



TECHNICAL REPORT WRITING FOR ENGINEERS

IN THE LAB: WRITING A DISCUSSION

Dr Andrew Garrard, Senior University Teacher, Multidisciplinary Engineering Education, The University of Sheffield: In our experiment, the effect of temperature on the impact toughness of steel was investigated using the Charpy impact test. In your results section, you will have presented the data from this experiment in the form of a graph, or table, or both, and described the trends shown in each figure. The discussion section is your opportunity to interpret what these results mean, and to explain their significance.

For example, you may have noticed that it requires more energy to fracture the steel at higher temperature compared to lower temperatures. In your discussion, you can explain this trend as follows. At higher temperatures, above 0°C, steel is more ductile than at lower temperatures, and therefore requires more energy to fracture. At lower temperatures, below 0°C, steel is more brittle and requires less energy to fracture. Therefore, the impact fracture toughness of steel is greater at higher temperatures than at lower temperatures.

You can then explain the significance of this experiment. For example, when choosing a material for a specific application, it is important to know its impact fracture toughness in order to predict how the material will perform at different temperatures. If the steel tested in this experiment was to be used to make the hull of the ship or an aircraft, it would encounter both high and low temperatures during operation. At room temperature or higher, the steel would be more ductile and more resistant to fracture. However, in cold seawater or at low air temperatures, the steel would be brittle and more likely to fracture on impact, which could be catastrophic.

Your discussion should also include a section on the errors in your experiment. You will want your readers to know that you have considered all aspects of the work. Your discussion will let them know how confident they can be in the results that you are reporting. In the discussion section, you are allowed to offer your justified opinion and present conjecture about the causes for the trends you observe in the data.

Let's look at the data again. How confident are you with the results? What are the sources of error in the experiment? For the Charpy impact test, you could consider whether the impact from the pendulum was consistent throughout the experiment, if



the sample had the same geometry, and how the temperature of the samples were controlled.

In this experiment, the same Charpy impact tester was used throughout the experiment, with a pendulum of known mass and length, and the pendulum was released from the same height each time. The dimensions of the steel samples were identical, and the V-notch was placed in the same position, centred and facing away from the pendulum.

So where does the variation in your data come from? This is likely to be the temperature of the steel samples. Even though the samples had sufficient time to reach thermal equilibrium, in this case, more than one hour, with the exception of the sample placed in the liquid nitrogen, the time taken to load the steel sample into the Charpy impact tester varied, which could have caused the samples to either warm or cold, causing variation in the data.