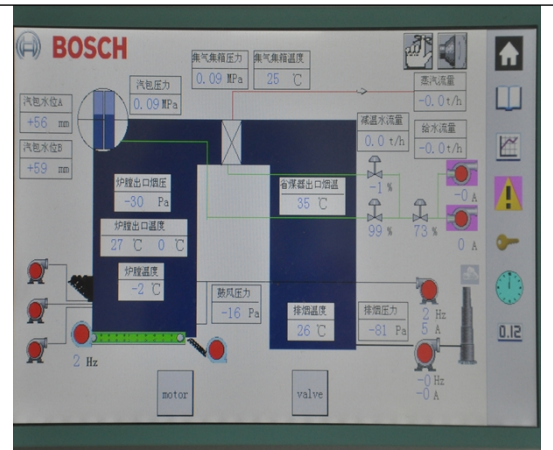


APPLICATION OF HACCP PRINCIPLES FOR THE MEAT INDUSTRY

GUIDANCE SHEET NO: 14

ESTABLISH THE CRITICAL LIMITS PRINCIPLE 3



CRITICAL LIMITS

Critical limits separate acceptability from unacceptability **or safe from unsafe food**. Critical limits must be at least as strict as any legal limits that apply at that step.

Critical limits are the values at critical control points (CCPs) that **must be achieved to ensure the safety of food**. These critical limits must be monitored at CCPs (discussed in guidance sheet 15). Failure to consistently achieve the values specified in the critical limits must result in appropriate corrective action (discussed in guidance sheet 16). Failure to meet a critical limit is known as “deviation”.

You must set at least one critical limit for each of the CCP's that you have identified. Some CCP's have more than one critical limit value as they involve multiple parameters. For example critical limits for CCP's during fermented sausage production will involve temperature/time, pH and water activity limits.

Measurement of critical limits must be as simple and rapid as possible (such as temperature/time combinations). Microbiological criteria such as “Absence of Salmonella in a 25g sample of the product” are **NOT** suitable as critical limits as they cannot be measured quickly enough in the factory (testing for Salmonella requires a microbiology laboratory and at least 24 hours to get a result). Microbiological criteria should be reserved for used as part of the validation and verification process (guidance sheets 18 & 19).

CRITICAL LIMITS VERSUS TARGET VALUES

Critical limits separate safe from unsafe food. It is desirable to have a safety margin / buffer zone to give more time for factory to identify the beginning of a loss of control and to take corrective action before there is a failure of a critical limit. A safety margin is achieved by setting target values for some/all CCP's.

A target value is always more stringent than the critical limit – this allows for early detection of potential process failures. The difference between the critical limit and the target value is known as the “tolerance” (at the CCP). For example, in the thermal processing of vacuum-packed cooked meats control of *Clostridium botulinum* is a CCP. The critical limit for destruction of *C.botulinum* is to hold the meat at 90°C for 10 minutes. In practice, vacuum-packed meat factories set a target value of 90°C for 13 minutes. The tolerance is 25% as the holding time has been increased by 25% from 10 to 13 minutes.

A detailed example of critical limits, target values and tolerances is given in box 1.

**Box 1. Production of Whole Roast Chickens Sold as Ready to Eat
Setting Critical Limits, Target Values and Tolerances**

Process Step/CCP: Roasting of whole chickens

Hazard: Survival of Salmonella or Campylobacter post-cooking

Control measure: Sufficient heat and time to kill all foodborne pathogens

Critical limit: Core temperature of meat must reach 70°C for a minimum of 2 minutes

Target value: Core temperature of meat must reach 72°C for a minimum of 2 minutes

Tolerance value: +2°C

Sanitary Standard operating procedure will include total process time and temperature to ensure food safety (see guidance sheet 17 for more information on standard operating procedures).

TYPES OF CRITICAL LIMIT

Critical limits may be chemical, physical or procedural in nature depending on the type of hazard that is subject to control. Some examples include:

Chemical Critical Limits Water activity (Aw), pH or acidity, Salt content, Mycotoxin levels, Absence of allergens.

Physical Critical Limits Temperature, Time, Dried weight, Absence of metals, Moisture content

Procedural Critical Limits "Supply of raw beef from approved slaughterhouses which have specific controls in place to minimise the risk of contamination of meat intended to be eaten raw or lightly cooked."

CHOOSING CRITICAL LIMITS

The critical limits that you choose must be suitable to ensure that the control measures that you have selected at the CCPs are adequately controlled. As such, appropriate critical limits should meet the following criteria. They should be:

- **Observable:** Achievement of and any subsequent changes in the critical limits during processing can be detected.
- **Measurable:** Achievement of the critical limits can be confirmed by measurement and any deviations quantified.
- **Subject to "real time" monitoring:** Any observations and measurements must be capable of being made whilst processing is in progress to allow appropriate corrective actions to be made promptly.
- It must be possible for staff know whether the operation is under control **or is moving out of control.**

SETTING CRITICAL LIMITS

When setting critical limits for your HACCP system you should consider:

1. What are the critical limits for each critical control point? You should insert the values and any relevant units of measurement. For example:

“70°C for 2 minutes”

“Aw of 0.92”

“pH of 4.0”

2. Provide details of how each critical limit was determined. Some critical limits will be set out in legislation, for example values for the pasteurisation of milk whereas others may be obtained from industry or regulatory guidance trade associations or published in peer-reviewed journals. Care must be taken to ensure that critical limits are based on scientific evidence and verified (validation and verification are covered in guidance sheets 18 & 19).

3. Is the critical limit appropriate to control the specific hazard? The critical limit selected must be adequate to either prevent, eliminate or reduce the identified hazard to an acceptable level.

4. Is the critical limit measurable or observable in real time? It is possible for some critical limits to be observed rather than actually measured, for example water can be seen to boil. However, it must be possible to detect such changes in real time.

Microbiological criteria are rarely useful as critical limits because their measurement normally involves a time delay whilst cultures of the relevant microorganisms are grown.

5. Is there a target value? Target values may be selected which are more stringent than the critical limit values required to control the hazard to assist in the early detection of potential process failures.

DOCUMENTATION AND RECORD KEEPING

Details of how the critical limit was established (including sources of information or data used) need to be recorded as part of the HACCP plan. In the example of the roast chicken factory the critical limits were taken from regulatory limits set by the European Union (EU) on the basis of scientific studies of survival of foodborne pathogens during cooking of whole chicken carcasses.

Recording of data from measuring devices is covered as part of monitoring & verification (guidance sheets 15 & 19). If a CCP deviates from the critical limit / target value the event and corrective actions will be recorded as part of corrective actions (guidance sheet 16).

The suitability of critical limits must be reviewed regularly especially if any changes have been made to the HACCP system (guidance sheet 21).

COMMON PROBLEMS WITH CRITICAL LIMITS

Critical limits are inappropriate (for example, do not relate to the hazard to be controlled and do not separate safe from unsafe food).

Critical Limit is difficult to measure or observe.