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Weight Reduction is a Permanent Issue in Transport Applications

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Introduction

Each and every contribution that resulted from this event has been meticulously revised and elevated to the calibre of standard journal publications. As a result, they successfully completed Materials and Design's customary, meticulous peer review procedure, which in this instance was co-moderated by the guest editors—the writers of the present introduction. Since there are no proceedings in the Euromat series, none of the contributions have ever been published in conjunction with a conference before.

Description

Weight reduction is a permanent issue in transport applications, and thus lightweight materials, structures and associated processes are focal areas of research in this industrial sector. They are inseparable, too, because the processing route that turns materials into engineering structures will necessarily affect material properties. It is well known that choosing the right material and manufacturing technique have a significant impact on a component's costs, which are largely set in the early design stages. Design engineers must therefore be cognizant of the impact of both materials and processing on performance, manufacturability, and cost when thinking about the introduction of novel materials.

According to a frequently cited remark, lightweight design is focused on fully using material qualities and tries to use the right material in the right place. Because the margins are getting smaller, it is also essential to create modelling, simulation, and optimization approaches and tools in parallel with expanding our knowledge of materials and processes. The present editorial cannot claim to comprehensively cover the topic for all transport modes addressed. Therefore, we have decided to focus our introductory remarks on developments in the automotive industry to show that lightweight materials and structures are indeed a success story despite the many challenges they face. Furthermore, we want to highlight that changing boundary conditions and fundamental technological approaches require continued efforts in research and development to secure what has been achieved and facilitate further progress. It is well known that the choice of material and manufacturing process has a significant impact on how much a component will cost during the early design stages. Design engineers must therefore examine the performance, cost, and manufacturability of both the material and the procedure when thinking about the introduction of novel materials.

The core of lightweight design is pushing the boundaries of material qualities in order to achieve the goal of placing the appropriate material in the right place, according to a frequently cited statement. Margin reduction in this area necessitates parallel development of modelling, simulation, and optimization approaches and tools in addition to expanding knowledge of materials and processes, all of which are equally important. Such developments are enabling design engineers to actually profit from the many lessons already learned in lightweight design: whereas improvements in this field have been mandatory to open up some freedom of design in the past, they now lead to an actual weight reduction. And this reduction can trigger the same secondary effects that formerly made halting the upward trend so difficult. The use of materials in transportation constructions is in many ways related to modelling, simulation, and optimization of materials and structures. For the introduction of novel materials in product design, it is necessary that appropriate material models and modelling techniques exist. In order to enable techniques like robust optimization and virtual testing, such models and the associated simulation and optimization techniques and tools are increasingly required to include stochastic processes.

Simultaneously, fundamental simulation approaches, like as ab initio methods, are being employed more and more to adapt material properties over many length scales to particular application requirements. The related session of the special issue is headed by a contribution. on modelling the influence of uncertainties on FRP material behaviour , followed by numerical study on optimum design of a sandwich structure for railway applications . The section closes with an account on the simulation-supported design of laminated metals towards increased ductility under tensile load. tending of the car as a complex system of interdependent components and functional units which explains why reversing the weight spiral proved so hard. Similarly, this interdependency is the basis of the high hopes linked to the fact that the reversal may have been achieved by now [1-4].

Conclusion

Naturally, this does not make lightweight design obsolete. Instead, this development bears the promise that in future, lightweight design may live up to its promises even more clearly than in the past Since performance is inversely proportional to weight regardless of the latter's measurement in miles per gallon, maximum range, top speed, passenger or cargo capacity, or acceleration, as well as regardless of the mode of transportation, lightweight design is and will remain a key issue for transport applications. The Euromat conference series has provided a forum in previous years for the presentation and discussion of materials engineering solutions to the difficulties design engineers confront in this regard. This forum will be expanded.

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Conflict of Interest

The Author declares there is no conflict of interest associated with this manuscript.

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