Editorial

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Biographical notes: Aleksandar Subic is the Head of School of Aerospace, Mechanical and Manufacturing Engineering at RMIT University in Melbourne, Australia. He is also at present Director of SAE-A and Education Director of AutoCRC. He has over 20 years of active involvement in design research with particular focus in recent years on sustainable design and green car technologies. He has published over 200 international peer reviewed journal articles, book chapters and books, and conference papers and has undertaken a wide range of high impact research projects in collaboration with industry. He is the Chair of the International Conference series on Sustainable Automotive Technologies and Editor-in-Chief of the *International Journal of Sustainable Design*.

The global automotive industry sector is currently undergoing a major transformation driven by the global financial crisis as well as by the need to focus on sustainability. Future vehicles will need to be 'green', and in particular have extremely low-energy consumption and emissions if they are to meet the following global challenges: global warming, population growth, finite fossil fuel energy supply and air quality. To produce 'green' vehicles, manufacturers will need to focus on technologies and practices that are able to reduce CO_2 emissions and hence GHG emissions, achieve increased efficiency and therefore reduce consumption of energy and natural resources. The increasingly severe legislations and policies aim to ensure that these changes are achieved in a more effective and timely manner. However, they do not provide the answers and solutions to the challenges facing the industry. The research and innovation must play a more significant role than in the past if the radical change in on-road vehicle design is going to occur. Market trends emerging from a range of industry sectors indicate that those industries that are willingly embracing and even surpassing the sustainability targets are emerging as the leaders of the future. Sustainability is truly becoming the new frontier of innovation.

This special issue of the *International Journal of Vehicle Design* is very timely as it focuses on *Global Sustainable Vehicle Design*. The issue features carefully selected peer reviewed research that reflects on the global challenges and opportunities associated with sustainable vehicle design. It aims to highlight some of the best practice in sustainable vehicle design research stemming from global automotive industry and research organisations. For example, the paper by Schmidt et al. titled 'Feasibility of a globally harmonised Environmentally Friendly Vehicle concept' presents the collaborative

work of leading automotive sustainability researchers from Ford, Renault, Daimler and Volkswagen. They have reviewed and evaluated current information systems relating to Environmentally Friendly Vehicles (EFV) and have determined that based on current approaches, a definition of EFV concept is technically not feasible at present. However, they provide in their paper recommendations for further work in this regard. Sparke in his paper 'Reducing transport emissions: the simultaneous challenges of global warming and oil shortage' analyses the need for sustainable transport solutions and provides a value proposition for use of gaseous fuels as an interim strategy to address looming oil shortage crisis and reduce the GHG emissions from road vehicles as an important response to global warming. Subic and Koopmans in their paper 'Global green car learning clusters' describe a global research project currently under way that aims to identify and consolidate the enabling knowledge relating to the sustainable life-cycle design of 'green' cars. They describe the global learning clusters concept and the key technological challenges and opportunities considered by the established clusters.

This special issue also features a number of research papers that provide an in-depth coverage of specific technologies and approaches that are considered an important part of the portfolio of sustainable technologies capable of meeting the challenges described above. For example, Milačić in his paper titled 'History in the making: 10 years of Ford fuel cell vehicles' describes the hydrogen fuel cell research and the major fuel cell vehicle accomplishments of the Ford Motor Company demonstrated through successful trials of a range of prototype vehicles. Höhn et al. provide detailed coverage of state-of-the-art in hybrid propulsion. In particular they present an efficient optimised Continuous Variable Transmission (CVT) hybrid driveline technology based on a two-range CVT. With this technology they claim to have achieved fuel savings of up to 30% compared with conventional diesel-powered vehicles, while achieving good drivability and high ride comfort. It is now widely accepted that Life Cycle Assessment (LCA) methodology plays an important role in the design and development of sustainable vehicle technologies. Subic et al. in their paper titled 'Comparative Life Cycle Assessment (LCA) of passenger seats and their impact on different vehicle models' present a comprehensive analysis of the effects of vehicle seat mass reduction and of other design changes on different vehicle models. Their analysis provides significant insight into the emerging changes in impact weightings across the vehicle life cycle phases for new vehicle models compared to older models. Mass reduction is of paramount importance in modern vehicle design as it impacts fuel consumption and the scale of use of natural resources. In rapid vehicle design this is not easily achieved as a number of competing requirements (including improved safety, weight reduction, improved recyclability, time to market etc.) must be met simultaneously. Kajtaz et al. present a novel collaborative FEA platform for rapid design of lightweight vehicle structures, which uses the FEA substructuring principle. This platform has been successfully used by the authors in the design and development of new seat adjuster mechanism structures that are lighter and easier to assemble and disassemble than the conventional actuators. A particular feature of this FEA platform is the ability to increase vehicle development efficiency by speeding up analysis and reducing the number of iterations in the product development process.

I gratefully acknowledge the authors, referees and members of the international Editorial Board who have contributed to this special issue of the *International Journal of Vehicle Design*. I would also like to thank Inderscience for their ongoing support and commitment to promoting contemporary research in sustainable vehicle design.

I hope that the papers featured in this special issue will be of interest to researchers, engineers and automotive sustainability enthusiasts in general whatever their background or persuasion. Finally, I acknowledge that much remains to be learnt about sustainable vehicle design, and hope that this special issue of the IJVD journal will play an important role on that journey of discovery.