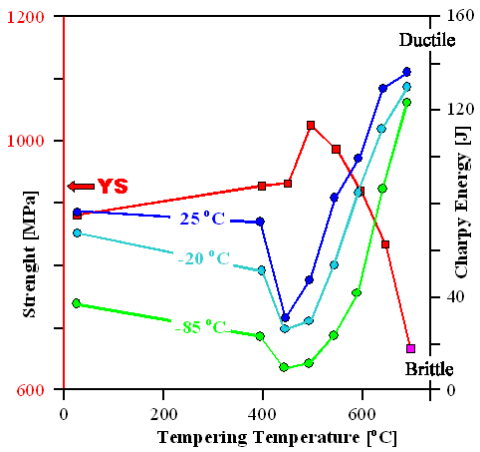
Charpy Impact Test: Example

Illustration

The example shown is from the set of experiments I used to illustrate the equivalence of hardness and yield strength; this link leads to the actual paper

Here is the set of data:



Example of Charpy impact energy measurements.

The specimen was a "high-strength low-alloy" steels; the yield strength curve (YS) obtained by tensile testing is also shown for comparison.

We have three series of tests with 8 specimens per series to get statistically significant data. After "tempering", meaning holding the samples at the temperatures indicated for 1 hour and then let them cool to room temperature, Charpy impact tests were done at the *three* temperatures indicated.

What we see is:

- The steel is always more brittle at lower testing temperatures.
- Tempering around 500 ^{o}C (932 ^{o}F) produces very brittle steel. At -85 ^{o}C (- 121 ^{o}F) the steel is brittle like glass
- Tempering at other temperatures is better with respect to brittleness. High-temperature tempering produces steel quite ductile at room temperature (25 ^{o}C) and below.
- Unfortunately - but expected - the yield strength or hardness shows opposite behavior. It is highest for brittle steel.
- The best compromise between brittleness and hardness is found for tempering at 600 ^{o}C (1112 ^{o}F). I'm sure you see why.

There are many more examples for Charpy impact energy measurements in a science module in chapter 9