Strength Optimization of Seat Cushion Frame with High Strength Materials Considering Automobile Dynamic Characteristics

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1. Introduction

In recent years, as safety issues have become more prominent throughout the industry, the automobile industry has also become safer. As the regulations for the evaluation of the automobile safety degree are strengthened, the test evaluation of higher strength than the existing test standard is required. In addition, interest in the weight reduction of automobiles is increasing, and a lot of research is underway to achieve fuel efficiency improvement and weight reduction of automobiles satisfying environmental regulations. Among the automobile parts, the seat frame is also lightweight and high-strength material that can replace the existing steel material to lighten the weight. Experimental and analytical methods are used to satisfy the static and dynamic characteristics of seat frames using high strength materials and to improve reliability.

2. Finite elements analysis

For the improvement of strength and dynamic characteristics of seat frame, finite element analysis using conventional steel material and high strength material was performed. For the finite element analysis, the safety standard per passenger and the frequency according to the vehicle vibration were applied. Based on the finite element analysis using existing steel materials, the variation of the deformation amount and the stress in the finite element analysis using the high strength material were confirmed.

3. Optimization for high strength materials

In order to satisfy the reinforced test standard with high load compared to the existing steel material seat frame, topology was performed considering the shape and thickness of the seat frame using high strength material. In the topology, the thickness of the part and the material to be applied are set as design variables, an optimization for strength improvement is proposed through the analysis of the stiffness of each part of the frame.
Figures

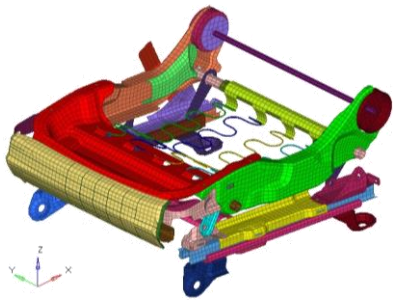

Fig.1 F.E.M of seat cushion frame

4. Optimization for dynamic characteristics

Based on the optimization method of the seat frame using high strength materials, the finite element analysis was performed according to the vibration characteristics transmitted to the vehicle in the running situation and the stop situation of the vehicle. Based on the results of the vibration analysis, an analytical solution that satisfies the safety specification is presented through compare son of the optimization result applying the test standard according to the high load.

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