



Developing a Food Safety Program: Pre-requisite programs Calibration

A food business must maintain food premises and all fixtures, fittings and equipment, having regard to their use, and those parts of vehicles that are used to transport food, and other items provided by the business to purchasers to transport food, in a good state of repair and working order having regard to their use.

Australia New Zealand Food Standards Code Std 3.2.2 Div 5 Clause 21 (1)

A food business must, at food premises where potentially hazardous food is handled, have a temperature measuring device that: is readily accessible; and can accurately measure the temperature of potentially hazardous food to $\pm 1^{\circ}\text{C}$

Australia New Zealand Food Standards Code Std 3.2.2 Div 6 Clause 22

Introduction

A wide range of equipment and instruments are used in the dairy industry to measure and monitor process and product parameters. This equipment has a vital role in ensuring food safety and supports compliance with regulatory and operational requirements. Most measuring and monitoring equipment needs regular calibration to ensure ongoing accuracy. Calibration means to establish, by measurement or comparison with a known standard, that the value of all readings from measuring equipment are accurate.

Regular calibration of monitoring equipment is necessary to provide confidence that your food safety controls are effective. Many instruments can lose their accuracy over time, or due to misuse or damage. Calibrating equipment on a regular basis will:

- ensure that critical processes for food safety are accurately monitored
- provide assurance that the monitoring equipment remains accurate over time
- meet regulatory requirements – calibration ensures monitoring results are valid
- maximise product quality and yield
- optimise performance of equipment and reduce failures and downtime
- save energy and minimise processing and reworking costs
- reduce the risk of error and ensure accurate, traceable, and repeatable measurements are achieved during processing

What monitoring equipment needs calibration?

Instruments including sensors, switches, gauges, x-ray, metal detectors, scales, magnets and meters which measure and monitor process and product attributes such as heating, cooling and storage temperatures, pH, flow rate, humidity, product viscosity, product weight and the presence of foreign matter may all require calibration.

The type of equipment and its function determines how it is calibrated. Examples of calibration of equipment and instruments commonly used in dairy manufacturing are shown in Table 1.



Table 1: Examples of calibration used in dairy manufacturing

Equipment	Function of calibration
Temperature sensors/ thermometers	Ensures temperature measuring and monitoring equipment is performing as expected. Frequency depends on the equipment.
pH meter	Ensures pH readings are accurate. A pH meter is calibrated using commercial buffer solutions of known pH prior to use.
Metal detection and x-ray inspection equipment	Ensures equipment is recognising target materials. This can be achieved by including test pieces at regular intervals during production to confirm these inspection systems accurately detect contaminants.
Flow meter	Ensures the flow rate through a pasteuriser is adequate to achieve the designated holding time. This should be undertaken by a suitably qualified technician.
Tank level	Ensures pressure sensors which measure the level of liquids or bulk chemicals in tanks or other containers are accurate.
Membrane and filter pressure	Ensures accurate measurements of differential pressure across membranes and filters to achieve optimal membrane life and function
Scales	Ensures scales are measuring accurately. The weight or volume of packaged foods must meet the requirements of the <i>National Measurement Act 1960</i> . Equipment used for weighing needs to be approved and verified before use and calibrated regularly by a licensed service organisation to ensure compliance.

Preparing and implementing a calibration program

Your calibration program will ensure all equipment is calibrated as required and may include the following key elements:

1. Develop a monitoring equipment register

- Compile a register of all monitoring and measuring equipment, especially those items critical to food safety
- Ensure each item of equipment is uniquely identified and recorded
- Consider having back up equipment onsite (i.e. thermometer, pH meter) in the event equipment replacement is required

2. Design a calibration plan and schedule

- Document procedures for how equipment will be calibrated. Always refer to equipment manuals or consult with your equipment suppliers to determine the exact requirements for calibration, and what credentials or training are required for personnel to be considered competent or authorised to perform the task
- Compile specifications for calibration (i.e. hot and/or cold calibration or weight range and the allowable limits)
- The frequency of calibration will vary depending on the type of equipment, manufacturer recommendations, and the operating environment of the instrument. For example, it may be sufficient to calibrate a thermometer mounted in a refrigerated storage tank annually, while a pH meter usually requires at least daily calibration.
- Consider how to minimise the impact on production or include calibration as part of your verification schedule
- List actions that should be taken if any monitoring equipment is found to be out of specification (i.e. recalibrate or replace)
- Document actions (which should include recalibration) in the event of damage or misuse, for example if a probe has been knocked or dropped.

3. Allocate responsibilities

- Calibrations can be performed in-house if your business has the appropriate equipment and personnel with the skills, and accreditations (if appropriate), to perform the tasks. If not, calibrations should be performed by a suitably qualified or accredited contractor or an accredited laboratory.
- Assign responsibility for management of the calibration program (plan and schedule) to a staff member. They can then ensure that any new monitoring equipment is incorporated into the program and that it is kept up to date.



4. Establish documentation and record keeping systems

All activities relating to the implementation of your calibration program need to be fully documented. Records for each piece of equipment provide evidence of calibration activity and confirm the date it was conducted. Calibration records should be retained for a defined period and made available for both internal and external auditors. They can also provide useful information to help resolve product or processing incidents and to help with root cause analysis. Examples of the information to include in calibration records are shown in Figure 1.

Figure 1: Examples of calibration record sheets

Form: CAL 002		Monthly thermometer calibration record				
		<i>Refer to Procedure CAL001 - Calibration</i>				
Date	Thermometer ID	°C reading in ice water (-1°C to +1°C)	°C reading in boiling water (99°C to 101°C)	Acceptable Y/N	Comments and actions	Initials
2/2/24	Cheese room 1	0	100.1	Y		KC

Form: CAL 003		Monthly scale calibration record						
		<i>Refer to Procedure CAL001 - Calibration</i>						
Date	Scale ID	Weight used	Reading			Acceptable Y/N	Comments and actions	Initials
			1	2	3			

Considerations for small businesses

- Businesses with limited staff or technical expertise may consider the use of contractors to carry out the calibration.
- A calendar or spreadsheet can be used as a record of all equipment requiring calibration and when calibrations are due.
- Calibration records need to be retained, even if they are performed by external contractors. These can be kept along with other information pertaining to the equipment.
- Information on how to calibrate a basic thermometer has been published by the Queensland government and can be found on their website.
- Information on how to calibrate a pH meter is included in the DFSV Technical Information Note: Measuring pH.

Verification of your calibration program

Verification of pre-requisite programs is an important element of your food safety program and involves ensuring that activities designed to manage food safety have been effectively implemented and are working as intended.

Your calibration program can be verified by:

- Internal and external audits
- Document reviews and sign-off e.g. daily production records, calibration records, schedules
- Root cause analysis

Accurate calibration provides a traceable record of monitoring equipment performance over time, which helps to demonstrate how you manage food safety hazards.

Further information

Further food safety technical information is available at www.dairysafe.vic.gov.au or by contacting Dairy Food Safety Victoria at info@dairysafe.vic.gov.au

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