Commercial Passenger Vehicle Seat Strength Analysis and Validation using Finite Element Analysis

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Abstract

*VE Commercial Vehicles Limited is a 50:50 joint venture between the Volvo Group (Volvo) and Eicher Motors Limited (EML) that brings together Global leadership in technology, quality, **safety** and environmental care, along with the deep knowledge and understanding of the Indian Commercial Vehicle (CV) market. Bus is one of the main and favorite sources of public transit in India. Thousands of people die or injure severely every year due to Bus accidents. Passenger injury in Bus accidents can be due to high stiff seat structures and most of the occupants Seated in the second row or further back were injured by hitting the seat back in the row in front of them.*

As per seat strength regulation (AIS-023) passenger seat of bus should not cause injury because of high stiffness, on the other hand seat should also be able to carry the passenger force during accidents. With this mechanism AIS023 specifies minimum and maximum range deformations of seat back to minimize the passenger injury. Hybrid Dummies are the widely used safety measurement tool to assess the injury mitigation characteristic of the vehicle and its components. FE model of Hybrid III dummy was used to compare Head, Chest and Kneee Injury levels.

Finite Element Analysis (FEA) is an imperative tool in automotive world to optimize the design of the vehicle components. LS-Dyna explicit tool was used to simulate test of 2 seating position bus seat as per loadings of AIS023 to ensure the compliance. With the optimized design from the simulation, test was approved successfully at ARAI and obtained the certificate. FE model results were also compared with the test results. Dummy output showed significant reduction in head, chest and knee injury from rigid seat to the final optimized seat. More than 80% of correlation was found between test data and simulation results.

Keywords: FEA, Crash-Safety, Injury Biomechanics, Seat, Bus, Dummy, LS-Dyna