Instrumentation for Impact Analysis

Abstract

A test apparatus and appropriate instrumentation were designed by a student with the help of a faculty, to test the deceleration time of a specified impact force applied to a test subject. The apparatus was made to be adaptable to different configuration requirements of future research. This apparatus utilized the accelerating force of gravity in a procedure known as “drop testing”, in which the test subject is placed at the base of the apparatus. A measured mass is then raised to a calculated height, where the potential energy is released as the mass is guided along a path to impact the test subject. An accelerometer was used to indicate the velocity and deceleration time, to verify the impact force, and calculate the impact rating of the test subject.

The data was converted into useful graphs of acceleration, force, velocity, and position in respect to time. The accelerometer contained an internal voltage regulator and an oscillator and produced a signal that was modulated to represent the acceleration experienced by the accelerometer.

The data from the procedure was stored electronically for calculations, analysis, and documentation. Results of the experimentation provided much insight into the varying characteristics of different materials to absorb the energy of physical impact. The paper will discuss the design process, the instrumentation involved, and the results of the tests as well as related student learning.