



DESCRIPTION:

Martec Limited performed research to determine the structural response of protective eyewear subjected to a high impact load. This work was conducted in collaboration with Leader Industries Inc. The objective of this research was to successfully perform a finite element (FE) impact analysis of a visor to demonstrate the maturity of this technology and its suitability for the design of protective eyewear.

The impact FE analysis was performed simulating the impact of the visor by a steel ball at 14 m/sec (31 mph) and a baseball at 31 m/sec (70 mph). The explicit nonlinear FE codes LS-DYNA and PAMCRASH were used to successfully perform the analyses. It was important to calibrate the response of a baseball during impact to accurately determine the load that the baseball would apply to the visor. The load response of a baseball was determined experimentally due to the lack of reliable property data for the materials used in baseball construction. Baseballs were tested at low to moderate displacement rates in order to calibrate the baseball material model to match actual load-displacement baseball response. The results of the baseball impact analysis compared well with the experimental results.

It was determined that the employment of FE impact analyses for virtual prototyping would help to reduce the overall cost of the current visor design process where experimental testing is exclusively used.

References:

1. J. Crocker, Sports Equipment Impact Analysis, Martec Limited, November 1998, Martec Report: TR-98-31
 2. J. Crocker, Finite Element (FE) Impact Analysis Validation for Sports Protective Equipment, Martec Limited, September 1999, Martec Report: TR-99-30
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