Redesign of Car Bumper through Moulding Process Induced Anisotropy and Impact Analysis

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Abstract:

Automotive industry is continuously evolving and is driving towards more cost effective and eco-friendly vehicles. Bumper is one of the important components to absorb the low speed impact and reduce the damage to other internal components. It also helps in lowering the shock experienced to the occupant. The present project work is aimed at strengthening the bumper fascia of Maruti Alto for corner impact during frontal crash.

The project study involved the following process, viz. designing of strengthening features in CATIA software using the principles of plastic design, selection of new material, followed by simulation studies on the bumper fascia as per National Highway Traffic Safety Administration (NHTSA) for corner impact. The strength evaluation of the existing bumper fascia with the integrated fog lamp cover during corner impact was carried out using LS Dyna as per NHTSA standards. The strengthening features like additional ribs were added to the B-surface in bumper fascia. A fiber filled polypropylene was used instead of the existing material for performance enhancement. It was found that the modified design and the new material had better strengthening effect compared to the existing design as well as the material.

Mould flow analysis was carried out to determine the gate locations for better fibre distribution in fascia for final design. The results from the fibre orientation analysis were used as input for the impact analysis. It was found that the redesigned gate locations enhanced the performance of fascia.