

## Chapter 6

# DEVELOPING AN EQUIPMENT PROGRAM

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A good equipment program minimizes the chances of food contamination in a facility. To minimize contamination look at how the equipment is:

- Designed
- Constructed
- Arranged
- Operated
- Maintained

When selecting any equipment, think about what risks it adds or removes from the production process. Because some equipment is purchased before putting a HACCP or food safety system in place, the existing equipment also needs to be evaluated.

*A recent European study found that 25% of all food contamination is caused by machinery that is used improperly or designed poorly.*

## 1.0 SANITARY FACILITY DESIGN

Facility design is an important part of controlling potential food safety hazards.

- Chemical hazards can come from lubricants or cleaning chemicals in equipment.
- Physical hazards may come from loose nuts and bolts, or metal-on-metal friction that releases metal fragments.
- Microbial and allergen hazards often come from food or other contaminants that get trapped in the equipment (e.g. blind corners or other areas that are hard to clean).



See Form A.2: Change Control Checklist, and Form A.9: Sanitary Design Checklist.

*HACCP is a continuous improvement food safety system. This means that every time there is a change to the production environment or process, the entire process must be re-examined to see if it affects food safety.*

When buying new or used equipment, keep the following in mind:

- All food contact surfaces should be made from food-grade material (smooth, non-corrosive, non-toxic and non-absorbent);
- The equipment's design and maintenance program must minimize the risk of food contamination (watch for loose bolts, metal chips or shavings);
- Chemicals, such as lubricants and seals, should be made from food-grade materials and not overused;
- Equipment should be easy to clean and not have cracks, crevices, hollow areas or other 'hang-up' points that collect particles of food, chemicals, allergens, or moisture;
- All areas of the equipment should be easy to reach for cleaning, sanitizing, maintenance and visual checks;
- Failure of any part of the equipment should not cause or risk contamination; and
- The equipment's design and maintenance should reduce the chances of product contamination from dust, condensation or any other sources.



*For more information regarding Sanitary Design, see Chapter 4: Developing the Premises Program.*

## 1.1 Pre-owned Equipment

When purchasing pre-owned equipment, it is important to identify:

- How long the machine was used;
- What the equipment was used for, and if these uses have a negative effect on food safety;
- Where the machine was stored when not being used;
- Whether the machine was exposed to any external hazards that might be brought into the new facility;
- How the machine was transported between locations, and whether it needs to be sanitized before bringing it into the facility;

- Why the equipment is being sold (is it reliable or will the reason for sale affect food safety?); and
- Whether the equipment has been evaluated by qualified professionals.

It's important to check the history of any piece of pre-owned equipment. This information is key in understanding how the equipment will affect a food safety system.

Ask the supplier for documents that show:

- The types of food products that were previously produced on the equipment;
- How long the equipment was used;
- How the equipment works;
- The servicing records;
- Installation information;
- A record of equipment testing proving it's in good working order; and
- The original operating manual.

The supplier should also be able to offer advice and training on how to use the equipment. This will help to make sure new hazards aren't introduced into the production process.



See Form C.1: Equipment Contact Information.

*Even the smallest change in equipment or process can impact the safety of the finished product.*

*Instruction sheets and posters about a colour-coding system are useful to employees and visitors.*

## 1.2 Colour Coding Equipment

Colour coding is a useful way of reducing the risk of cross-contamination. It separates equipment used for different products and activities. It also separates equipment used for products that may contain allergens.

Colour coding maintenance and other equipment, as well as clothing and utensils, helps identify raw product operations versus processed product operations. It also helps to identify allergen versus non-allergen operations.

There are no legal guidelines or standards in Alberta or Canada outlining which colour is best for an item or activity.

While colour coding can help reduce cross-contamination, equipment must be cleaned and sanitized between products or different activities. Cleaning and sanitizing is very important between raw meat products. For example, chicken and beef may carry different microbial hazards.

## 1.3 Air Quality in a Facility and Air as a Processing Aid

It's very important that the air quality in a processing plant is controlled. Air can carry mould, yeast, pathogens, moisture and dust particles. Dust particles can easily carry microbes, allergens, oils or other contaminants

To maintain air quality:

- To maintain air quality:
- Control airflow in the establishment. Make sure that airborne contaminants flow away from ready-to-eat and potentially hazardous foods.
- Direct airflow away from equipment that uses air as a processing aid. For example, negative air pressures in raw product areas and restrooms help prevent air flowing from these places into the processing areas. Positive air pressure can then be maintained in places such as the processing and packaging areas.

- Make sure that filters perform at the manufacturer's standards of performance.
- Filter compressed air, such as oxygen (O<sub>2</sub>), nitrogen (N<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) used in some packaging, when such air contacts finished products

Air used in processing must be safe. Just as with any other ingredient, make sure that the air is not a source of contaminants. This could include treating or filtering the air



*For further information regarding Ventilation Systems, see Chapter 4: Premises.*

## 2.0 PREVENTATIVE MAINTENANCE

Develop procedures that prevent equipment from breaking down or becoming a future source of contamination. Fixing equipment only when it breaks down can be wasteful, costly and can create food safety hazards.

The main goal of preventative maintenance is to avoid equipment failure before it occurs. This is done by inspecting and replacing worn parts before they fail.

Preventative maintenance involves:

1. The care and service that keeps equipment and facilities in good operating condition;
2. Organized inspection, detection and correction of problems before they happen; and
3. Testing, measuring, adjusting and replacing parts to prevent faults or failures.

*An effective preventative maintenance is the best form of an equipment maintenance program in a HACCP system.*

*Calculate hourly rates associated with breakdowns (rates = lost production + lost opportunity costs + overtime and other extra input costs).*

## 2.1 Value of Preventative Maintenance

A good preventative maintenance program reduces downtime. Long-term benefits of a reliable and well-documented preventative maintenance program include:

- Improved system reliability;
- Decreased cost of replacement;
- Fewer production stoppages;
- Fewer large scale repairs;
- Less raw material and product spoilage;
- Increased life expectancy for equipment;
- Less need for standby equipment;
- Identification of equipment with high maintenance costs (leads to checking and correction of misuse, operator abuse or outdated equipment);
- Better spare parts control;
- Greater work safety;
- Lower manufacturing costs; and
- Better control over food quality and food safety.

Long-term cost comparisons show that preventative maintenance leads to lower costs over maintenance done only when equipment fails.

## 2.2 Creating a Preventative Maintenance Program

There are five accepted steps for setting up a preventative maintenance program.

### **1. Create a list of all equipment in the facility:**

Use the equipments' manuals and previous experience/history to outline all maintenance and repair activities that might affect food safety. Do this for each piece of equipment.

Outline regular maintenance requirements, small part inventories or any other aspects of the equipment that may affect food safety.

**2. Adopt a plan:**

Detail the who, what, when, and how for each element of equipment maintenance in the facility. Develop ways to perform and document each activity outlined.

Like other prerequisite programs, the preventative maintenance program should be something that can be checked on. It should include steps to prove that activities follow manufacturer's recommendations.

**3. Perform the work:**

Organize tasks. Do emergency repairs but don't neglect preventative maintenance.

**4. Collect data:**

Use documents from the preventative maintenance program to adjust the HACCP program. Analyze this data for food safety issues.

**5. Inventory the parts required for maintenance:**

Keep an inventory of spare parts, especially those needed for common or regular repairs. Keeping spare parts organized or coded for each machine increases efficiency and reduces clutter.

## 2.3 Communications and the Preventative Maintenance Program

Maintenance activities sometimes create hazards. Any preventative maintenance program should be coordinated with both sanitation and production.

Some preventative maintenance activities are complex and time consuming. This can result in equipment (and sometimes entire areas) being isolated from the processing environment for hours, or even weeks. That's why it is important that sanitation personnel communicate effectively with maintenance personnel. This helps to make sure that:

- All personnel are notified when these items/areas are returned to the processing environment; and
- The equipment and surrounding areas have been cleaned and sanitized.

Maintenance activities also have direct effects on production and scheduling. Consult with production planners, supervisors and management about scheduling preventative maintenance activities. This helps eliminate unnecessary customer or supply issues.

## 2.4 Documenting a Preventative Maintenance Program

Make sure that all maintenance activities are well documented. Keep records of staff training, regular repairs, purchases, pre-operation inspection findings, etc. Documents should show that the preventative maintenance program supports all other prerequisite programs.

The preventative maintenance program will include:

- A facility's food processing equipment and maintenance requirements;
- Maintenance equipment and what is needed to maintain them; and
- Regular inspection or maintenance activities, procedures and frequencies.

Staff training ensures that employees have the skills they need for effective preventative maintenance.



*For more information on documenting personnel training, see Chapter 7: Developing a Personnel Training Program.*

### Equipment Records

Necessary equipment records include:

- All manufacturers' literature such as manuals, drawings and lists of spare parts;
- Flow diagrams of the entire facility;
- Individual diagrams showing locations of all equipment and production processes; and
- A recording and reporting system of performance inspections and activities for each piece of equipment.

This last point ensures that corrective action is taken immediately after a deviation or unusual event.

Make the system and documentation simple. A Repair/Maintenance Request Card file can be used for the equipment records. See Figure 1.

Figure 1: Repair/Maintenance Request Card

**C.6 – Repair/Maintenance Request**

Date: \_\_\_\_\_ Ref #: \_\_\_\_\_

Area: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Equipment: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Repair Needed or Description of Problem: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Priority (Please Check):

Today

Tomorrow

Undated

Reported by: \_\_\_\_\_

Action Completed By: \_\_\_\_\_

Date: \_\_\_\_\_

Equipment Cleaned and Inspected

By: \_\_\_\_\_

Date: \_\_\_\_\_

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Equipment Program: Repair/Maintenance Request Page 1 of 1

Issue Date: \_\_\_\_\_

Developed by: \_\_\_\_\_ Date last revised: \_\_\_\_\_

Authorized by: \_\_\_\_\_ Date authorized: \_\_\_\_\_

Canada *Alberta*

Each card should have space for information about any major changes and repairs. These documents become the health record of the equipment.

### *Inspection Schedules*

All equipment is subject to wear and tear. Over time, efficiency and performance will decrease. Regular inspections are necessary to identify performance issues before a breakdown occurs.

Inspection schedules should include a review of equipment performance. They should also include regularly scheduled servicing and inspection of all other areas of the facility.

When developing the maintenance schedules, also check the instruments used to measure equipment performance. Check or calibrate these testing tools frequently to make sure they are working well.

Inspection and scheduled servicing records can supply important information to the maintenance department. Use this information when drawing up a maintenance schedule.

### *Lubrication and Other Preventative Maintenance Activity Schedules*

Preventative maintenance schedules are an important part of the equipment program. Most machines have parts that require lubrication, tightening or other adjustments.

The following is an example of a six-step process that maintenance staff can follow every day for preventative maintenance.

1. Collect the preventative maintenance schedule cards for the day (or maintenance requests from a department or staff member), or examine the maintenance schedule for required activities.
2. Collect necessary tools and lubricants.
3. Perform necessary activities and then tag machines to show the maintenance activity is complete.
4. Notify the sanitation department or production supervisor that equipment is ready to be cleaned and inspected.
5. Record the job on a card or log, and note any important issues about the maintenance or equipment.
6. Where applicable, return the cards to an appropriate location or employee.



See Form C.5: Preventative Maintenance Schedule, Form C.4: Maintenance Request Tracking, and Form C.2: Equipment Maintenance Log

### *Spare parts program*

A good preventative maintenance program must have a good spare parts inventory system. This helps to make sure that supplies are readily available.

An inventory program also helps to minimize the risk of extra or missing parts that end up in food products. Every maintenance department has various equipment parts ranging from pipes and fittings to nuts, bolts, washers, and electrical components. These can pose a safety risk to consumers.

## 3.0 EQUIPMENT CALIBRATION

Make sure that all inspection, measuring and test equipment are working. Calibrating or adjusting instruments for accuracy is important.

One way to test an instrument's accuracy is to compare its results to those of an accurate reference instrument. This can be done by shipping the testing or measuring equipment to the manufacturer. It could also be done by hiring someone from outside the company to check the instrument.

You can also test the instrument against controlled conditions. The best example of this is the use of pH standards for pH meter calibrations. In this test, solutions of known pH values are compared to results from the meter.

Whatever method is used, make sure that the calibration standards are traceable. Also make sure that they meet national or international standards. If no such standards are available or practical, use a single reproducible standard or an in-house standard.

*Keep in mind that calibration may need to be performed by trained and/or qualified people. For example, scales may need to be checked by licensed technicians, or metal detectors may need to be calibrated by the manufacturer.*

The frequency of calibration may depend on the manufacturers' limits or recommendations. It might also depend on the instrument's accuracy in the past. Consider the risk to the product if the instrument is not working correctly. High-risk products (such as ready-to-eat meals), or high-risk activities, need more frequent instrument calibration or accuracy checks.

### 3.1 Documentation

Calibration documentation should include:

- A list of all equipment requiring calibration;
- Calibration procedures and frequencies. These procedures must include:
  - the frequency of calibration activities,
  - who will perform the calibration, and
  - specific directions and limits for accuracy and precision;
- Description of standards used, where these are applicable, and records of certification; and
- Procedures necessary for maintaining certification of calibration standards or devices.

When calibration limits aren't met, take corrective actions to restore the equipment to its required accuracy. Also check whether there have been any long-term effects on the instrument's quality and operation. Document all related activities.



*See Form C.7: Thermometer Calibration Log, or Form C.3: Hand Held Thermometer Calibration Record.*

## 4.0 EQUIPMENT FORM TEMPLATES

- C.1 Equipment Contact Information
- C.2 Equipment Maintenance Log
- C.3 Hand Held Thermometer Calibration Record
- C.4 Maintenance Requests Tracking
- C.5 Preventative Maintenance Schedule
- C.6 Repair / Maintenance Request
- C.7 Thermometer Calibration Log

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