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INSTRUMENTED CHARPY IMPACT TEST

PREPARED BY:
SYAMSUL EL-ADHA
HAIDIL MUSTAFA

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CONTENT.

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1. INTRODUCTION.

Impact testing is today a common laboratory practice for evaluating the impact performance of plastics. Although tests have been standardized for many years they represent now almost as much mystery as in Charpy's or Izod's time, at the beginning of the present century. The first and most important questions are :

- What kind of correlation exists between the measured parameter (usually the energy) and the actual behaviour of the materials?

- Does any method exist, within those standardized by various organizations, which gives us the chance to classify the materials according to actual behaviour?

The answers to these questions are not very simple because behind them there is the whole field of the science of strength of materials in which to find the answers. During the last ten years remarkable steps towards a better comprehension of impact test phenomenology have been made. New equipment and theoretical models have been proposed, in particular in accordance with fracture mechanics theory. This review intends to give a picture of what has happened in the field of impact testing of plastics in this period, pointing out the main results achieved.

2. HISTORICAL OUTLINE.

One of the most important methods for determining the brittleness of a steel is to measure the energy absorbed in the sudden breaking of a slotted bar of the metal. From Leathersich's work,[1] it appears that the earliest reference to the subject was in 1734 by Swedenborg[2] who said that iron bars were tested by throwing them against a sharp edge. If the blow marks the bar without breaking any part of it, this is a sign of tenacity. Further experimental and theoretical works pointed out the depedence of the resistance of metals on the test speed and notches. Charpy (1901) and Izod (1903) presented their equipment, still used today, for analysing the impact performance of materials. The devices introduced by Charp and Izod are shown in Fig. 1. The impact resistance is evaluated in energy terms, i.e. the energy absorbed by the specimen during the impact process is given by the difference between the potential energy before and after impact.

Charpy presented his equipment two years before Izod, but from the physical point of view they are equivalent. The main differences are

- the clamping system.
- the notch.
- the hammer speed and weight.