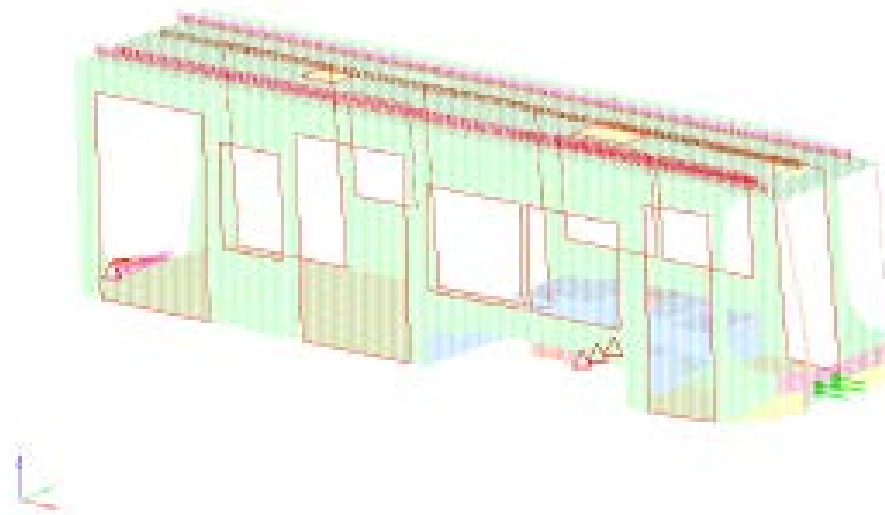
**DES ART sp. z o.o.**

## **ABSTRACT**

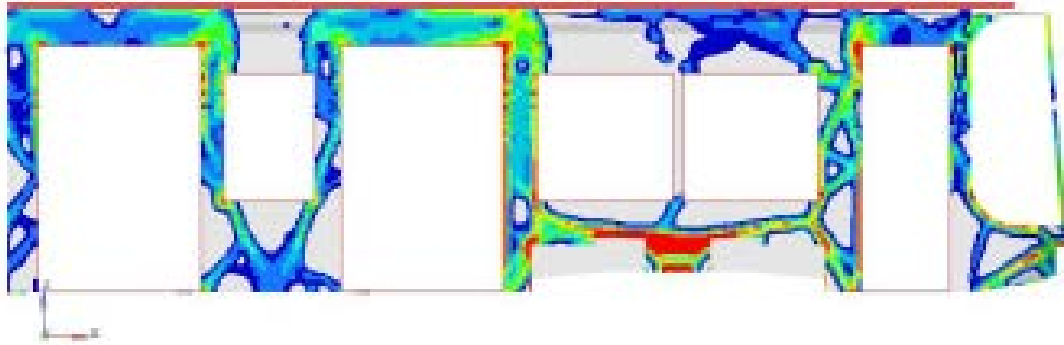
Modern tramway cars have some significant features which require mass control and optimization: low suspension, large masses on the roof (A/C, transformers) and many additional equipment and devices on board. Traditional optimization methods are time consuming and give limited mass reduction. Topological optimization is the proper way to handle a number of complex load cases in an automatic way and to suggest the designer the best geometrical shape of the structure from mathematical point of view. The presentation will show typical features of work flow when topological Optimization was applied. A real project will be discussed from the long DES ART reference list like PESA tram models Twist, Jazz, Jazz Duo (Warsaw, Gdansk), Fokstrot (Moscow, Kiev), Krakowiak (Krakow) and Solaris Tramino Braunschweig with homologation in Germany.

Topological optimization stages applied to a steel car body structure

a) design space of the car body with boundary conditions (support, loading)



b) result of the automatic topological optimization by Altair OptiStruct



c) optimization results translated to a manufacturing fit design

