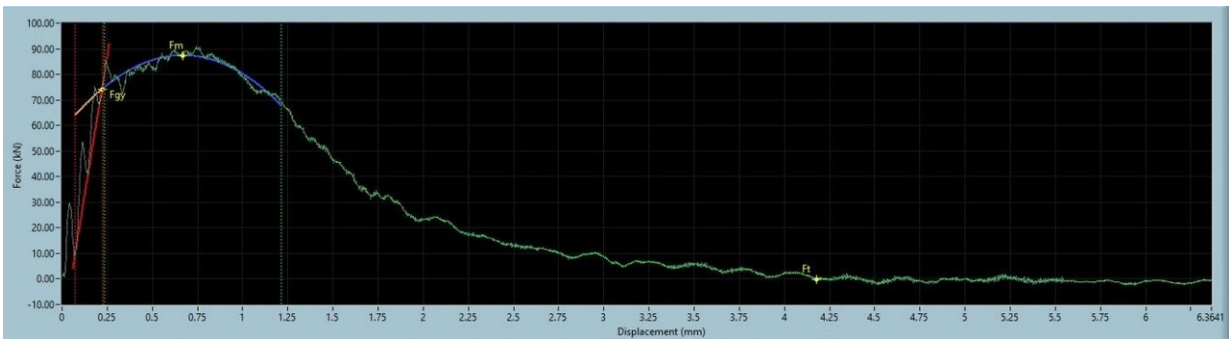


NIST software aids the analysis of instrumented Charpy tests

June 11 2020



A screenshot from NICAS, showing an instrumented force/displacement curve for a fully ductile specimen and its corresponding characteristic force parameters (general yield, maximum force, end of test). Credit: National Institute of Standards and Technology

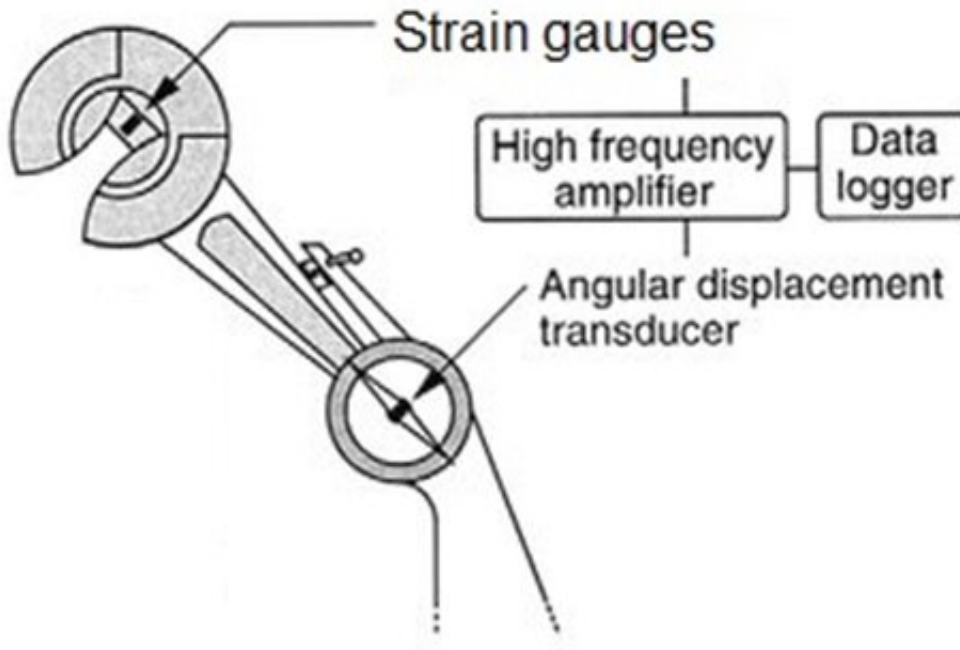
To help labs characterize the toughness of steel, a new software package allows analysis of instrumented Charpy tests, or Charpy tests augmented with strain gauges, in compliance with standards from ASTM and ISO. The NIST Instrumented Charpy Analysis Software, or NICAS, is available free of charge from NIST as part of the Charpy Machine Verification Program.

Producers and buyers in the \$10 billion-a-year structural steel industry frequently test materials for hardness and toughness, especially for applications where failure is not an option. NIST has long produced

reference materials for calibration of testing machines. The Charpy impact test is used to characterize toughness; the NIST Charpy program both produces and certifies specimens for use with impact test machines, and works directly with over 1,500 test labs per year to diagnose problems that may arise during verification testing.

A standard Charpy test consists of a pendulum dropping from a known height and striking a notched specimen. After the specimen fractures, the difference between the height to which the pendulum rises and its original height provides a measure of the energy absorbed in breaking the specimen.

In the instrumented version of the Charpy test, strain gauges attached to the part of the hammer that impacts the specimen transform it into a force transducer that provides an indication of the force applied to the specimen during impact. The force-time record derived from an instrumented Charpy striker offers additional information about the tested material's properties, in comparison to a standard (or non-instrumented) impact test.



Schematic of an instrumented Charpy test. Credit: National Institute of Standards and Technology

Instrumented Charpy testing is covered by widely used international [test standards](#), such as ASTM E2298 and ISO 14556. NIST developed NICAS to aid analysis of instrumented Charpy tests in full compliance with ASTM E2298 and ISO 14456. The software also permits some manual operations by the user.

The NICAS software is provided free of charge in the form of compressed .zip folders downloadable from the GitHub [software development platform](#). The compressed folders must be downloaded and extracted before installation.

The [Charpy Analyzer package](#) contains open source LabVIEW virtual instruments, documentation, and sample data files that allow users to analyze their data in LabVIEW 16.0.1 or later. Executable files can be

provided upon request. A comprehensive instruction manual (NIST IR 8302) guides the user through each step of the analysis.

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