

Development process of new bumper beam for passenger car: a review.

Abstract

Bumper beam absorbs the accidental kinetic energy by deflection in low-speed impact and by deformation in high-speed impact. The safety regulations “low-, and high-speed, and pedestrian impacts” along with new environmental restrictions “end-of-life vehicles” increased the complexity level of bumper system design. The new bumper design must be flexible enough to reduce the passenger and occupant injury and stay intact in low-speed impact besides being stiff enough to dissipate the kinetic energy in high-speed impact. The reinforcement beam plays a vital role in safety and it must be validated through finite-element analysis (FEA) and experimental tests before mass production. The careful design and analysis of bumper beam effective parameters can optimize the strength, reduce the weight, and increase the possibility of utilizing biodegradable and recyclable materials to reduce the environmental pollution. Developing the correct design and analysis procedures prevents design re-modification. On the other hand, analysis of the most effective parameters conducive to high bumper beam strength increases the efficiency of product development. Cross section, longitudinal curvature, fixing method, rib thickness, and strength are some of the significant design parameters in bumper beam production. This study critically reviews the related literature on bumper design to come up with the optimal bumper beam design process. It particularly focuses on the effective parameters in the design of bumper beam and their most suitable values or ranges of values. The results can help designers and researchers in performing functional analysis of the bumper beam determinant variables.

Keyword: Developing process; Bumper beam; Design parameters