Practical No. 1

Impact Testing
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Introduction:

Toughness is a measure of a materials ability to resist sudden or impact loads. Toughness is measured by Impact tests, of which there are two types, namely Charpy and Izod. Both are performed using the same piece of equipment with different attachments.
The objective of this experiment is to determine the relative toughness of a number of types of plastic.

Theory:

With impact testing, samples are made up to strict dimensions, 10mm square with a notch cut in the centre of one side. A pendulum is brought up to its stop position. The sample is placed in the test position and the pendulum released. When it strikes the test piece some energy is absorbed by the test piece. If the test piece breaks, the pendulum will continue beyond the point of impact, and the angle through which it moves is inversely proportional to the energy absorbed., i.e. if it moves through a large angle only a small amount of energy has been absorbed.
The Charpy pendulum with this machine uses a 15J “hatchet-like” pendulum and the test piece is supported freely on both ends.
The Izod pendulum is 11J and the test piece is clamped on one side only with the notch positioned at the point of support.
Equipment:

The equipment used for these tests was a Zwick Roell Pendulum Impact Tester, Type B5113.300.
Serial number 155943/2002
A 15J Chapry pendulum was used.
Procedure:

(a) Prepare the test pieces
(b) Put on safety glasses
(c) Move the pendulum up to its locked position, and ensure that it is locked in place.
(d) Place the sample in position
    For Chapry, simply lie against the stops supported on both sides, with the notch facing away from the direction the pendulum will come.
    For Izod, clamp the test piece into the jig, with the notch facing towards the direction the pendulum will come, and the notch at the point of support.
(e) Ensure that all safety guards are in place.
(f) Ensuring that the path of swing for the pendulum is clear, release the pendulum using the two hand release mechanism.
(g) Record the readout from the display of the test equipment.
(h) Pull on the red handled brake for the pendulum.
(i) Return the pendulum to its locked position.

Results:

All units are in Joules (J), from ME-1 class 2004/05

<table>
<thead>
<tr>
<th>Material</th>
<th>Tecamid 66</th>
<th>Tecaform</th>
<th>Tecamid 66MH</th>
<th>Tecamid 6 GF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result 1</td>
<td>N/A</td>
<td>7.845</td>
<td>4.115 (disregard)</td>
<td>2.366</td>
</tr>
<tr>
<td>Result 2</td>
<td>14.972</td>
<td>3.520</td>
<td>10.494</td>
<td>3.393</td>
</tr>
<tr>
<td>Result 3</td>
<td>11.126</td>
<td>4.703</td>
<td>15.000</td>
<td>4.505</td>
</tr>
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<td>Result 4</td>
<td>12.60</td>
<td>8.020</td>
<td>10.885</td>
<td>3.020</td>
</tr>
<tr>
<td>Result 5</td>
<td>N/A</td>
<td>7.34</td>
<td>12.600</td>
<td>4.190</td>
</tr>
<tr>
<td>Average</td>
<td>12.899</td>
<td>6.286</td>
<td>12.245</td>
<td>3.495</td>
</tr>
<tr>
<td>Range</td>
<td>3.846</td>
<td>4.500</td>
<td>4.506</td>
<td>2.139</td>
</tr>
</tbody>
</table>
Summary of Results:

Tecamid 66 had only three valid results with an average of 12.899J absorbed with a range of 3.85J
Tecaform got an average of 6.286J with a range of 4.5J
Tecamid 66MH got an average of 12.245J with a range of 4.506J
Tecamid 6GF got an average of 3.495J with a range of 2.139

Conclusion:

As the results demonstrate a wide variation, as seen by the large range in the results little can be taken from this experiment. The reason behind the variations is due to the preparation of the test pieces. They were made up by hand with little control over the notching in particular. On the face of it, the results indicate that Tecamid 66 is the toughest plastic tested with Tecamid 66MH next, then Tecaform and finally Tecamid 6GF being the most brittle.