

Instrumented Impact Testing

INTRODUCTION



MPM Instrumented Striker System

MPM manufactures several impact test systems including:

- Charpy impact testing (ASTM E23)
- Miniature Charpy impact testing
- Drop tower impact testing (ASTM E208, E436, and E 604)
- Plastic impact testing (ASTM D256, D1709, D2582, D3763, D5420, D5628, D5941, and D5942)
- Beverage can impact testing

Most of the test machines can be supplied with strain gage instrumentation. Instrumented test systems enable measurement of the force applied to the test specimen during the impact event. Instrumented data can be used to calculate the energy absorbed by the test specimen. In addition, the crack initiation and arrest loads can be used in fracture mechanics models.

SYSTEM FEATURES

The MPM instrumented system is very accurate and versatile. Some important system features are listed below:

- Up to 18,000 data points per test
- Data acquisition time ranges from microseconds up to 20 seconds
- User friendly software controls acquisition and data analysis
- Optical encoder data can be read and stored automatically
- Full system includes:
 - -computer
 - -high speed 12 bit acquisition board
 - -strain gage amplifier
 - -instrumented striker
 - -hardware/software manual
 - -software

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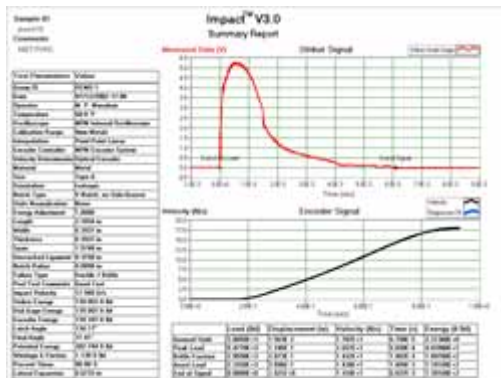
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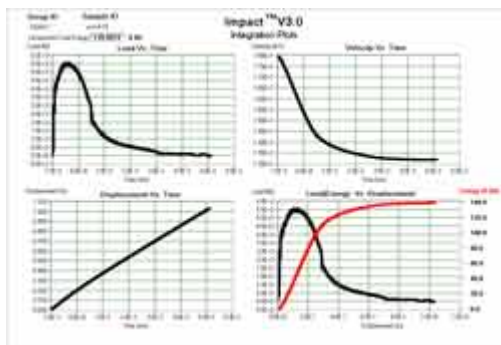
SAMPLE INSTRUMENTED STRIKER DATA

The nature of the instrumented signal response depends on the material being tested (metal, plastic, ceramic, composite, etc.), the test temperature, and other key test parameters such as impact velocity. Shown below is a typical instrumented striker voltage response for a Charpy test on a metal test specimen at a test temperature in the transition region.



Instrumented Striker Voltage Response

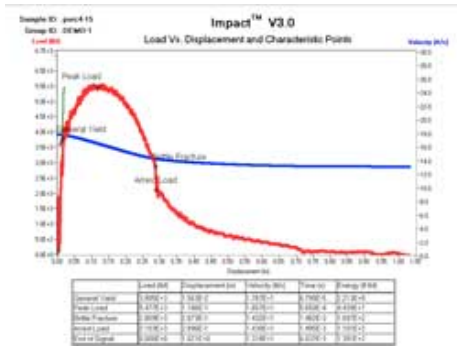
The voltage-time curve is converted to a force-time curve through the load cell calibration. During the testing, the MPM system measures the impact velocity directly using an optical encoder and this velocity is used in the numerical integration of the measured force to determine the velocity-time curve. A second numerical integration is performed to obtain the displacement-time curve. These data are then used to construct the force-displacement curve, and the total energy absorbed by the test specimen is calculated by integration of this curve. These analysis steps are shown graphically below.



Integration Plots



Another analysis option is to determine characteristic loads, deflections, and energies. The general yield load is determined from the intersection of the elastic loading line and a fit of the data during load up. The peak load is determined by least squares regression of the data. Finally, for tests conducted in the transition region, the brittle fracture load and crack arrest load are determined from a robust data analysis algorithm. An example of the characteristic load report is given below.



Characteristic Load Report

SYSTEM UPGRADES

New test machines can be provided or existing test machines can be upgraded by the addition of the MPM state-of-the-art system. MPM will assemble the system and provide a field installation and calibration if desired.

FOR MORE INFORMATION

If you would like a price quotation or additional information concerning MPM's services or products, please contact us at the below listed address:

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