APPLICATION NOTE

PO Box 531, Cambridge, NZ
Telephone + 64 7 827 4142
Facsimile + 64 7 827 8435
www.aircaretechnology.co.nz
Ph 0800 774 100
Fax 0800 774 101

Food Safety and Airborne Contamination Control

In most food processing situations airborne contamination is not the major safety risk factor. Yet it must be considered as part of the Food Safety Programme because food is inevitably exposed to air which could potentially contain hazardous and undesirable contamination.

HACCP Methodology

Systematic identification of airborne contamination hazards should be the first step in assessing the need for a controlled air system. In the absence of a controlled air system, the degree of hazard is dependent on the type of food, the process stage, and other conditions such as temperature. Thus the degree of air control required may vary from no control to tight control at different stages of the process.

Airborne Contamination

Because they can form bioaerosols, virtually all micro-organisms can be transmitted by air. Some pathogenic bacteria, such as *staphylococcus aureus*, are well known to exist in air. (1) Yeasts and moulds are certainly airborne, and while not generally hazardous, are often undesirable food contaminants.

Other airborne contaminants include odours and even excessive humidity.

Cross-contamination from contaminated areas to clean areas and perhaps from one process to another is often an important consideration.

Air Control

The characteristics that may be controlled are as follows:

1. Temperature and RH.
   This is the role of air-conditioning and perhaps specialised refrigeration systems in critical process stages.
2. Airflow.
   The direction of airflow from one room to another can be controlled by establishing pressure differentials between rooms. To pressurise a room is simply a matter of supplying more air than is extracted into a relatively “tight” room. The excess air will then leak out into adjacent rooms under the door and through other cracks. Thus the room can be protected from airborne contamination from adjacent rooms while the

doors are closed. Control can be maintained when doors are opened by means of an airlock – i.e. an anteroom between two rooms in which only one door is open at any time.
Airflow can also be controlled within a room by well-designed placement and sizing of air supply and extract points.

3. Dilution
Contaminants released in a room can be diluted with fresh or a mixture of fresh and filtered air. The measure of dilution is the air change rate, usually expressed as air-changes per hour. It is found by dividing the room's air supply volume in cubic metres per hour by the room volume in cubic metres.
4. Filtration
Supply air can be filtered to remove virtually any contaminant of concern. HEPA filters will remove 99.99% of all particles 0.3 Microns and greater. This takes care of all viable organisms. Activated carbon filters deal with odours and virtually any other specific vapour. These are relatively expensive and need only be used for the most critical food processing applications. Generally, medium efficiency particulate filters are used to remove larger particles and control concentration of smaller particles.

Guidelines

Some industries are working to establish guidelines for food safety and HACCP, and hopefully airborne contamination will be addressed.

The Recommended International Code of Practice – General Principles of Food Hygiene by the Codex Alimentarius [(2)] includes general guidelines for air quality and ventilation as follows:
Adequate means of natural or mechanical ventilation should be provided, in particular to:

- *Minimise air-borne contamination of food, for example from aerosols and condensation droplets.*
- *Control ambient temperatures; and*
- *Control odours which might affect the suitability of food; and*
- *Control humidity, where necessary, to ensure the safety and suitability of food.*

Ventilation systems should be designed and constructed so that air does not flow from contaminated areas to clean areas and, where necessary, they can be adequately maintained and cleaned.

Specifying a System

The air system should be designed by an air systems engineer. Remember that the engineer may be expert in air systems, but is not expert in a particular process. It is up to the client, the food producer, to clearly identify what the system should achieve. The client should specify the critical areas and the ideal environmental conditions required. Also specify monitoring requirements such as pressure gauges. It is wise to specify at the design stage how the system will be tested to confirm its performance, and make final payment subject to a compliant test report from an independent test laboratory. The test laboratory can provide details of tests to verify that the installed air control system provides the required environmental protection.

Air Care Technology Ltd can recommend specialist engineering support to assist with preparation of the system specification.

Monitoring Air System Performance

Pressure gauges to monitor room pressurisation are relatively inexpensive and can provide a daily means of confirming that the air system is operating and that air is flowing the right way. Temperature and RH monitors are also available.

An annual inspection and test by an IANZ accredited test laboratory will provide independent written confirmation to demonstrate continued compliance.

References

(1) The “Bad Bug Book”, US FDA, Centre for Food Safety & Applied Nutrition.
(available on-line at http://vm.cfsan.fda.gov/~mow/intro.html)

(2) Codex Alimentarius Recommended International Code of Practice – General Principles of Food Hygiene,
(for info see http://www.fao.org/docrep/w8088e/w8088e04.htm)