TECHNICAL REPORT WRITING FOR ENGINEERS

IN THE LAB: INTRODUCING THE EXPERIMENT

Dr Joanna Bates, University Teacher, Materials Science, The University of Sheffield: The experiment we are doing is an impact Charpy test, an experiment on steel samples at different temperatures.

We want to look at the different impact energies of the same steel sample at different temperatures to see how the impact energy changes by cooling or heating up the sample.

The Charpy tester has been around since the 1940s, mostly for analysis of metals. However, it's still widely used for different materials because it's relatively cheap and quick to test the samples.

We use a rectangular sample, which has been notched in the centre, we place it between two anvils and we break it by swinging a pendulum. And by looking at how much this pendulum has moved after the impact, compared to the position of the pendulum before dropping it, we can calculate the energy absorbed by the sample.

We will be analysing the samples at different temperatures. At 200°C, 100°C, room temperature, 0°C, -80°C, and -196°C. So we can start by testing the sample at room temperature.

The sample is placed on top of the two anvils. We centre the sample - centre the notch - so it's perfectly opposite to the impact of the pendulum, close the door, and release the pendulum.

[The pendulum in the Charpy machine swings down through the room temperature steel sample, leaving a clean surface fracture in the sample, but does not cut it in half.]

The sample has been left at 100°C for about one hour to equilibrate to the temperature. And they're already placed inside with the notch facing away, so we can put it back in the machine.

[Joanna removes the steel samples from the thermostatically controlled oven and places the samples in the Charpy machine. The sample at 100°C is not cut in half and

has a relatively clean surface fracture. The sample at 200°C is not cut in half either, and has a rough, uneven surface fracture.]

The samples at 0°C has been left in a bath of ice for about one hour to equilibrate. So we use cold tongs to take the samples.

[The sample at 0°C has a rough texture where the sample has been struck, but is not cut in half.]

The sample at -80°C has been left in the dry ice bath. Also, in this case, for about one hour.

[The sample at -80°C is cleaved in half, and has a grainy surface where the pendulum has impacted.]

To cool down the sample at -196°C, the sample is dipped into liquid nitrogen and left for about 10-20 seconds for the sample to equilibrate at the low temperature. And the same as for the other samples that has been cooled or heated, we need to transfer and break the sample quite quickly.

[Similar to the sample at -80°C, the sample at -196°C is cleaved in half, and has a rougher, grainier surface where the pendulum has impacted.]