

# MATERIALS – PIONEERING CHANGE IN MOBILITY



**DR ARUN JAURA**  
European Advisory Committee,  
SAE International, USA

The emphasis on energy saving aka fuel economy, recyclability, need for speed, comfort and safety has been the driver of change for decades, in materials and their applications in the mobility industry. Be it the regulatory bodies, consumers or sustainability of the businesses, materials have been the pillars in advancement of mobility on land, air or water. Materials have pioneered current and future product development from their inception.

Considerable development and innovative work continues to be done for weight reduction through various advances in steels, aluminium, magnesium, plastics and alloys. The expectation is to converge on breakthroughs in the combination of these materials with lighter materials used in space applications, as implemented by some of the premier OEMs. These new-found materials will be the biggest enablers in reducing weight, improve structural longevity and fuel economy, and create more space. In addition, the preliminary imperative is to improve the performance and reliability of the systems and components without compromising customer value.

The ability to develop variety of form factors has provided breakthroughs in styling, combustion, packaging, higher energy density, marvellous opportunities in modularity and frugality. The advent of

nano-materials has boosted these form factors and avenues of alloy applications exponentially. The power density and energy density in xEV sub-systems and conventional vehicles too, have enormously grown due to nano-materials. Nano-fluids have also improved thermal management in vehicle sub-systems. Memory shaping alloys, paints embedded with nano-particles that can change colours, when in light, are on the front end of applications. The popularity and penetration is anticipated to grow over the future years as the technologies' outreach grows in different segments and markets.

## RADICAL INNOVATIONS

The highest gain in cost, weight and space would be in material innovations for thermal management. This would reduce the cooling system components, thus doing away with their weight and reducing cost, improving reliability, eliminating service and growing recyclability. Innovations pertaining to dissipating higher heat per square inch of material are primary research domains. For cabin comfort, the same materials can be designed to create cooling or heating effects, in occupant body shape seating and for cabin air circulation. Another

innovative step change would be to make screens and displays a part of the structural instrument panel rather than carry them as separate units for mounting and wiring.

The other radical innovation would be to embed electronics into materials that can take any form factor and perform under the hood or other hostile environments. The electronics embedded in body panels could be used for V2V communications, vehicle identification, toll collections, monitoring driver behaviour and other regulatory enforcements. These will of course help reduce weight and create additional space for occupants and other digital traveller sub-systems.

For safety and crash, a material that either retracts and re-forms after absorbing the shock of an impact or becomes brittle with impact and turns into dust during the impact will change the panorama of material applications. These materials could enhance pedestrian and occupant safety. There are also deliberations to develop special polymer-based air cushions for occupant safety during a crash, which could be quicker and more efficient in deployment, and at some point in time replace airbags.

At the outset, structural and body in white weight saving appears to be the largest thrust area in the mobility industry. Nevertheless, miniaturisation of electronics, thermal management, safety aspects and end of life of vehicles has been at par on the list of innovative material development. Materials have pioneered improvements for occupant comfort, safety, recyclability and energy saving. They are the heart of sustainable mobility solutions and drive carbon footprint reduction.



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