



PROCESS DESCRIPTION

This note covers industrial scale bakeries producing bread, cake and biscuit products for human consumption, starting with milled flour as the basic ingredient.

It does not cover grain milling, although this may take place in the same enterprise. For issues related to milling see the Grain Mill products guidance note.

Although the environmental issues associated with baking remain, in principle, the same for small bakery operations such as individual bakery shops, in practice, the risk level is much lower and it may not be appropriate to implement some of the precautions and management measures mentioned here.

The main bread making activities are shown in Figure 1 and include:

- **Receipt and Storage of raw materials:** principally flour, water, yeast, salt, levelling agents in biscuits (eg ammonia carbonate), improvers (e.g. vitamin C) and preservatives but can include many other ingredients such as onion, olives, herbs, cheese;
- **Preparation:** Mixing, shaping, placing in tins, proving;
- **Baking:** Removing from tins, cooling;
- **Packing:** Slicing, wrapping/bagging.

KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Product Contamination

Bakery products can become contaminated through:

- Contaminated raw materials received;
- Poor hygiene standards within the processing operations, e.g. unclean machines, unhygienic handling;
- Pest infestation, e.g. rodent, insects;
- Poor storage conditions e.g. raised moisture levels promoting insect, mould and bacterial growth.

The Company's operations should be designed to internationally recognized food safety standards consistent with the principles and

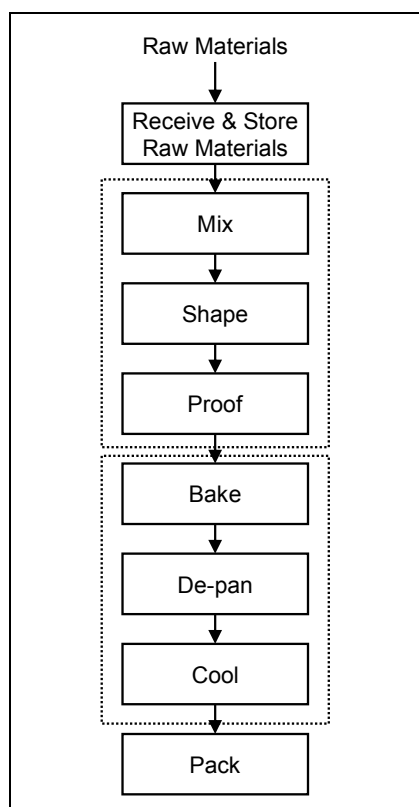


Figure 1: Basic Steps in Bread Making



practice of Hazard Analysis Critical Control Points (HACCP)¹ and Codex Alimentarius².

Emissions to Air

The major air emissions of concern from bakeries are known as volatile organic compounds (VOCs). The primary VOC emitted from bakery operations is ethanol. It is produced by yeast metabolism during fermentation and is emitted in large amounts when the dough is exposed to elevated temperatures in the oven. It combines with other VOCs in the atmosphere to form smog. A large facility may require a permit with specific emission parameters from the regulatory authorities may be required.

Energy Consumption

Processing operations consume high amounts of energy as:

- Thermal energy for proving and baking the product and to produce hot water for cleaning and sterilising;
- Electricity for machinery operation, dust extraction, ventilation, lighting and production of compressed air.

Energy usage has a direct correlation to the operating costs of the company and energy generation and consumption may be regulated or taxes/levies applied to reduce energy use and associated emissions of gases such as carbon dioxide.

Dust, Aerosols and Gases

Dust may arise from raw material storage, handling and drying activities; aerosols typically result from the use of compressed air and high-pressure water for cleaning.

- Workers may inhale or ingest the dust and aerosols exposing them to biological and microbial hazards presenting a risk of occupational lung disease or asthma. When combined with high levels of humidity dust and/or aerosols may give rise to skin irritation or allergic reactions;
- Ammonium carbonate used as a leavening agent in biscuits decomposes to emit ammonia on contact to air. It is toxic if inhaled at high concentrations;
- Some bakery additives/flour improvers contain enzymes that are an occupational hazard to which workers may become allergic (sensitised). Exposure to them should be limited by using improvers in liquid, paste or dust suppressed powder form;
- Dust can be a nuisance to the surrounding locality;
- A dust cloud of any flammable material (such as flour) will explode if:
 - The concentration of dust in air falls within the explosive limits³;
 - A source of ignition is present.

Dust can be controlled by enclosing processing and transport equipment, which also reduces

¹ ISO 2005

² FAO and WHO (1962–2009).

³ HSE 1996



product losses and by the installation of extraction (antistatic) equipment.

Storage

Bulk storage facilities will be used for the storage of raw materials, finished product, chemicals used in the production process and for cleansing and disinfection, and fuel oils for energy production. These storage facilities should be provided with satisfactory containment (concrete walls/bunds, drainage gullies connected to wastewater treatment areas) to prevent spills reaching the wider environment. The storage facilities should be secure to prevent pest invasion, be waterproof and well ventilated. Alarms should be fitted to detect leakages. All outdoor bulk storage of dusty, or potentially dusty materials should be in silos and ventilation/extraction equipment used to minimise dust generation or explosion/fire. Bulk storage facilities should be fitted with alarms to prevent overfilling.

Solid Wastes

Wastes may arise at all stages in the production process, including spoiled raw materials, spillages, dough, non-conforming product, packaging wastes and sludge from wastewater treatment. Organic wastes should be segregated from non-organic wastes to facilitate recycling/reuse and stored in adequate containers. Solid wastes will need to be temporarily stored, collected and disposed of regularly to avoid odour, litter, fly, rodent or hygiene problems.

Packaging

Packaging is widely used within the bakery industry to preserve the quality of the product, for marketing and transport purposes. Smaller

bakeries and in-store bakeries may transport some unwrapped finished product in open reusable plastic crates or baskets, but the majority of larger operations package the product in paper (sometimes waxed), polythene, plastic or card. Companies operating with the European Union (either as a manufacturer or as a supplier into European Union countries) will be subject to the European Union Packaging and Packaging Waste Directive (94/62/EC), which aims to reduce the amount of packing that is being introduced into waste streams.

Water supply

Bakeries can use a relatively large volume of water, which may require treatment before it can be used. It is used both to make the product and for cleaning. In cities and towns, water is supplied by the municipal water supply system. It is typical for abstraction or water use permits to detail volumes of water abstraction allowed as over abstraction can impact local communities.

Wastewater treatment

Wastewater arising from cleaning and spillages will contain high quantities of organic matter and other material which if discharged without treatment will potentially pollute watercourses.

Wastewater treatment systems for process drainage and cleaning wastewaters are essential in order to mitigate the risk of pollution.

Instead of building their own wastewater treatment facility, some companies will discharge to the municipal wastewater treatment plant. It is typical for authorities, in either case, to require pre-treatment of such wastewater before it is discharged. This will depend on the size of bakery. These requirements will be set out in an environmental permit.



Manual Handling and Repetitive Work

Lifting, repetitive work and posture injuries occur as a result of lifting and carrying heavy or awkward shaped items such as sacks, lifting of boxes and manoeuvring wheeled racks within the plant. Repetitive tasks such as tin loading, lidding, cake decorating and packing operations can lead to musculoskeletal injuries.

Collision

In a busy manufacturing environment, it is common to have injuries where people are struck by moving or falling objects such as crates, boxes, equipment, conveyors and forklift trucks.

OTHER ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Permitting

Large bakeries in the EU producing more than 300 tonnes per day of finished product are subject to national regulations under the Integrated Pollution Prevention and Control Directive (2008/1/EC). Other smaller facilities within the EU and operations outside the EU will still be subject to local regulation but this will generally set less stringent requirements on the environmental management practices to be adopted.

Polychlorinated Biphenyls (PCBs) and Asbestos

- PCBs are a group of substances which are good electrical insulators. Typically, PCBs may be present in hydraulic oils or dielectric fluids in electrical switchgear and transformers.

- Asbestos has been used on a large scale for many years as a fire proofing and insulation material and may be encountered in a wide range of forms including asbestos cement boards, as fire retardant gaskets in pipework and as fire retardant insulation around boilers and furnaces.

Though the presence of PCBs and asbestos are not likely to be a principal issue of concern in relation to the main bakery production process, they may be present in factories constructed prior to the 1980s and present both an environmental and health and safety hazard.

Temperature

Employees may be exposed to high temperatures near ovens and may have to handle hot product. This could lead to collapse through heat exhaustion and contact burns.

Confined Spaces

Storage silos are dangerous confined spaces and entry to them must be strictly controlled and avoided wherever possible. There is a risk from engulfment, lack of breathable atmosphere and mechanical hazards (e.g. sweep augers).

Noise

Noise induced hearing loss can occur from working in noisy areas, e.g. mixers, baking plant, depanning, slicing, fruit washing.

Machinery

All equipment should have safety guarding and workers should be issued with appropriate personal protective equipment to protect against unavoidable sharp items and edges.

Exposure to Ammonia

- Ammonia, which is commonly used as a replacement for Chlorofluorocarbons (CFCs) in refrigeration systems, and may also be emitted by ammonium carbonate (a leavening agent in biscuits) if exposed to air, is toxic if inhaled at high concentrations and can cause frostbite when released to the atmosphere. Facilities using ammonia should be aware of the potential hazards of ammonia releases and of the steps that can be taken to prevent such releases e.g. fitting alarms on equipment.. They should be prepared to respond appropriately if releases do occur.

Slips, Trips and Falls

- Vats/vessels for mixing raw materials provide hazards in the form of working at height which could result in falls and asphyxiation;
- Slippery floors and surfaces present a high risk of slips, trips and falls where spills have not been cleared up or effective cleaning has not taken place;
- The cleaning and disinfecting of process areas and some food preservation if inappropriately used and stored could result in chemical contact burns to employees, inhalation of harmful/toxic fumes generated during processes or ingestion of harmful substances.

KEY SOCIAL, LABOUR AND COMMUNITY RISKS/LIABILITY ISSUES

Hygiene

Contamination of product could result in ill health in the general public and may result in product recall. Hygiene standards within process areas must be maintained to a high level to prevent product contamination and should be consistent with the principles and practice of HACCP and Codex Alimentarius.

OTHER SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Odour

Although bakeries do release odours, these are considered by the majority of people to be not unpleasant, but some form of abatement may be required by regulatory authorities.

Noise

The noise generated by equipment and manoeuvring trucks can be a nuisance if the site is located close to residential areas and other sensitive receptors.

Transport

Trucks delivering bulky raw materials may cause traffic congestion or excessive noise potentially leading to complaints.

FINANCIAL IMPLICATIONS

- Product recall can have a significant impact on a business. Financial impacts may arise from compensation claims, loss of reputation, loss of contracts and market



share. Significant upgrades in quality control standards may be required at the production facility in order to reduce the risk of contamination during processing and to satisfy national and international food hygiene standards. A system of product traceability may be required to facilitate product recall. This will be mandatory in some territories;

- Many countries are signatories to the Kyoto Protocol and have adopted targets for the reduction of CO₂ emissions. Where Governments have set up carbon emission reduction programmes some industrial processes have been required to reduce their CO₂ emissions through the setting of targets. This may require investment in new/clean technologies to achieve the emission targets. These targets may be reflected in environmental permits;
- Other complex investment may be required to comply with new hygiene health, safety and environmental regulations;
- Where large quantities of energy are used per unit of products this can result in high operating costs to the business;
- Injuries may lead to increased payroll costs to replace skilled workers and lost production time;
- Fines, penalties and third party claims may be incurred for non-compliance with environment, health and safety regulations.

IMPROVEMENTS

- Reduce dust emissions by:

- Enclosing and sealing plant/facility and equipment to prevent escape and accumulation of dust;
- Use of doors/plastic strip curtains on building access points;
- Redesigning processes to reducing free-fall distances and speed of movement for flour and other dry products;
- Encouraging careful working to avoid spillages;
- Use of centralised piped vacuum cleaning systems or other suitable vacuum clearers;
- Installation of dust extractors e.g. cyclones and fabric filters;
- Improving ventilation within buildings;
- Maintaining a slight negative pressure within storage vessels such as bins and silos;
- Install dust monitoring equipment;
- Replace dusty bakery additives and flour improvers with those in liquid, paste or dust suppressed form;
- Screen raw materials, water and finished products for contaminants;
- Monitor product losses during processing operations;
- Consider whether the installation or upgrade of a wastewater treatment plant is necessary;



- Insulate ovens and proving areas to reduce energy consumption and recover heat from ovens;
- Consider shutting down ovens when plant is not operating at full capacity;
- Ensure organic waste is collected and stored separately from other solid waste where to enable its reuse where feasible for composting and/or use for soil amendment, or use in energy production;
- Improve waste storage containment to prevent ingress of water, pests and leakage;
- Upgrade raw materials storage areas to allow proper containment of spills and leakages;
- Undertake regular integrity testing of underground storage tanks and bulk storage tanks to reduce to prevent leakage and product loss;
- Good housekeeping should be maintained at all times all areas. The adoption of good cleaning and working practises as a routine will reduce dust emissions and improve hygiene standards;
- Upgrade exhaust stack heights from cooking processes to minimise air pollution and nuisance to the local community;
- Assess air emission (e.g. ethanol) and if required install equipment to reduce emissions of volatile organic compounds.
- Provision of personal protective equipment (PPE) that is fit for the task to prevent injury and maintain hygiene standards. Staff should be trained in the correct selection, use and maintenance of PPE;
- Train workers in how dust from flour and other bakery ingredients can cause asthma, the symptoms and how to prevent it and what to do if they experience the symptoms;
- Train workers in correct use of machinery and safety devices;
- Redesign of manual processes to avoid heavy lifting/repetitive activities;
- Install mechanical lifting aids where possible and rotate work tasks to reduce repetitive activities;
- Separation of people from moving equipment:
 - Ensure that the process layout reduces opportunities for process activities to cross paths;
 - Installation of safeguards on peelers, moving parts of conveyor belts and packaging machinery to reduce risk of entrapment of employees;
 - Install walkways to separate people from vehicle movements to reduce risk of collision;
- Walking and working surfaces should be kept clean and dry. Restrict access to areas being cleaned or where spillages have occurred;
- To reduce the risk of noise exposure by isolating noisy equipment and rotate tasks to minimise time spent in a noisy area and provide personal protective equipment;
- Restrict duration for people being in very hot areas;



- Ensure all electrical equipment in wet areas is safe and regularly maintained;
 - Consider introducing pre-employment screening for past or present asthma or chest illnesses; conduct annual screening of employees;
 - Introduce arrangements for redeploying employees with respiratory sensitisation away from the bakery;
 - Provide worker welfare areas segregated from the main production process;
 - Train employees in hygiene including; regular hand washing with soap and alcohol; prohibition of smoking, eating and drinking in the workplace.
- treatment plant. Higher risks will be associated with plants discharging to watercourses;
 - Check the condition of storage facilities for chemicals and raw materials;
 - Discuss the procedures and controls around screening raw materials for contamination, from contaminants, such as, pesticides, herbicides, radioactivity, heavy metals, industrial pollutants;
 - What is the standard of “housekeeping” on site? Do areas look clean and tidy? Look for build up of dust on floors and surfaces, evidence of any recent spills or releases of raw materials/product. Look for evidence that the walking and working surfaces are kept clean and dry;

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

During the initial site visit, the issues will vary according to the type of bakery product being produced and depending on the level of environment, hygiene, health and safety management already introduced. While visiting the site it is important to discuss and review the following:

Environmental, Health and Safety

- Confirm organisational responsibilities and systems for environment, health and safety;
 - Check the condition and efficiency of any wastewater treatment plant present and location of discharge points. Note the colour and appearance of adjacent watercourses;
 - Note whether the plant discharges to a local watercourse or the municipal wastewater
- Are employees wearing Personal Protective Equipment?
 - Is there a quality control system? Is there a food traceability system?
 - Check signage around the site:
 - Does it convey the health and safety risks?
 - Are fire exits clearly marked?
 - Are there demarcated routes for pedestrians and vehicles painted on floor?
 - Is fire fighting and first aid equipment available?
 - Check the age and condition of equipment, look for signs of wear and tear, degradation, leaks and breaks;



- Check that solid temporary waste storage collection and disposal is carried out according to the legal requirements;
 - Check that waste collection takes place on a regular basis and that temporary waste storage areas are clean of debris;
 - Review measures of controlling dust and VOC emissions from the plant (ovens and boiler emissions);
 - Check for automatic safeguards on machinery to prevent accidental injury;
 - Have there been any recent (within last three years) incidents on site such as fatalities, fires/explosions, spills? Are there insurances in place to cover such incidents?
 - Have the premises been inspected recently (within the past 2 years) by the regulatory authorities for health, hygiene and environment? What were their findings?
 - Does the company has environmental policy and does the business plan have line items for environment, hygiene, health and safety improvements?
 - Check the conditions and duration of validity for all permits.
- receive written details of hours worked and payment received;
 - Check that wages and working hours are consistent with the average for the sector and national standards;
 - Has the Company received inspections from the local labour inspectorate in the previous three years? Have these resulted in any penalties, fines, major recommendations or corrective action plans?
 - Does the organisation have a grievance mechanism which allows employees to raise workplace concerns?
 - Are employees free to form, or join, a worker's organisation of their choosing?
 - Consider installing product traceability systems that facilitate tracing and recall of products once released for sale.
 - Does the organisation have insurance in place to cover the recall of contaminated products? Have there been any recent product recall incidents? What other insurances does the company have in place?
- Take note/ask questions relating to any activities that address the improvements listed in the improvements section of this document.

Social, Labour and Community

- Check that labour standards, contracting and remuneration are in line with national law and are consistent with the average for the sector;
- Check that hours worked, including overtime, are recorded and staff should

ACTION PLANS

Dependent on the individual business, select appropriate improvements from the list above to include in the action plan. As a minimum, any business should be required to have the following in place:



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- Operational procedures to manage environmental, hygiene, health and safety risks;
- Monitoring programmes;
- Improvement objectives, targets and project plans;
- Training for personnel;
- Regular inspections, checks and audits with records to demonstrate achievement of the required level of performance against legal requirements and improvement action;
- Emergency plans for environment, health and safety accidents;
- Emergency plans for product recall.



European Bank
for Reconstruction and Development

Sub-sectoral Environmental and Social Guidelines: Bakery Products

REFERENCES AND OTHER SOURCES

European Bank of Reconstruction and Development (EBRD). Environmental and Social Policy May 2008. Performance Requirement 2: Labour and Working Conditions. <http://www.ebrd.com/enviro/tools/index.htm>

European Union (1994), European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31994L0062:EN:HTML>

European Union (2005), Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques in the Food, Drink and Milk Industries, December 2005

European Union (2008), Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (Codified version) Text with EEA relevance, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:024:0008:01:EN:HTML>

European Union, Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work (seventh individual directive within the meaning of Article 16(1) of Directive 89/391/EEC), <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0054:EN:HTML>

FAO and WHO (Food and Agriculture Organization and World Health Organization).1962–2009. Codex Alimentarius. Geneva: FAO and WHO, http://www.codexalimentarius.net/web/index_en.jsp

International Organisation for Standardisation (ISO) www.iso.org
ISO22000:2005: Food Safety Management System – Requirements for any organisation in the food chain. Geneva ISO; and
ISO14001:2004: Environmental Management Systems – Requirements with Guidance for use. Geneva: ISO.

United Kingdom Environment Agency (2003), Food and Drink Sector Guidance Note, IPPC S6.10, Issue 1, October 2003

United Kingdom Federation of Bakers (2007), <http://www.bakersfederation.org.uk>, accessed 14/11/08

United Kingdom Health and Safety Executive (HSE), Food and Drink Manufacture, <http://www.hse.gov.uk/food/index.htm>