



## Packaging machinery: Safeguarding pre-formed rigid container packaging machines

### Food Information Sheet No 28

#### Introduction

This information sheet gives practical advice on safeguarding at machines that pack product into pre-formed rigid containers. It also includes guidance on associated machinery that manipulates, cleans, inspects, pasteurises, sterilises and labels the containers, as well as machinery that crates or cases them.

HSE investigated 45 serious accidents on this category of machine between 1997 and 2001. They were the second-highest cause of investigated packaging machinery accidents for that period.

The advice in this guidance is based on the requirements of Provision and Use of Work Equipment Regulations 1998 (PUWER) and on BS EN 415-2: 2000 *Safety of packaging machines - Part 2: Pre-formed rigid container packaging machines*.

#### Hazards

##### **Mechanical hazards**

The main hazards of rigid container packaging machinery and associated equipment are mechanical. Moving parts give rise to shearing, puncture, cutting and entanglement hazards. There are also hazards from ejection of containers or parts of containers, particularly where pressurised filling is carried out.

##### **Other hazards**

Other hazards include:

- electrical shock, eg during pressure washing;
- thermal hazard, eg hot surfaces;
- noise;
- radiation hazards:
  - ionising, eg fill level gauges;
  - non-ionising, eg laser etching; and
- chemical hazard from contact with cleaning solutions.

The wide range of machinery covered by BS EN415-2 means that the standard may not cover every circumstance. The standard contains reference to a

large number of hazards but there may be additional hazards on individual machines. These should have been identified in the design risk assessment and appropriate safeguarding provided.

#### **New and existing machinery**

The full range of hazards on new pre-formed rigid container packaging machines should be safeguarded using techniques described in BS EN415-2: 2000, as summarised later in this information sheet. Purchasers should specify in the purchase contract that, as a minimum, the machinery meets the requirements of this standard and should check on delivery that the Declaration of Conformity confirms this.

Existing machinery is subject to the Provision and Use of Work Equipment Regulations (PUWER) 1998 and should be suitable for its purpose, properly maintained, and safe to use and clean.

Users should use the safeguarding standards set out in BS EN415-2: 2000 as a benchmark for existing machines. Where the standard of safeguarding is found to be lower than for new machines, a risk assessment should be carried out to see if it is reasonably practicable to upgrade the guarding. Improvement may be needed in basic hardware, systems of work and in training and supervisory procedures.

All improvements should form an integrated package since improved guarding alone may lead to tampering if there is a significant increase in the difficulty of carrying out production and maintenance tasks.

Where improved safeguarding is required, this should be carried out as soon as possible. Until then, such machines should only be used under safe systems of work arrived at by risk assessment that deals with the risks arising from the safeguarding deficiencies.

#### **Safeguards for mechanical hazards**

Where possible, all mechanical hazards should be avoided by design. Where this is not possible, the following measures should be used:

- fixed guards;
- interlocked guards;
- electrosensitive protective equipment (ESPE);
- adjustable guards; and
- protective structures.

BS EN 294:1992 *Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs* should be consulted in relation to safety distances for guards.

On some machines, such as high-speed rotary machines and packing or unpacking transfer mechanisms, the operation of an emergency stop or a power failure can cause a loss of operational stability or the dropping or breaking of a container. Machines should be designed so that unwanted movement is avoided (by balancing rotating parts or suitable anchoring) and falls of material or machine parts are either prevented or contained.

Where cutting tools form part of the machine mechanism, they must be capable of being removed and replaced safely. This may require the provision of, for example, jigs or attachments.

### **Safeguards for other hazards**

#### ***Electrical***

Electrical equipment should have appropriate ingress protection (IP) to the standards laid out in BS EN 60529: 1992 *Specification for degrees of protection provided by enclosures (IP Code)*. Control gear should be to IP54 and control devices to IP55 as minima. Where control devices are installed where they might be cleaned by water, the minimum should be IP65.

#### ***Thermal***

Surfaces that reach a temperature of over 65°C should be guarded or insulated to prevent burns. Where appropriate, a pictogram or warning label with the word 'HOT' should be fitted as a warning.

#### ***Noise***

Noise hazards should be addressed at the design stage and should be reduced to the lowest level commensurate with technical progress and the state of the art. Typical achievable noise levels for glass bottling and associated processes vary with throughput but range from around 88 dB(A) at unscrewing machines to about 83 dB(A) at packing and unpacking machines.

#### ***Radiation***

Ionising radiation exposure from inspection devices and non-ionising radiation from etching/coding devices should be reduced to a level such that the devices can be assigned to Category 0 or 1 as defined in clause 7 and Annex D of EN 12198-1: 2000 *Safety of machinery. Assessment and reduction of risks arising from radiation emitted by machinery*.

### **Chemicals**

Chemical hazards should be dealt with by good design and compliance with the Control of Substances Hazardous to Health Regulations 1998 (COSHH).

### **Machine-specific safeguards**

In addition to the general standards for safeguarding, BS EN 415-2 requires additional safeguards on certain machines to deal with machine-specific hazards:

#### ***Filling machines (other than machines for filling kegs, casks and barrels)***

The powered filling nozzle should be safeguarded by fixed or interlocked guards or by a sensing device that will retract the nozzle should it meet an obstruction.

#### ***Seaming/sealing stations***

The sealing/seaming stations should be fitted with interlocked guards.

#### ***Cap presses***

The trapping and shearing hazards should be safeguarded with interlocked guards.

#### ***Corking machines***

Fixed or interlocked guards are required at the hazard between the corking head and the containers.

#### ***Cap hoppers***

Automatic feeders should be provided, but where they are not, safe working platforms and access should be provided for operators.

#### ***Washing and rinsing machines (other than machines for cleaning kegs, casks and barrels)***

Depending on the conclusion of a risk assessment, the feed and discharge stations may be safeguarded either by interlocked guards or optoelectronic devices in accordance with EN 61496-2: 1997 *Safety of machinery. Electrosensitive protective equipment. Particular requirements for equipment using optoelectronic protective devices*. Where inspection points are used for access, fixed or interlocked guards should be provided.

Risks from hot and/or toxic cleaning solutions should be removed by including a suitable time delay with guard locking to ensure depressurisation or draining of the liquid.

### ***Label presses and scrapers***

Label presses should be fitted with interlocked guards. The machine should allow waste to be taken away safely.

### ***Double-ended container-cleaning machines***

Emergency stops should be fitted at both feed and discharge ends and there should only be one effective start control.

### ***Linear- and rotary-rinsing and air-cleaning machines***

The transport mechanism should be safeguarded with fixed or interlocked guards, as should areas where there is a risk of airborne debris.

### ***Linear- and rotary-labelling machines***

Where there are multiple labelling stations, the guards at the stations should be interlocked.

### ***Oscillating labelling machines***

Fixed or interlocked guards should be used to cover the hazard of the oscillating magazine.

### ***'Roll through' can-labelling machines***

Where there is an injury risk, fixed or interlocked guards should be used.

### ***'Hot-melt' adhesive labellers***

Fixed or interlocked guards should be used to prevent injury from ejection of hot glue. Where a separate isolated power supply is used, there should be a warning label with the words 'Warning-separate power supply'.

### ***Laser-coding machines***

If dust and fumes are generated, suitable extraction ventilation should be fitted.

### ***Inkjet-coding machines***

Non-flammable inks should be used where possible. Extraction ventilation should be used if there is a likelihood of the flammability or toxicity limits being exceeded.

### ***Decapping/unscrewing machines***

Fixed guarding, interlocked guarding or optoelectronic devices should be used except in multi-head machines, where only fixed or interlocked guards should be used.

### ***Inspection machines***

Protective structures or fixed and/or interlocked guards should be used to prevent access to hazards. Solid guards should be provided where components or material might be ejected.

### ***Bottle-stopper wiring machines***

Dangerous parts should be safeguarded with fixed or interlocked guards.

### ***Machines for pushing, turning, cleaning and filling barrels, casks and kegs (single-lane plants)***

On automatic machines, the preferred guarding option for these machines is full enclosure by perimeter fencing with fixed guards and interlocked guards for access. Feed and discharge points should be as small as possible and guarded by fixed tunnel-type guards or optoelectronic devices.

On semi-automatic cleaning/filling machines, the clamping force between the clamp and the container should be minimised to only that needed to hold the container in place during cleaning/filling.

On semi-automatic pushing and turning machines, fixed or interlocked guards should be used at hazard areas.

Operation of semi-automatic machines should be by two-hand-control devices.

Leakage of fluid or steam should be prevented by use of spray shields, spray curtains or interlocking of spray heads to ensure the spray head is inside the container when steam or fluid is delivered.

If the pressure of the cleaning medium can dislodge the container, the cleaning machine must provide some means of holding the container in place.

### ***Packing, unpacking and unscrambling machines, and continuous vertical and horizontal sterilising machines***

Depending on the characteristics of the machine, one or more of the following safeguards, listed in order of preference, should be provided:

- fixed and/or interlocked guards;
- electrosensitive protective equipment;
- protective structures;
- two-hand-control devices (but only when a risk assessment has identified a low risk).

## Further reading

### BSI publications

BS EN 415-2: 2000 *Safety of packaging machines - Part 2: Pre-formed rigid container packaging machines*

BS EN 294: 1992 *Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs*

EN 12198-1: 2000 *Safety of machinery. Assessment and reduction of risks arising from radiation emitted by machinery*

BS EN 60529: 1992 *Specification for degrees of protection provided by enclosures (IP Code)*

BS EN 61496-2: 1997 *Safety of machinery. Electrosensitive protective equipment. Particular requirements for equipment using optoelectronic protective devices*

### HSE publications

*Supplying new machinery* Leaflet INDG270 HSE Books 1998 (single copy free or priced packs of 15 ISBN 0 7176 1560 X)

*Buying new machinery* Leaflet INDG271 HSE Books 1998 HSE Books 1998 (single copy free or priced packs of 15 ISBN 0 7176 1559 6)

*Effective purchasing procedures for equipment in the food and drink industries* Leaflet INDG323 HSE Books 2000

*Five steps to risk assessment* Leaflet INDG163(rev1) HSE Books 1998 HSE Books 1998 (single copy free or priced packs of 10 ISBN 0 7176 1565 0)

*Safeguarding flat belt conveyors in the food and drink industries* Food Information Sheet FIS25 HSE Books 2001

*Provision and use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22 (Second edition)* HSE Books 1998 ISBN 0 7176 1626 6

*Application of electrosensitive protective equipment using light curtains and light beam devices to machinery* HSG180 HSE Books 1999 ISBN 0 7176 1550 2

## Other publications

*Product standards: Supply of Machinery 98/644* (Explanatory booklet on the Supply of Machinery (Safety) Regulations 1992). Available from DTI Hotline Tel: 0870 150 2500

*Supply of Machinery (Safety) Regulations 1992* SI No 3073 The Stationery Office ISBN 0 11 025719 7

*Supply of Machinery (Safety) (Amendment) Regulations 1994* SI No 2063 The Stationery Office ISBN 0 11 045063 9

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

British Standards are available from BSI Customer Services, 389 Chiswick High Road, London W4 4AL Tel: 020 8996 9001 Fax: 020 8996 7001 Website: [www.bsi-global.com](http://www.bsi-global.com)

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 Website: [www.clicktso.com](http://www.clicktso.com) (They are also available from bookshops.)

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](http://www.hsebooks.co.uk) (HSE priced publications are also available from bookshops.)

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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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