

EXPERIMENT 2

NOTCHED BAR IMPACT TESTING OF MATERIALS

Background

Materials sometimes display brittleness which precludes their use in a given design. Brittleness is characterized by fracturing with low energy under impact. The fracture energy is proportional to the area under the tensile stress-strain curve and is called the **toughness**. Tough steel is generally **ductile** and requires 100 ft-lbs of energy to cause failure. **Brittle** steel does not deform very much during failure and requires less than 15 ft-lbs energy to cause failure.

Characterizing the toughness of a material is done in several ways. The most common method is the notched-bar impact test for which two types of specimens prevail, **Charpy** and **Izod**. By subjecting a specimen to an impact load, it will fail if the load exceeds the breaking strength of the material. By using a swinging pendulum to impart the load, the energy required to fracture the specimen can be calculated by observing the height the pendulum swings after fracture, as shown in **Figure 2-1**.

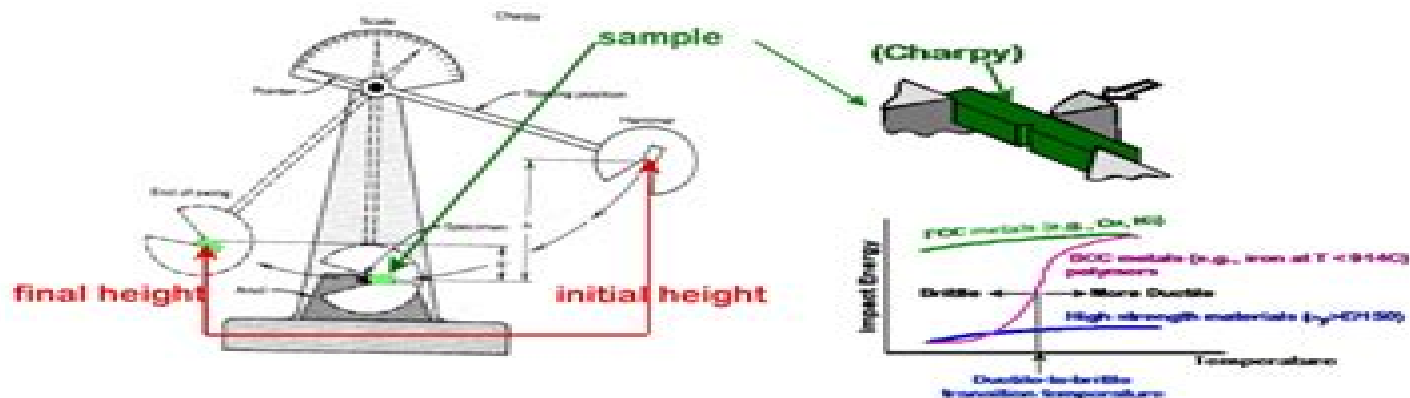


Figure 2-1: Charpy impact tester, sample positioned in anvil and general testing results.

This test has been used almost exclusively with **body-centered-cubic** (bcc) crystalline materials. These materials show a **transition** from ductile to brittle behavior with temperature (**Figure 2-2**). This means that at low temperature the fracture energy is low.

The mechanical behavior of materials often exhibits variations even for seemingly identical specimens and materials. The steel specimens for this experiment are manufactured from a single ingot of steel and are machined to a single drawing. Despite these precautions, the results from identical tests will not always be identical.

Variations in properties are often evaluated by means of statistics to establish the average value and the possible variance in the results. The amount of shear in the surface failure of

Laboratory Manual Of Impact Testing Of Material

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