The thermometer is the most important tool in the entire cold chain

AFCCC chair Mark Mitchell takes a deeper dive into the Cold Food Code and training program for all those involved in Australia's food cold chain.

When you consider that the thermometer has the power to send a truck or trailer load of valuable food to landfill, you can begin to understand why this single device is the subject covered in the first industry-wide cold chain training program that went live on 1 February this year.

The program is aimed at improving the credentials of those responsible for the integrity and safety of Australia's chilled and frozen food supply; the people we have called cold chain practitioners.

I covered some of the basics of our new Cold Food Code dealing with the selection and use of thermometers in previous issues. The Code is the document that underpins the training program.

Someone working in a loading dock, on a refrigerated transport, or in a supermarket or hospitality environment, needs to fully understand the difference between the destructive and non-destructive temperature measurement.

They may well be able to use a thermometer, but unless they know how to apply the thermometer probe to different kinds of foodstuffs and packaging, they could be putting consumers, or the whole load, at risk.

Taking the non-destructive method of checking the temperature of products using a probe thermometer is rapid and can be done without unduly disturbing the food product. However, because the temperature being measured is only of the outside of the package or carton, there could be up to 2°C difference between that and the true product temperature.

For best results, a probe thermometer must be placed between boxes on a pallet or between packages inside a carton. Use sufficient pressure to ensure good thermal contact, and sufficient length of inserted probe to minimise conductivity errors. Use a probe with a flat surface for good surface thermal contact, low thermal mass, and high thermal conductivity and of course it must be waterproof.

With the destructive method, a pointed probe thermometer is inserted into the product or pressed firmly into its side.

Probe thermometers are not designed to penetrate quick frozen foods. You must first make a hole in the product, the same size as the probe you are using, by using a pre-cooled sharp pointed metallic device such as an ice punch, hand drill or an auger.

To give a proper reading, the probe needs to penetrate the product to a minimum depth of 2.5cm from the product surface. For smaller products, the probe should be inserted to a minimum depth from the surface of three or four times the diameter of the probe.

Where it is not possible to make a hole in certain foods, such as diced vegetables, the internal temperature of the food package should be determined by insertion of a suitable sharp-stemmed probe.

In general, the probe thermometer should be accurate at the preferred temperature range, instantly readable, and fitted with a thin probe that slides easily into the product.

Temperatures that may be in dispute can only be proven by a destructive temperature check, using a probe thermometer for which calibration, accuracy and limitation tolerances can be confirmed. This action would be necessary to avoid load rejection and potential liability claims.

The accuracy of temperature measurement depends on how and where the probe thermometer is placed. If wrongly placed, the

By the time food gets to the supermarket it would have had its temperature taken many times.

A probe thermometer must penetrate to a minimum depth of 2.5cm

reading will be inaccurate.

The only accurate food temperature is core or pulp temperature, where a probe is inserted into the food, because the surface temperature may be warmer or cooler than the temperature in the rest of the food.

To ensure the most accurate temperature measurement, these steps must first be taken:

- ensure the device has been properly calibrated;
- verify the display;
- check the battery and if replacing, always calibrate;
- stabilise the temperature of the sensor and pay attention to the temperature delay and radiation heat;
- pre-cool the thermometer prior to the test to equalise the temperature of the probe to that of the product's surrounding air temperature thus avoiding heat being conducted from the probe to the product which can result in inaccurate temperature measurement; and
- clean the thermometer before and after the test by washing it with cool soapy water or clean with alcohol wipes and then allow to air dry or wipe it dry with a clean cloth or paper towel.

Meat and poultry are the most refrigeration intensive foods, and are subject to the most stringent standards and regulatory scrutiny.

There are traps for the unwary when checking the temperature of these foods. Bone, fat and gristle have different thermal properties and heat transfer rates.

If the food is irregularly shaped, the temperature should be checked in several places.

The probe should not penetrate the packaging because this could contaminate the contents and damage the sensor to the point where it delivers incorrect readings.

The probe should be disinfected before and after measuring products. Use dedicated disinfecting cloths or hold the sensor in boiling water and wipe with clean, disposable paper.

At critical control points, such as a loading dock that is exposed to ambient airflow, the temperature of the outer surface of the package cannot be relied upon.

Correct temperatures can only be taken in a refrigerated space.

At loading docks, temperature measurement can be taken with a probe placed between two packs while they are still in the truck or trailer. Leave the probe in place for at least one minute before reading the results.

AFCCC research shows that quality management systems that demand temperature validation through a series of refrigerated events in the cold chain are not being followed or even taken seriously by many companies involved in the delivery and management of cold food.

This abuse is leading to massive food wastage, estimated to be costing the country $20 billion every year. F