

NEW VEHICLE DESIGN TOOL ENABLES QUICK COMPARISONS OF MATERIAL SELECTION TRADE OFFS

The Design Advisor software, available free at www.worldautosteel.org, allows users to compare mass, cost and emissions on a vehicle system basis

Brussels 1 May 2012 – A new tool available today from WorldAutoSteel (www.worldautosteel.org) allows vehicle design decision makers to accurately examine material selection tradeoffs in terms of mass, cost and greenhouse gas emissions savings. Design Advisor, developed by Dr. Don Malen of University of Michigan's College of Engineering, provides an easy-to-use Microsoft Excel file format that allows users to enter vehicle design scenarios for quick evaluation.

Making a material selection decision for an automotive component is complicated by several factors. First it is generally recognized that such decisions should be based on the effect on the overall vehicle system rather than considering only effects of the component. Second, the decision criteria include multiple characteristics. These characteristics address such questions as: How is the vehicle system mass affected by the material selection? How is the vehicle system cost impacted? How will fuel economy be impacted? How will environmental stressors be impacted over the life cycle of the vehicle system?

“Since these criteria are not easily combined as a single objective number, the decision maker must be presented with contributions of mass, cost, and greenhouse gas emissions so any tradeoffs between attributes can be recognized,” said Malen. The objective of the Design Advisor software is to provide the decision maker with a tool to evaluate these component material selections contributions at a vehicle system level.

Said Malen, “Because these material selection decisions are often made very early in the vehicle design cycle, the Design Advisor is configured to operate in that context, the only required inputs being the information which would be available during the vehicle planning stage.” To support quick decision making during meetings, Microsoft Excel was the chosen application because of its wide availability on laptops. “Design Advisor’s interface is intended to be intuitive and visual as the assumed decision maker may be someone other than an analyst,” said Malen. Because of the approximate nature of input data, a sensitivity analysis is included to allow varying the input values to evaluate the robustness of the estimates.

- MORE -

PAGE TWO / NEW VEHICLE DESIGN TOOL GIVES QUICK COMPARISONS IN MATERIAL SELECTION TRADE OFFS

Case Study: Steel versus Magnesium Seating

An example use for Design Advisor could be to compare a seat component manufactured in steel or magnesium. With the information available in Figure 1, users input the component material and manufacturing method, define the comparative vehicle in terms of size and powertrain type, driving cycle and subsystem masses. The user also may size the component for the comparative vehicle mass, using the software’s benchmarking data to look at several vehicles for comparison. The resized component can then be used to evaluate secondary mass reduction potential in other subsystems which are mass dependent.

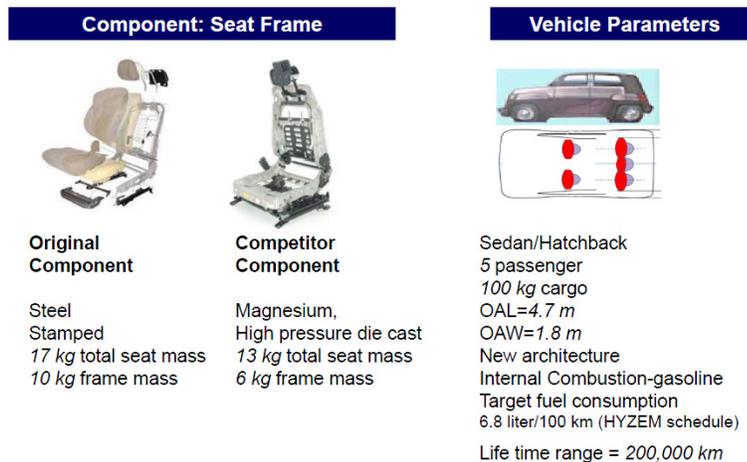


Figure 1: Available data for Design Advisor seat material comparison example

A comparison summary (Figure 2) provides a very high-level insight into results for mass, cost and greenhouse gas emissions of the nominal (steel seating) vehicle relative to the resized (magnesium seating) in an easy-to-view table. With a minimum amount of inputs, engineering teams can review the trade-offs that will be faced in a material substitution decision. In the case of the magnesium seating, while 5 kg are saved, it comes at a cost increase of nearly US\$14.00 per vehicle. Further, greenhouse gas emissions are increased over the vehicle life cycle. Users are able to go to detailed results for each attribute at a mouse click.

- MORE -

PAGE THREE / NEW VEHICLE DESIGN TOOL GIVES QUICK COMPARISONS IN MATERIAL SELECTION TRADE OFFS

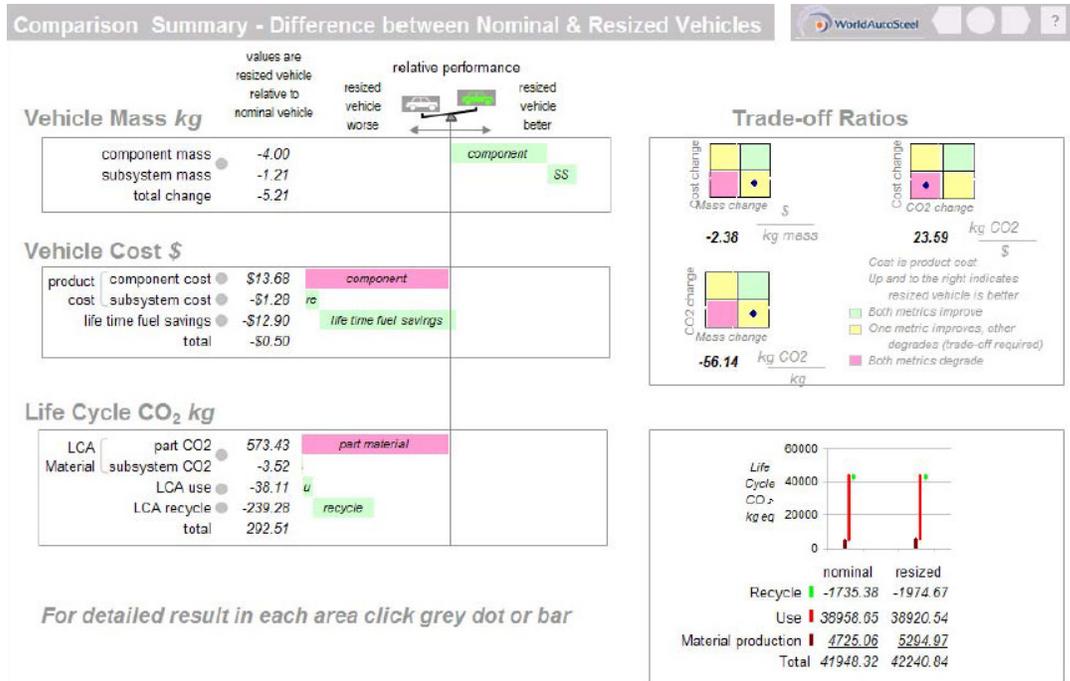


Figure 2: Comparison summary of the Nominal (steel seating) and Resized (magnesium seating) vehicles

The mathematical models used in the Design Advisor draw from the research and findings of several projects supported by the Steel Market Development Institute, the Auto/Steel Partnership, WorldAutoSteel and USAMP.

Along with a complete version of the Design Advisor software, decision makers may download a User Guide as well as case study examples geared to demonstrate and teach Design Advisor's functionality and use.

- MORE -



PAGE FOUR / NEW VEHICLE DESIGN TOOL GIVES QUICK COMPARISONS IN MATERIAL SELECTION TRADE OFFS

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