



Hygienic design of machinery in the food and drink industries

Food Information Sheet No 24

Introduction

This information sheet is for manufacturers, suppliers and those who modify or directly import their own food processing machinery into Britain. It covers legal duties for minimising microbiological foreign body and chemical risks to food consumers through hygienic design. The guidance will also be relevant to the food and drink industry generally, regarding duties to specify and select suitable machinery when making purchases.¹ Advice is given on how to approach hygienic design issues and sources of assistance are listed.

The guidance has been agreed between HSE, the Food Standards Agency, and user and manufacturer trade associations.

The need to consider hygienic design

The need to consider hygienic design at the specifying (if purchasing) and designing (if manufacturing) stages is now crucial as users face increasing potential problems from loss of product through spoilage, food safety fears and loss of market confidence. Their prime needs are ease of access and ease of cleaning.

Under the Machinery Directive, since 1995 machinery makers/suppliers throughout Europe have been required to meet certain essential hygiene design requirements, declare conformity to the Directive and CE mark machinery used to process food and drink for human or animal consumption. HSE is the enforcing authority for hygienic design issues for machinery designed for use at work under the Supply of Machinery (Safety) Regulations 1992.² Local authority food safety inspectors are responsible for enforcement of food safety legislation on the users of such machinery but have been asked to inform HSE if there are significant defects in hygienic design of machines or makers' instructions to users.

Hazards

Food safety hazards can arise from:

- microbiological causes such as pathogens, spoilage organisms or toxins;
- chemicals such as cleaning agents, disinfecting agents and lubricants;
- foreign bodies such as raw materials, pests and materials used in the construction of the machinery.

How to approach hygienic design

Machinery makers/suppliers

A risk assessment should be undertaken by the machine manufacturer at the design stage as different products at different stages of processing give rise to different levels of food safety risk and need different levels of rigour in engineering the hygiene controls. Low-risk product/process machinery may need only to partially conform to best engineering practice. However, high-risk product/process machinery will need to fully conform to design requirements set in Standards (see References) and operate within set heat, chemical or physical treatment limits and require planned disassembly for cleaning. A categorisation scheme is given in the draft ISO Standard.³ See 'Sources of assistance' towards the end of this information sheet.

Hygienic risk factors to consider

- Purpose of the machine - is it intended for a single type of food?
- Nature of the food - is it raw material or ready for consumption?
- Stage of processing - will the machine only handle raw materials or produce the final product?
- Stage of the food - will it be consumed immediately or have a defined shelf life?
- Consumer of the food - is the food intended for vulnerable groups such as children or the elderly?
- Market - is the food intended for local or international markets?
- Use of the machine - will it be used infrequently, or be in continuous use?
- Cleaning and inspection - will this be done routinely during the day or once a week?

Machinery users

Intending users of equipment will be undertaking their own analysis of food safety risks which can help them decide the hygienic design risk specification they need. Users will need to ensure there is a good match between the level of good hygienic design they need in the process for the product and the level of hygienic design offered by the equipment. Ideally, users should

set a specification for the supplier or maker to match. However, if this is not possible, and for series production machines, the maker can specify the risk levels the machine has been designed for through limits of intended use and safe applications. It is then down to the user to select only suitable machinery for use.

Hygienic design priorities

Those machines for products and processes which pose the highest food safety risks to consumers need to have their hygienic design needs considered more rigorously and in more depth.

British experts currently consider the main hygienic design priorities to be any machinery, and its cleaning-in-place (CIP) system, which is intended or could be used for:

- liquid filling, especially in the dairy industry;
- dairy products;
- cooked meat;
- short shelf-life, chilled foods;
- finished salads;
- conveyor systems for unpacked product;
- meat slicers;
- ice cream production post-pasteurisation;
- cold fill, cook-in sauce lines;
- cook chill production;
- sandwich manufacture;
- pork pie and pastry production; and
- dust control units and silos (infestation risks).

Hygienic design principles

The broad principles can be summarised as follows:

- firstly, establish whether the food safety risk can be eliminated by design and construction methods which are state of the art;
- if not, reliance has to be placed on cleaning and disinfection regimes - these need to be given to the user in instructions from the maker and the machine designed to allow easy and effective cleaning;
- if not, limitations need to be given in instructions to the user on use of the machine (temperature, product etc).

Some general design pointers

Do's:

- Ensure that the materials and surfaces food will come into contact with are suitable (eg corrosion-resistant, non-absorbent, unpainted and easy to clean) - such materials must not be likely to break, crack or fracture in normal use.
- Ensure surfaces food will come into contact with are made of non-toxic materials which will not transfer any odour, taint or taste to the product.
- Ensure permanent joints are smooth where joints are in the same plane or curved where they are not.
- Ensure dismountable joints have a true and hygienic fit.
- Ensure projections, edges and recesses are kept to a minimum.
- Ensure internal curves allow thorough cleaning and, where necessary, disinfection.
- Ensure all fluids, including those from foods and cleaning the machine, can be easily discharged from the machine.
- Ensure shafts and seals are self- or product-lubricated or use food grade lubricants - ensure they can be cleaned and, where necessary, disinfected.
- Ensure appropriate materials are used in the machine construction - there may be a balance between ease of access for effective cleaning indicating ordinary steel could be used and lack of such access (eg in enclosed plant) indicating stainless steel could be used.⁴

Don'ts:

- Don't allow dead spaces or bends in pipework in the food area which allow product to accumulate - if this is unavoidable, then ensure good drainage and cleanability.
- Don't allow bearings in the food area unless this is unavoidable - use food grade lubricants and ensure cleanability and, where necessary, disinfectability.
- Don't use screws, screwheads and rivets in contact with food.
- Don't allow liquids, pests or organic matter to enter parts of machines which cannot be cleaned.
- Don't allow ancillary substances (eg lubricants) to come into contact with the food.

Further guidance on hygiene design principles is given in European Standard BS EN1672-2: 1997.⁴ This Standard defines food areas, splash areas and non-food areas and the types of design suitable for each; it contains 16 pages of illustrations. Machine-specific European Standards (eg BS EN 1974: 1998: *Food slicing machines*) set out the design requirements for individual types of machines. Following such Standards is not mandatory, but they give practical guidance on how to meet the Machinery Directive's requirements and using them gives a presumption of conformity.

Instructions to the user

Machinery must be supplied with instructions to the user which include specifying the cleaning regimes and materials and safe methods of dismantling, cleaning (disinfecting) and rinsing the machine, including any internal pipework. BS EN 1672-2 gives details on verification tests and on what instructions need to cover.

Verification/checking

Food/drink machine makers must verify that machine design meets the needs of the hygiene risk assessment. This can be done by undertaking specific hygiene tests (where available) and, where not, by reconsidering the specifications, drawings and the fabricated machine. Only circular saws used on meat products must be submitted to a third-party test house under the Machinery Directive but makers can voluntarily consult third parties for their reassurance. Makers must follow the Directive conformity assessment and documentation procedures.⁵ Users should check that machinery supplied meets their original specification and is safe.

Safety considerations

The hygiene risk assessment should also identify and resolve any situations where there might be a conflict between safety and hygiene. European agreement (see BS EN 1672-2) records that there should not be many occasions when a solution cannot be found which satisfies both safety and hygiene objectives. This may mean a less obvious route than might have been adopted to meet a hygiene or safety need alone on occasions. Where frequent access is needed for blockage clearance or cleaning etc, then hinged interlocked guards should be used. The only type of interlock switch which meets both safety and hygiene objectives for food areas is a coded magnetic switch. Sometimes hygienically designed fixed guards can be hosed through, eg mesh guards at a suitable safety distance beneath conveyors.

Sources of assistance

CCFRA: Campden and Chorleywood Food Research Association, Chipping Campden, Gloucestershire GL55 6LD (Tel: 01386 842000). This research association runs

courses on hygiene in engineering. It has also been accredited by BSI to test hygiene design conformity under the Machinery Directive.

EHEDG: European Hygienic Equipment Design Group. This consortium of equipment manufacturers, food producers and research associations produce best practice guideline documents within the EU. A list is available from the EHEDG Secretariat, NSF International, Avenue Grand Champ 148, 1150 Brussels, Belgium.

References

- 1 *Effective purchasing procedures for equipment in the food and drink industries* INDG323 HSE Books 2000
- 2 The Machinery Directive (98/37/EC). Implemented in Britain as the *Supply of Machinery (Safety) Regulations 1992* SI 1992/3073 Stationery Office 1992 ISBN 0 11 025719 7
- 3 Draft International Standard ISO/DIS 14159: *Safety of Machinery - Hygiene Requirements for the Design of Machinery* BSI
- 4 BS EN 1672-2: 1997 *Food Processing Machinery - Basic Concepts Part 2: Hygiene Requirements* BSI
- 5 *Supplying new machinery* INDG270 1998 HSE Books Single copies free, multiple copies in priced packs ISBN 0 7176 1560 X
- 6 *Buying new machinery* INDG271 HSE Books 1998 Single copies free, multiple copies in priced packs ISBN 0 7176 1559 6
- 7 *Hygienic Design of Liquid Handling Equipment* Technical Manual No 17 CCFRA (see 'Sources of assistance')
- 8 *Hygienic Design of Equipment for Open Processing* European Hygienic Equipment Design Group. EHEDG Guideline Document No 13. Available from CCFRA (see 'Sources of assistance')
- 9 *Food Safety (General Food Hygiene) Regulations 1995* (makes broad reference to duties on users concerning construction of food equipment) SI 1995/1763 Stationery Office 1995 ISBN 0 11 053227 9
- 10 EC Directives on food contact materials: implemented in UK by The Materials and Articles in Contact with Food Regulations 1987, as amended. An explanatory note is available from Food Standards Agency, Room 216, PO Box 31037, London SW1P 3WG

While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

Further information

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA. Tel: 01787 881165 Fax: 01787 313995. Website: www.hsebooks.co.uk

HSE priced publications are also available from good booksellers.

British Standards are available from BSI Customer Services, 389 Chiswick High Road, London W4 4AL. Tel: 020 8996 9001 Fax: 020 8996 7001.

The Stationery Office (formerly HMSO) publications are available from The Publications Centre, PO Box 276, London SW8 5DT. Tel: 0870 600 5522 Fax: 0870 600 5533. They are also available from bookshops.

For other enquiries ring HSE's InfoLine Tel: 08701 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ. Website: www.hse.gov.uk

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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