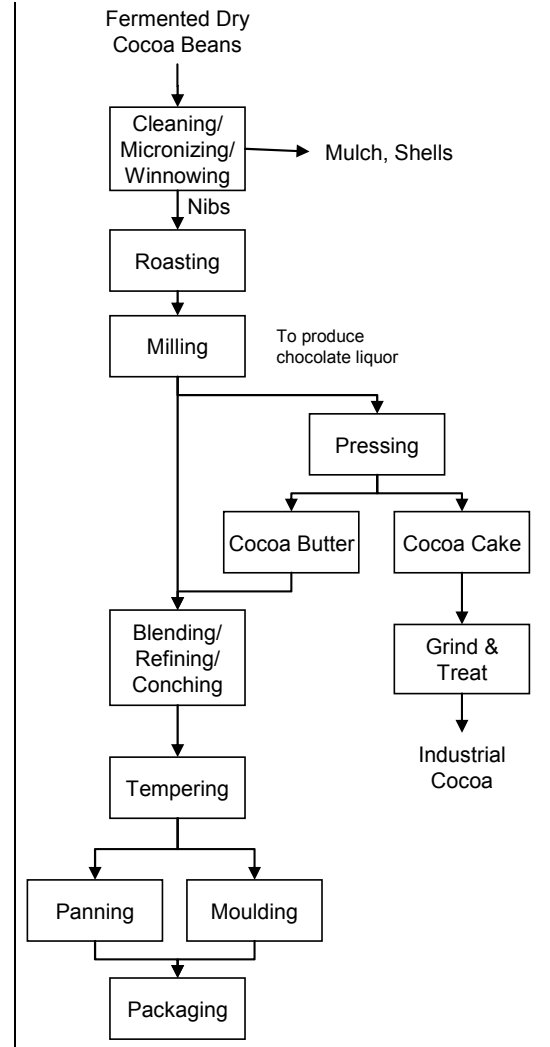




## PROCESS DESCRIPTION

The confectionery market is divided into three main segments: chocolate, sugar confectionery and gum manufacture.

Chocolate is made from the dried, fermented beans of the cacao tree. The beans are cleaned, shelled, roasted, the inner part (the nib) is ground, and refined to produce cocoa liquor from which cocoa butter, powder and chocolate can be made. Further mechanical processes are used to affect the texture of the chocolate. Sugar, other sweeteners, flavourings, nuts, fruits, and potassium carbonate may be added before the chocolate is poured into moulds, cooled and packaged.



Sugar confectionery is made by dissolving sugar in water or milk to form a syrup, which is boiled until it reaches the desired concentration or starts to caramelize. The type of confectionery produced depends on the ingredients and how long the mixture is boiled.

Chewing and bubble gums are made from natural or synthetic gums that are ground, cooked, mixed with flavourings, rolled, cut and packaged.

The packaging may be automated or carried out by hand. The finished products are often kept in cold storage facilities prior to distribution.

**KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES**

### *Product Contamination*

Confectionery products can become contaminated as a result of:

- Contamination of the raw materials with chemicals such as pesticides;
- Poor food hygiene standards within the processing operations, e.g. unclean machines, unhygienic handling. Factory hygiene standards should prevent the spread of diseases such as salmonella, Escherichia coli (E. coli) and Legionnaires' disease inside the factory.

Screening of raw materials will identify any incoming contaminated raw product and food hygiene standards will need to be considered in order to reduce the risk of contamination.

A system of product quality testing and traceability should be considered to enable product recall if required. In some territories, this may be mandatory.

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

Critical Control Points (HACCP)<sup>1</sup> and Codex Alimentarius<sup>2</sup>.

### *Wastewater Treatment and Discharge*

Liquid raw materials and wastewater produced during the confectionery manufacturing process are likely to have a high organic content, particularly sugars and vegetable fats. Should effluent containing these materials be discharged untreated into water courses it can cause pollution.

Containment of raw materials, product storage and process areas are necessary to prevent spillages entering water courses or the public sewer.

Typically, authorities require treatment of such wastewater before it is allowed to enter natural watercourses. For plants located near urban areas, the effluent is either treated at the plant or discharged to municipal waste water treatment systems. In rural areas, the effluent may be irrigated to land. Contaminants in the effluent may impact groundwater quality.

Large facilities are likely to have been issued with a permit from the local regulatory authority, which specifies limits for various contaminants. These permits may apply to effluent discharges to sewer and to surface water.

### *Water supply*

Large volumes of water are needed for cleaning process equipment and work

<sup>1</sup> ISO 2005

<sup>2</sup> FAO and WHO (1962–2009).

areas to maintain hygiene standards, for cooling and for production purposes. The amount of effluent generated is closely related to the volume of water consumed for these processes.

Where water abstraction takes place it is typical for abstraction or water use permits to detail volumes of water abstraction allowed as over abstraction can impact local communities. Where ever changes take place in product volumes this should be reflected in the permit.

### ***Energy Consumption***

Confectionery factories consume large quantities of energy (gas, electric or diesel) for running electric motors on process equipment, for roasting, liquefying, cooking and cold storage.

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. Territories which have programmes to reduce energy/carbon emissions may require (via environmental permits) require the organisation to reduce emissions.

### ***Solid Waste***

Large volumes of waste will be generated in the form of

- Cocoa shells and other debris removed during cleaning of raw ingredients;

- Organic food waste generated as off-cuts, other production waste, or below quality confectionery;
- Packaging arising from raw materials delivery i.e. sacking, paper, cardboard and mixed solid waste consisting of board, metals, plastics, vehicle batteries;
- Sludge from wastewater treatment.

The majority of the organic waste can be composted for use as soil improver.

Solid wastes should be stored in adequate containers and segregated where possible to encourage recycling. Solid wastes will need to be disposed of regularly to avoid odour, litter, fly and rodent problems.

### ***Packaging***

Packaging is used to preserve and protect the confectionery product from contamination and damage during transport but also to market the product. In particular, premium and luxury products typically use large quantities of packaging compared to the volume of edible product it contains.

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 & Packaging Waste Directive (94/62/EC), which aims to reduce the amount of packing that is being introduced into waste streams.

### ***Dust and Aerosols***

Dust may arise from cleaning, storage and handling activities; aerosols typically arise 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. When combined with high levels of humidity they may give rise to skin irritation or allergic reactions.

Powder-based raw materials (in particular, sugar) represent a fire or explosion risk if inadequately stored and handled. Storage areas should be fitted with explosion and fireproof equipment, where necessary.

### ***OTHER KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES***

### ***Permitting***

Operations within the EU with a finished product production capacity greater than 300 tonnes per day will be subject to national regulations under the Integrated Pollution Prevention and Control Directive (2008/1/EC), which requires the use of the best available techniques and a programme of continuous environmental improvement. 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 techniques to be adopted.

### ***Refrigerants***

Cold storage may be used to preserve the products. The refrigerants used may be ozone depleting chemicals, such as Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs), the production of which are being phased out under the Montreal Protocol. Releases of these types of refrigerant gases should be avoided. Ammonia is becoming a more commonly used alternative refrigerant, which has no such restriction but does have health and safety issues.

### ***Storage Issues***

Raw ingredients, chemicals for cleaning and fuel oil may all be stored on site in bulk storage tanks, fuel oil tanks; and drums of assorted additives, caustics, disinfectants, detergents and cleaning agents.

These storage facilities should be provided with satisfactory containment (concrete walls/bunds, recessed drainage gullies connected to effluent treatment areas) to ensure that spillages do not enter the surface water drainage systems or leak direct to the ground. Alarms may be fitted on equipment to detect leakages of gas or oil.

### ***Hazardous Substances***

Workers may be exposed to hazardous substances (liquids and gases) typically during cleaning and disinfecting of process areas and in the maintenance of heating and cooling systems.



Ammonia, which is commonly used as a replacement for Chlorofluorocarbons (CFCs) in refrigeration systems, is toxic if inhaled at high concentrations and can cause frostbite when released to the atmosphere.

Facilities using ammonia refrigeration should be aware of the potential hazards of ammonia releases and of the steps that can be taken to prevent such releases. They should be prepared to respond appropriately if releases do occur.

### ***Polychlorinated Biphenyls (PCBs) & Asbestos***

Neither Polychlorinated Biphenyls (PCBs) nor asbestos are likely to be principal issues of concern in relation to confectionery manufacturing facilities, however either material may be present and may therefore pose some potential for environmental and health and safety impacts. With respect to these materials, particular attention should be paid to facilities constructed prior to the 1980's.

- PCBs are a group of substances which are good electrical insulators and typically PCBs may be present as constituents of hydraulic oils or dielectric fluids in electrical switchgear, transformers and fluorescent light starters.
- 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 pipe work and

as fire retardant insulation around boilers and furnaces.

### ***Slips, Trips and Falls***

The high volume of water and other liquid substances used within dairy processing lead to a high risk of slips, trips and falls where leaks and spills have not been cleaned up or where cleaning of process areas is taking place.

Vats and tanks used for mixing raw materials and storage provide hazards in the form of working at height, which could result in falls and asphyxiation (immersion).

### ***Manual Handling and Repetitive Work***

Lifting, repetitive work and posture injuries occur as a result of lifting and carrying heavy or awkward shaped items, lifting of boxes and manoeuvring carts/manual forklifts within the plant. Repetitive tasks such as packing 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.

### ***Noise***

Noise induced hearing loss can occur from working in noisy areas, e.g. hopper feeds, mould shakers, packaging machinery.

### *Sharp Edges and Machinery*

Sharp tools are used to process confectionery including mixers, cutters and packaging equipment. All equipment should have safety guarding and workers should be issued with appropriate personal protective equipment to protect against unavoidable sharp items and edges.

### *Temperature*

- High temperatures can lead to collapse through heat exhaustion and contact burns and scalds.
- Refrigeration systems will result in very cold temperatures, which can result in frostbite and contact burns.

### *Forklift truck Operation Injury*

Forklift trucks are a potential danger to their operators and to other people in the vicinity if not operated with great care. Risks include being struck by a moving truck, crushed by an overturning vehicle, becoming trapped between a truck and an object or, being crushed by a falling load.

**KEY SOCIAL, LABOUR AND COMMUNITY ENVIRONMENT, HEALTH AND SAFETY RISK/LIABILITY ISSUES**

### *Hygiene*

Factory hygiene standards should prevent the spread of diseases such as salmonella, Escherichia coli (E. coli) and Legionnaires' disease beyond the factory boundaries, for example to the local

surrounding community and/or consumers. 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.

### *Child Labour*

Child labour, (labour that is mentally, physically, socially or morally dangerous and harmful to children and interferes with their schooling) is frequently used to grow and harvest cocoa beans in developing countries. Responsible manufacturers are now seeking to work with their suppliers to eliminate the reliance on such child labour.

### **OTHER SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES**

#### *Noise*

Noise generated by the movement of traffic to and from the plant, particularly during the night, may be an issue in populated areas.

#### *Odours*

Although the odours associated with confectionery manufacturer are generally not considered offensive<sup>3</sup>, odour can be a significant nuisance issue for neighbouring facilities and residential areas due to poor

<sup>3</sup> UK EA (2002)

housekeeping and inadequately operated wastewater treatment plants. The installation of odour control equipment may incur significant expenditure depending upon the location of the facility. Odour reduction and prevention is much more cost effective than end of pipe control.

### *Transport*

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

### **FINANCIAL IMPLICATIONS**

- The quality of the final product determines which countries the product may be exported to. Product contamination may affect the viability of the business. Consumer awareness of the quality of ingredients and the use of natural ingredients, particularly in countries which the product may be exported to may influence the choice of ingredients used depending on the end market.
- Environmental standards for water supply, effluent control and treatment or waste disposal may require capital investment in new treatment equipment or increase operating costs on an ongoing basis. Non-compliance may result in significant fines.
- Contamination of the site or ground water may result in expenditure on site clean up or reduced asset value.
- Legislative requirements to recycle used packaging in countries to which product is exported may increase cost of sales or require modifications to product or packaging design and materials.
- The continued use of inefficient technologies can represent increased operating costs for organisations. Therefore investing in technologies which generate less waste and residues, reduce operating inefficiencies and lead to lower emissions of environmental contaminants is likely to reduce operating costs for an organisation.
- International organisations are increasingly insisting higher quality standards from their supply chains. For example requiring ethical and sustainable sourcing for raw materials, reducing carbon footprint, reducing the environmental impacts of the processes in use, and ensuring that working environments are hygienic and safe, and that all workers are treated fairly and that there is no child labour in use. Not adhering to the requirements of these types of organisations could cause the organisation to lose market share.

### **IMPROVEMENTS**

Potential environmental improvements include:

#### ***Environmental Improvements***

- Organic solid wastes may be sold as animal feed. Recycle of confectionery returned as un-saleable.
- Ensure that packaging is either recovered or capable of being recycled;
- Increased monitoring and control of effluent discharges;
- Collection of organic wastes for use as animal feed;
- Installation or upgrade of effluent treatment plant;
- Optimisation of use of water and cleaning chemicals; recirculation of cooling waters;
- Segregation of process, cooling and sanitary effluent to enable recycling of waste water;
- Use taps with automatic shutoff valves and use high pressure hoses and optimised nozzles to minimise water usage;
- Recover energy using heat exchangers for cooling and condensing;
- Insulate refrigeration rooms; consider automatic door closures and alarms to prevent chill room doors being left open;
- Implement procedures which ensure regular inspections of surface and foul drainage systems, soakaways, fat traps and interceptors etc.;
- Implement waste management systems which are safe, hygienic, secure from scavenging and minimise manual handling;
- To maintain hygiene standards establish clear, effective and practical waste management procedures;
- Consider changes to non-CFC coolants and /or sealing of leakages in the refrigeration system;
- Undertake continuous sampling and monitoring of key production parameters to enable identification and reduction of production loses, thereby reducing waste arisings, energy and water consumption.
- 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; the training should include the reasons for its use and the dangers of not using it. PPE should be inspected regularly and maintained or replaced as necessary;
- Take measures to avoid spillages and leakages onto floors and walkways,

- ensure there is a system for cleaning spillages;
- Walking and working surfaces should be kept clean and dry and workers provided with anti-slip footwear. Restrict access to areas being cleaned or where spillages have occurred. Floor cleaning should be scheduled for a time when work is not in progress or has finished for the day and the floor should be dried as much as possible;
  - Handrails should be fitted on platforms, ladders and stairs;
  - Eliminate the need to work at height or at the top of tanks, e.g. install automatic tank sampling. Ensure correct fall arrest systems are in place, e.g. guarding and harnesses;
  - Redesign manual processes to avoid heavy lifting/repetitive activities. Where this is not possible install mechanical lifting aids and rotate work tasks to avoid repetitive tasks;
  - Separate work and welfare facilities should be provided to maintain worker personal hygiene;
- To safeguard against the dangers posed by forklift trucks, companies must ensure they assess the risks involved in any use of these vehicles and take appropriate steps to counter those risks.
- Use of licensed/certified forklift truck operators is mandatory in some countries
- Vehicle routes and movements need to be planned to ensure segregation from pedestrians. Ideally areas where vehicles are manoeuvring should be made pedestrian free.
  - All operators of machines need to be competent and trained on the individual characteristics of machines they are expected to operate.
  - Separate people from moving equipment:
    - Redesign process layout to reduce crossing paths to avoid collisions and falls;
    - Separate transport corridors and working areas to reduce risk of collision;
    - Provide appropriate signage for segregating people and vehicles
    - Install correct guarding of machinery to reduce risk of entrapment;
  - Improve signage to give clear warnings and instructions e.g. health and safety, waste segregation and minimisation; fire exits.
- Social, Labour and Community Improvements***
- Implement a food safety programme to maintain or improve food hygiene standards and to enable product traceability.



### **GUIDE TO INITIAL DUE DILIGENCE SITE VISITS**

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

#### ***Environment, Health and Safety***

- Confirm organisational responsibilities and systems for environment, health and safety;
- Check the condition of wastewater treatment plant and location of discharge points for wastewater from the facility. Note the colour and appearance of adjacent watercourses;
- Note whether the wastewater treatment plant discharges to a local watercourse or the municipal wastewater treatment works. Higher risks will be associated where waste water is directed to water course rather than a sewer;
- Check the condition of storage facilities for chemicals;
- Discuss the procedures and controls around screening of raw materials and products for potential contamination, in particular, which contamination parameters are analysed (e.g. 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 fat and oil 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;
- Observe food hygiene standards at the facility and the results of previous food hygiene inspections, e.g. Separate welfare areas for workers; Are staff are wearing PPE?; Does the organisation have systems in place to support food traceability;
- Check signage around the site:
  - Does it convey the health and safety risks?
  - Are fire exits clearly marked?
  - Are there separate 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 waste storage and disposal (storage equipment) is in a good condition;
- Check that waste disposal takes place on a regular basis;

- Check that waste storage areas are clean of debris and that skips covered to prevent waste escaping, for example, check that waste containers have lids or are stored in an area with a roof;
  - Have the premises been inspected recently (within the past 2 years) by the regulatory authorities for health, hygiene and environment? What were their findings?
  - Review measures of controlling the odour coming out from the plant.
  - 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?.
  - Is the facility subject to any audits by customers? What was the outcome of these audits?
  - Does the business plan have line items for Environment, Health and Safety improvements?
  - Check the conditions and duration of validity for all permits;
- consistent with the average for the sector.
- Check that hours worked, including overtime, are recorded and staff should receive written details of hours worked and payment received.
  - 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?
  - Does the organisation have insurance in place to cover the recall of contaminated products? Have there been any recent product recall incidents?
- Take note/ask questions relating to any activities that address the improvements listed in the improvements section of this document.

### ***ACTION PLANS***

#### ***Social, Labour and Community***

- Check that labour standards, contracting and remuneration are in line with national law and are

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

- Operational procedures to manage environmental, health & 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 & safety and hygiene accidents;
- Management review/demonstrated involvement in environment, health & safety and social management

### **REFERENCES AND ADDITIONAL SOURCES**

CAOBISCO, Association of chocolate, biscuit and confectionery industries of the European Union, <http://www.caobisco.com/>

European Bank for Reconstruction and Development (EBRD) (2008), 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, <http://eippcb.jrc.es/pub/english.cgi/0/733169>

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>.

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](http://www.codexalimentarius.net/web/index_en.jsp)

International Cocoa Initiative, <http://www.cocoainitiative.org/a.html>

International Confectionery Association <http://www.international-confectionery.com>

International Organisation for Standardisation (ISO) [www.iso.org](http://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.

UK Environment Agency (2002), Technical Guidance Note IPPC H4 Integrated Pollution Prevention and Control (IPPC) DRAFT Horizontal Guidance for Odour Part 1 – Regulation and Permitting

UK Health & Safety Executive (HSE), Prevention of dust explosions in the food industry: <http://www.hse.gov.uk/food/dustexplosion.htm>



**European Bank**  
for Reconstruction and Development

## **Sub-sectoral Environmental and Social Guideline: Confectionery**

UK HSE 1997, Priorities for health and safety in the cocoa, chocolate and sugar confectionery industries, Food Sheet No 9, <http://www.hse.gov.uk/pubns/fis09.pdf>.