International Journal of Research in Engineering, Science and Management
Volume-2, Issue-5, May-2019
www.ijresm.com | ISSN (Online): 2581-5792

A Review on Development of New Light Weight Vehicles

Veeresh[1], G. Shashank[2], M. D. Vinay Kumar[3], M. N. Bharath[4]
[1,2,3]*Student, Department of Mechanical Engineering, JSSS & TU, Mysore, India*
[4]*Assistant Professor, Department of Mechanical Engineering, JSSS & TU, Mysore, India*

***Abstract*: In the current scenario, research and technology move on weight optimization of product having highly sustainability of material strength. Moreover, now a day many researches are based on mass reduction. Many automobile industries have targeted on to substitute a material of leaf spring due to a number of mechanical properties. The aim of this paper is to characterize a common place learn about on format and analyse of reduction in weight. In addition to, this paper contains study of different materials. As a significant technology in the automotive manufacturing industries.**

***Keywords*: Lightweight materials, Benefits, Uses.**

1. Introduction

With the help of the fast development of industrialization in the society and urbanization, automobiles have grown to be a critical means of transportation. Car ownership has basically turned out to be an important indicator for measuring the industrial stage and some of the the great of economic improvement of a country/region. Today, the typical US family vehicle weighs about 3,086 lb, with iron and steel accounting for the majority of this weight, as displayed in. However, the new trends in vehicle light-weighting aim not only to enhance the vehicle fuel efficiency, but also to improve its driving performance while lowering its emissions. This can be achieved to a high degree through the use of low-density materials such as aluminium and plastics. Based on a national study, a 10% reduction in vehicle weight translates into a 5% increase in its miles per gallon. At an annual build of 15 million passenger vehicles per year this equates to a sizable savings in gasoline and the accompanying emissions. The average passenger vehicle weights declined from about 4,000 lb to less than 3,200 lb, where the OEMs tried to use less steel in the vehicles. Over the same time period, the amount of plastics used in a typical US passenger vehicle increased from about 4.6% to about 10% to 12%. However, the customer demand shifted to preference to larger and heavier vehicles e.g., SUVs. The average vehicle weight has increased again where it reached about 4,150 lb.

2. Lightweight materials

A. Aluminium alloys

Pure aluminium bodies have been developed and implemented. They are used for luxury cars, such as the Audi A8, and some niche vehicles, such as the BMW Z8, because of their comparatively high cloth and production costs. Aluminium presents advantages and chances will play an increasingly more essential role for the car industry in the future.

- Low density (2.7 g/cm3)
- Aluminium - specific fabrication techniques, such as complex, multi-hollow extrusions can make further weight reduction.
- Several alloy systems are well established for various usages
- Recyclability

B. Application

- For semi structural components, with honeycomb structure - aluminium hybrid
- Hybrid of aluminium foam and aluminium or AHSS for structural or semi structural components
- For roofing, flooring and door panels with or without AHSS for reinforcement

C. Magnesiun alloys

- High specific strength
- Almost equal specific stiffness
- High strength to weight ratio

D. Application

- Steering wheel
- Steering column
- Inner doors
- Seat frame
- Instrument panel
- Transfer case etc.

E. Polymer

- Light weight
- Easy to mould, good flexibility of manufacturing
- Fire retarding nature
- Complicated or intricate shapes can be moulded easily
- Electrical and thermal insulator

F. Application

- Panelling
- Fire retardant floor and/or roof
- Seat back plate, structure

G. Composites

Currently used in

- Polymer matrix Composites (PMC)
- Metal Matrix Composites (MMC)
- Ceramic Matrix Composites (CMC)

3. Aspects

- In order to increase the fuel efficiency in a current point of view, it is necessary for reduction of weight of vehicles, but not compromising on strength at the same time.
- Thus, possibility of multi-material joints and structures arises. Thus, leading to CAE based validations for their structural integrity.

4. Challenges in manufacturing materials

With Plastics and Composites

- Data on fatigue and creep behaviour of these materials
- Environmental issue: Recycling of waste material
- Safety related: inflammable characteristics

With Aluminium

- Profile making is difficult with Aluminium than MS
- Joining technology
- More number of joints required due to lack of weldability thereby, affecting the coach rigidity
- Tensile strength of Aluminium is very less compared to MS; implying coaches are susceptible to frequent breakdowns

A. Durability

- Full vehicle Life cycle assessments to be performed to assess the benefits of light weight material
- Challenge to keep vehicle repair costs low
- Infrastructure and skills development of technicians for handling multi material joineries
- Requirement of widespread competence base among the value-chain partners.

5. Benefits of light weighting

Lesser CO_2 emissions due to

- Direct weight saving because of lighter material usage
- Indirect weight saving due to downsizing of some components

6. Conclusion

Light weighting is beneficial & essential, but it has issues which need to be addressed at various levels. Hence, addressing the 'Manufacturing Challenges' is very vital and requires involvement of all stakeholders. The problem of environmental population is more and extreme; engineers and designers should look the effects that their design decisions have on the local and global ecosystem.

References

[1] Gundolf Kopp, Elmar Beeh, Roland Schšll, Alexander Kobilke, Philipp Stra§burger, and Michael Krieschera, "New Lightweight Structures for Advanced Automotive Vehicles–Safe and Modular," in Procedia - Social and Behavioral Sciences, vol. 48, pp. 350-362, 2012.
[2] A. T. Mayyas, A. R. Mayyas, and M. Omar, "Lightweight Composite Structures in Transport," in Design, Manufacturing, Analysis and Performance, pp. 267-302, 2016.
[3] http://www.academia.edu/Documents/in/Lightweight_Structures