Experimental Study on Bending and Torsional Strength of Bulk Molding Compound Seat Back Frame Part

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Abstract : Lightweight technology using composites is being developed for vehicle seat structures, and its design must meet the safety requirements. According to the Federal Motor Vehicle Safety Standard (FMVSS) 207 seating systems test procedure, the back moment load is applied to the seat back frame structure for the safety evaluation of the vehicle seat. The seat back frame using the composites is divided into three parts: upper part frame, and left- and right-side frame parts following the manufacturing process. When a rear moment load is applied to the seat back frame, the side frame receives the bending load and the torsional load at the same time. This results in the largest loaded strength. Therefore, strength test of the component unit is required. In this study, a component test method based on the FMVSS 207 seating systems test procedure was proposed for the strength analysis of bending load and torsional load of the automotive Bulk Molding Compound (BMC) Seat Back Side Frame. Moreover, strength evaluation according to the carbon band reinforcement was performed. The back-side frame parts of the seat that are applied to the test were manufactured through BMC that is composed of vinyl ester Matrix and short carbon fiber. Then, two kinds of reinforced and non-reinforced parts of carbon band were formed through a high-temperature compression molding process. In addition, the structure that is applied to the component test was constructed by referring to the FMVSS 207. Then, the bending load and the torsional load were applied through the displacement control to perform the strength test for four load conditions. The results of each test are shown through the load-displacement curves of the specimen. The failure strength of the parts caused by the reinforcement of the carbon band was analyzed. Additionally, the fracture characteristics of the parts for four strength tests were evaluated, and the weakness structure of the back-side frame of the seat structure was confirmed according to the test conditions. Through the bending and torsional strength test methods, we confirmed the strength and fracture characteristics of BMC Seat Back Side Frame according to the carbon band reinforcement. And we proposed a method of testing the part strength of a seat back frame for vehicles that can meet the FMVSS 207.

Keywords : seat back frame, bending and torsional strength, BMC (Bulk Molding Compound), FMVSS 207 seating systems
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