Sound solutions for the food and drink industries

Reducing noise in food and drink manufacturing

HSG232 (Second edition, published 2013)

This book gives examples of simple, cost-effective ways of reducing the risk of hearing damage to workers in the food and drink industries. It contains 60 case studies showing how companies have found successful solutions to problems created by high noise levels.

The introduction in this new edition has been revised but the case studies remain unchanged.

Contents

Introduction

What is the problem?

1 Noise at work can cause hearing damage that is permanent and disabling. This can be gradual, from exposure to noise over time, but damage can also be caused by sudden, extremely loud noises. The damage is disabling as it can stop people being able to understand speech, keep up with conversations or use the telephone.

2 Hearing loss is not the only problem. People may develop tinnitus (ringing, whistling, buzzing or humming in the ears), a distressing condition which can lead to disturbed sleep.

3 Noise at work can interfere with communications and make warnings harder to hear. It can also reduce people's awareness of their surroundings. These factors can lead to safety risks – putting people at risk of injury or death.

How can this book help me?

4 Often the dangers from high noise levels can be reduced by relatively simple and inexpensive means. This book shows simple, cost-effective ways of reducing the risk of hearing damage to workers. These are 'real-life' cases – the solutions were successful answers to actual problems experienced by companies. The table following this introduction sets out a summary of each case study to help steer you through the book.

5 The solutions are only examples of what can be achieved and may not apply directly. However, they should provide inspiration on how noise can be tackled.

What processes cause high noise levels?

6 Most food and drink industries have processing and packaging machinery producing high noise levels. These are likely to result in employees being subjected to noise exposures above the levels at which employers are required to take action to prevent workers suffering damage to their hearing. Typical noise levels at drinks, meat, milling, bakery, dairy and confectionery processes are shown in Appendix 1.

7 Food and drink industry processes particularly associated with high noise levels include:

- glass-bottling lines;
- product impact on hoppers;
- wrapping, cutting wrap, bagging;
- bowl choppers (meat);
- pneumatic noise and compressed air;
- milling operations;
- saws/cutting machinery;
- blast-freezers/chillers;
- trolley wheels and bearings;
- packaging machinery.

8 Many of the case studies in this book deal with these ten processes. By concentrating on these and other high noise processes in your workplace, you will

maximise the effects of your efforts. In addition to the case studies, Appendix 2 shows generic noise-reduction solutions applicable to these ten processes.

How far do I need to go in implementing these case studies?

9 Employers are required to implement the most cost-effective solution to eliminate or reduce risks from noise-induced hearing loss. But you are not required to implement every applicable solution in this book – you are only required to implement solutions that are 'reasonably practicable'.

10 Each noise problem needs to be assessed separately, as a solution that may not be reasonably practicable in one part of the factory (eg because of inadequate space to provide segregation), may be reasonably practicable in another.

11 When HSE inspectors visit and look at process noise, they will look at whether there are known solutions that are 'reasonably practicable'. If there are, you will be expected to have implemented them.

Table of case studies

Case study	Noise source	Problem (initial noise level)	Solution	Result	Case study number	Page
Replacing water pumps with air pumps	Water pumps on filling machines	90 dB	Replaced with air pumps and fitted silencers	84 dB	13	24
Redesign of horizontal powder-feeder	Filling sachets and cups	83–84 dB	New design of horizontal powder-feeder and enclosed machine	80 dB	14	25
Reducing noise in a bottling plant by modifying the building	Bottle manufacture, filling and packing lines	Above 90 dB	Acoustic panels fitted to walls, high ceiling installed	83 dB	15	26
Replacing tracking material on conveyors	Contact between metal trays and metal tracking	94 dB	Replaced with plastic tracking	87 dB	16	27
Fitting plastic chutes	Product impact on metal chutes	96–98 dB	Replaced with plastic chutes	90 dB	17	28
Replacing electric spooler with compressed-air spooler	Electrically powered sausage-spooling machines	86–90 dB	Replaced with compressed-air spooler	Below 80 dB	18	29
Fitting plastic caps to fingers of indexing arm	Tray-indexing arm	94 dB	Plastic caps on fingers of indexing arm	87–89 dB	19	30
Conveyor speed setting	Vibratory conveyor	Above 90 dB	Ensured conveyor only used at least noisy speed	Below 85 dB	20	31
New design of bottling conveyor	Glass bottles	101 dB	New design of conveyor with different chain speeds	84 dB	21	32
Installing robots for lidding and de-lidding bread tins	Lidding and de-lidding tins	90–93 dB	Installed robots to lid and de-lid baking tins	88 dB	22	33
Segregation						
Segregating pedestrians away from noisy area	Main production area of bakery	94 dB	Re-routing pedestrian traffic, signage and training	Below 85 dB	23	34
Segregation of bowl chopper and mincers	Bowl chopper and mincers	88–94 dB	Moved from main production area to an isolated area	Below 85 dB	24	35
Segregating basket-washing plant	Basket-washing machine in main bakery	88 dB	Moved to a separate building	Noise source removed	25	36
Segregating air-compressor during installation	High-pressure air-compressor	110–112 dB	Located in a separate room	60–70 dB outside room	26	37

Case study	Noise source	Problem (initial noise level)	Solution	Result	Case study number	Page
Removal of cap-hopper-vibrators	Vibrating cap-hoppers	Above 90 dB	Located in separate enclosure	Noise source removed	27	38
Erecting a secondary roof over office	Filling gas cylinders adjacent to office	68–70 dB in office	Installed secondary, absorbent roof over office	55–57 dB in office	28	39
Segregating air-compressor	Air-compressor	94–95 dB	Located in separate, unmanned room	80 dB	29	40
Erecting a dividing wall	Pet food processing area	95 dB	Solid block wall with acoustic panelling between processing and packaging area	Below 85 dB	30	41
Enclosure						
Enclosing bakery machinery in a soundproof room	Compressed-air knives	91–92 dB	Enclosed machine	Below 85 dB	31	42
Enclosing a bottling line conveyor	Glass-bottle conveyor	Above 90 dB	Enclosed the conveyor	Noise levels reduced by 2–8 dB	32	43
Enclosure of a blower machine for animal food	Blower machine	Above 90 dB	Enclosed machine using sound-absorbent panels	Below 90 dB	33	44
Enclosing and segregating bottle-blowing machines	Bottle-blowing machines	94 dB	Machine enclosed and segregated	89 dB	34	45
Acoustically enclosing a hammer mill	Hammer mill	102 dB	Enclosed in an acoustic booth	87 dB	35	46
Enclosing a rinser-filler-capper machine	Rinser-filler-capper machine	85 dB	Enclosed machine	73 dB	36	47
Enclosure of conveyor	Glass jars clashing together on conveyor	96 dB	Fitted enclosure and changed conveyor speed	86 dB	37	48
Enclosing bottle-filler infeed	Bottles banging together on filler infeed conveyor	96–100 dB	Fitted covers over conveyor	92 dB	38	49
Acoustic panels and curtains						
Erecting an outer wall	Filling gas cylinders adjacent to office	70–71 dB in office	Erected sound-absorbent outer wall between production area and office	62–63 dB	39	50

Case study	Noise source	Problem (initial noise level)	Solution	Result	Case study number	Page
Fitting flexible PVC curtains	Product impact on multi-head weigher	92 dB	Fitted flexible PVC curtains	88 dB	40	51
Fitting baffles to ceiling	Packaging lines	Above 90 dB	Fitted acoustic baffles to ceiling	Below 90 dB	41	52
Installing automatic doors	Noise from hearing protection zones affecting quieter areas	Above 90 dB	Erected acoustic panels and automatic doors between hearing protection zones and quieter areas	Below 85 dB	42	53
Fitting acoustic hood to filler pump	Filler pump	96 dB	Improved efficiency of pump and added acoustic hood	86 dB	43	54
Fitting acoustic panels to a bottle-transporter	Compressed air in bottle transportation	85–86 dB	Acoustic side panels fitted	73 dB	44	55
Enclosing hopper with flexible PVC curtains	Product impact on hoppers	Above 90 dB	Flexible PVC curtains fitted	83 dB	45	56
Damping materials and silencers						
Coating hoppers, transfer points and chutes	Product impact on hoppers and chutes	96–98 dB	Coated internally with food-grade, sound-deadening material	Noise reduced by 2–8 dB	46	57
Fitting rubber matting to shot-blast machine table	Gas cylinder impact on metal table	110 dB peaks	Rubber matting on table	Removal of peak noises	47	58
Reducing environmental noise from a grinder	Grinding machine	Environmental noise 53 dB	Anti-vibration mountings fitted to bottom of grinder and noise-absorbent panels fitted to walls	Environ-mental noise reduced to 43 dB	48	59
Lagging container transport ductwork	Product impact on ducting	92 dB	Lagged ductwork with noise-absorbent padding	84 dB	49	60
External coating of metal components in confectionery manufacture	Product impact on vibrating components	92 dB	Coated externally with sound-deadening material	84 dB	50	61
Fitting rubber caps to hydraulic dampers	Bread-basket stacking machine	92 dB	Fitted hydraulic dampers	83 dB	51	62
Mounting crimping machine on rubber	Hand-crimping metal foil packages	86–89 dB	Mounted on layers of rubber	85–86 dB	52	63

Case study	Noise source	Problem (initial noise level)	Solution	Result	Case study number	Page
Laying rubber matting on floor	Keg impact on concrete floor	High noise levels	Fitted rubber matting on to floor	Noise levels reduced	53	64
Fitting rubber matting to trolleys	Gas cylinder impact on metal 'A' frame trolleys	110 dB peaks	Fitted rubber matting on to trolleys	Peak noise levels reduced	54	65
Fitting silencer to de-gassing equipment	Road tanker de-gassing	92 dB	Fitted silencer	83 dB	55	66
Fitting silencers to refrigeration plant	Evaporative condensers and refrigeration plant	94 dB	Fitted silencers	83–87 dB	56	67
Maintenance						
Maintenance modifications to a mixing machine	Dough mixer	94 dB	Bearings replaced, panelling changed, compressed-air exhaust reduced	91 dB	57	68
Regular maintenance of machines to reduce noise from air leaks	Compressed air in soft drinks factory machines	High noise levels	Introduction of 'Air Leak Week' to identify and repair air leaks	Noise levels reduced by 3–4 dB	58	69
Lubricating gearboxes	Gearboxes on mixing machine	80–85 dB	Used PTFE food-safe gel to lubricate gearboxes	Noise levels reduced by 1.5 dB	59	70
Fitting and maintaining silencers on wrapping machines	Compressed-air exhausts on vacuum-wrapping machines	88–90 dB	Introduced system of planned, preventative maintenance and fitted silencers	Below 85 dB	60	71

Case studies

The case studies are grouped under the following seven headings:

Purchasing policy

Design/design changes

Segregation

Enclosure

Acoustic panels and curtains

Damping materials and silencers

Maintenance

Purchasing policy

Case 1 Purchase of a new bottling line

Noise source

On the bottling line of a soft drinks factory, plastic preforms were blown into bottles, rinsed, filled with soft drink and then capped and packed.

Problem

The noise level produced by the machines on the bottling lines was 89 dB.

Solution: new bottling line

Finding solutions

The company ordered a new bottling line and, with the Noise Regulations in mind, specified that the noise level at the employees' positions should be no greater than 80 dB when operating. They liaised with the manufacturers and purchased a machine with reduced noise levels.

On the new line, the rinser-filler-capper machine was enclosed and there was less use of stainless-steel, which helped reduce the reverberant noise. The company also installed the line in a production hall with high ceilings to reduce the reverberant noise levels.

Solution: new bottling line

Results

- The noise levels produced by the new bottling line were below 80 dB.
- The layout of the line made cleaning easier.
- The number of raised work platforms on the new line was reduced, which led to a reduction in accidents from slips, trips and falls.
- The new line was more efficient.

Case 2 Reducing noise from bottle-blowers by design and segregation

Noise source

A key operation in the PET plastic-bottling manufacturing process is bottle-blowing. Key elements within this process are preform storage, preform transfer and delivery into linear ovens where the preforms are heated before passing into the blowing wheel to be moulded.

Problem

The process was very noisy, reaching levels of up to 86–87 dB, and was a hearing protection zone. The equipment used compressed air at 600 psi and had many mechanical moving parts.

Solution: *preform hopper relocated in segregated area*

Finding solutions

Preform storage and delivery

On the new installation of four bottle-blowers and associated preform storage, the company took the decision to reduce noise in the areas where people worked.

The preform storage consisted of large stainless-steel hoppers. These created a great deal of noise when preforms were loaded in, and when the hopper was delivering to the blower. The hoppers were relocated into an unmanned area. As the hoppers only needed to be visited twice daily, this reduced noise exposure considerably in the working areas.

Solution: *new bay lined with acoustic panels for enclosed bottle-blowers*

Reduced equipment noise by design

The purchasing contract for the new equipment included noise targets in addition to the usual performance and quality targets.

The suppliers were required to deliver equipment that produced noise levels less than 83 dB. This then became part of the performance guarantee.

Noise reduction by building design

A new bay was constructed to house the new bottle-blowers with acoustic panels on the walls and ceiling to reduce noise reverberation. Consideration was given to having a high ceiling as a further improvement to reduce reverberation, but this could not be achieved due to planning constraints.

Results

- Noise levels in the new hall were below 83 dB.
- The area did not require mandatory hearing protection.
- Communication in the area improved and the area is seen as the benchmark for future developments.

Case 3 Purchasing new design of bottle transport conveyor

Noise source

Bottles on a bottling line were transported along a conveyor from the labelling machine to the packing machine.

Problem

- The glass bottles were banging together as they travelled along the conveyor.
- There was a noise level of 101 dB.

Finding solutions

A noise survey identified the high noise levels. The company purchased a new design of conveyor in which the various chains moved at different speeds in relation to the number of bottles on the line and their progress through the machines.

Solution: new variable-speed conveyor with adjustable guide-rails

In addition, the new conveyor was designed so that the distance between the guide-rails could be adjusted very accurately, depending on the size of the bottles. Although this was originally introduced to orientate the bottles and prevent them locking together because of their shape, it also reduced the number of times the bottles clashed together.

Results

- The new design of conveyor, in which the chains moved at different speeds, reduced the noise levels to 84 dB; and the adjustability of the conveyor width reduced the noise level by a further 1 dB.
- The adjustable conveyor width orientated the bottles and prevented them locking together as a result of their shape.
- Bottles could be of lighter weight, which meant saving on cost and energy.

Case 4 Packing machinery-compressed air

Noise source

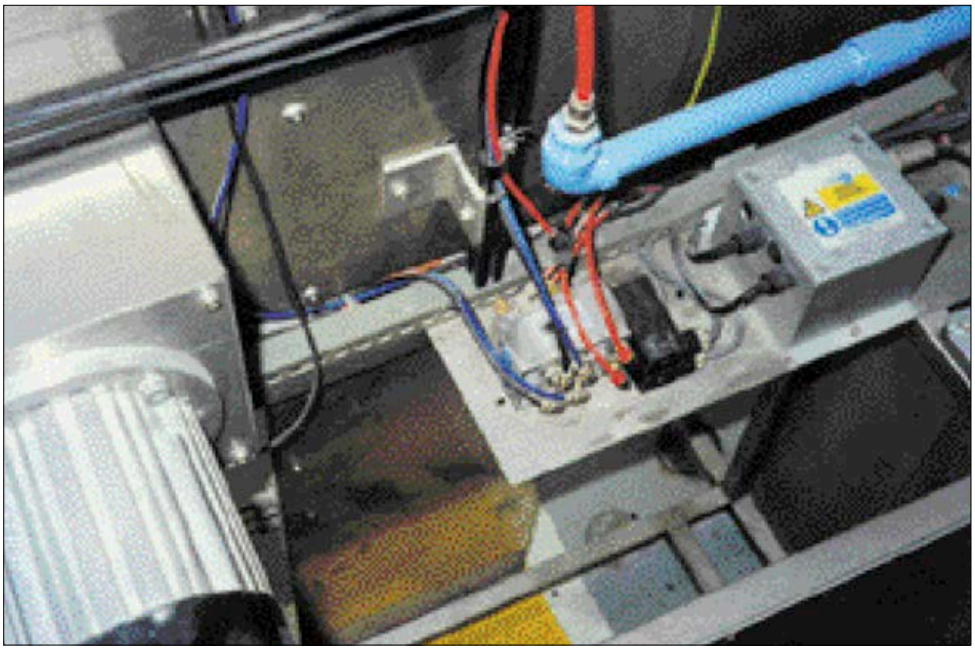
Packaging machinery on several lines in the factory were fed by compressed air and had compressed-air exhausts.

Problem

The compressed-air exhaust caused noise levels in 'hot spots' next to the packaging machinery of above 90 dB.

Finding solutions

For all new air-compressor requirements, the company makes sure that the equipment meets low noise standards before they are purchased. The company also fitted silencing equipment on all compressed-air exhausts on the packaging machinery.



Solution: *silencing equipment for compressed-air exhausts*

Results

- The noise levels were reduced to below 85 dB.

Case 5 Reducing noise from bakery machinery

Noise source

A bakery produced fresh-frozen buns and frozen dough balls for pizza bases.

Problem

Some of the machines in the bakery produced noise levels of 94 dB and as a result, some areas of the factory were hearing protection zones.

Finding solutions

The company brought in a policy of not purchasing equipment that produced a noise level above 85 dB when running. This was documented in the company's purchasing checklist, which was used when buying new equipment. In addition, the company's health and safety adviser would visit the makers of new machinery during its manufacture and conduct a noise assessment to make sure the machinery did not exceed the noise levels specified.

Results

- New equipment purchased by the company did not exceed noise levels of 85 dB.
- In time, it will be possible to phase out the noisier equipment and make sure noise levels from machinery are reduced to 85 dB or below.

Design/design changes

Case 6 Fitting guide-rails to bottle-laner

Noise source

Glass bottles of soft drink travelled along a conveyor and through a laner (which sorted the bottles into lanes) ready for packaging in cardboard boxes.

Problem

The bottles were banging together, resulting in noise levels between 93–96 dB.

Finding solutions

As part of bringing in a new machine, the laner mechanisms were changed to include guide-rails that moved the bottles into lanes. This change resulted in no additional cost.

Solution: *new machine fitted with guide-rails in laner mechanism*

Results

- Noise levels were reduced to 87 dB.

Case 7 Replacing metal trays with plastic trays

Noise Source

In the boiled-sweet department of a sugar confectionery company, metal trays were used to transfer product from the wrapping machine to the next process. The boiled sweets were deposited into the trays via a conveyor.

Problem

A noise level of 89 dB was recorded as the sweets dropped from a conveyor into the metal trays.

Finding solutions

The company replaced the metal trays with trays made from high-density plastic.

Results

- Noise levels in this section were reduced to 84–85 dB.
- The trays were lighter for the operators to handle.
- Risk of metal contamination was eliminated.

Problem: *sweets dropping into metal trays causing noise*

Solution: *plastic trays now used to reduce noise*

Case 8 Replacing baking rack wheels

Noise source

At a pork-pie bakery, baking racks were placed in rotating ovens at a temperature of 250/300°C. The racks had metal wheels mounted on spindles that were continually greased.

Problem

Due to the high temperatures within the oven, the grease on the spindles melted, causing intermittent noise levels in excess of 100 dB.

Finding solutions

The company replaced the metal wheels on the baking racks with phenolic resin wheels.

Results

- The intermittent noise levels within this area were reduced to 86–92 dB.

Problem: *rack fitted with original metal wheels*

Solution: *rack with new phenolic wheels*

Case 9 Modification of air knives in a bakery

Noise source

Baked loaves were removed from multi-strap baking tins by suction. Before they could be removed they were loosened in the tins by the use of air knives. Each air knife comprised an unsilenced air jet.

Problem

Normal baking plants operate at between 3000 and 6000 loaves per hour so that there are up to 100 unsilenced air pulses per minute, which contributed significantly to the general noise level in the proximity of the de-panning equipment.

Finding solutions

The air knives were modified to operate with a diffuse air jet, therefore reducing general noise level near to the de-panning equipment.

Results

- As one element of a noise reduction action plan, this made a significant contribution to reducing overall noise levels.

Case 10 Installing 'tin-friendly' conveyors

Noise source

Multi-strap baking tins on a plant breadline were transported between various items of plant in the production process on metal slat or chain conveyors.

Problem

When tins reached a flow-control stop point, the chain or slat conveyors continued to run, driving the tins into each other and causing them to vibrate and rattle on conveyor guides. This produced continuous noise levels typically in excess of 90 dB and much higher short-term peaks, depending on operating conditions.

Finding solutions

The continual operation of conveyors beneath stationary tins also led to excessive wear of tins and conveyor slats or chains.

Results

The company installed a new type of conveyor consisting of two side chains with closely spaced and freely rotating rollers mounted between them. When the tins on these conveyors hit a stop point, the rollers passed freely beneath them. The result was reduced impact between tins and reduced vibration and rattling on conveyor side-guides.

- General noise levels from this source were reduced to below 85 dB.
- There were significant reductions in tin and conveyor wear.

Solution: new conveyor fitted with freely rotating rollers (visible between blue tins)

Case 11 Installing robots to change baking tins

Noise source

Product changeover on a plant breadline required the baking tins to be changed. This was a manual operation.

Problem

Manual tin changeover produced noise levels in excess of 94–96 dB for the two-hour duration of the changeover. Noise was produced by:

- old tins being lifted from metal slat conveyors and dragged across conveyor side-guides;
- impact of old tins being placed on tin racks;
- impact of new tins being positioned on conveyor side-guides prior to placement;
- impact of new tins being placed on metal slat conveyors.

Problem: *manual tin changing*

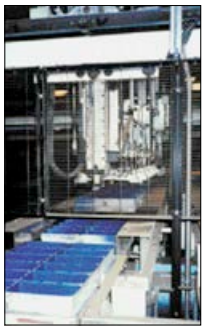
Problem: *manually stacked tins*

The operation also presented manual handling risks and resulted in excessive wear and damage to tins and conveyors.

Finding solutions

The company installed robots to remove the tins from the line and feed on new tins in accordance with product type. The system also incorporated a tin store eliminating the use and manual loading of tin racks.

Solution: *new robot installed to change tins*



Solution: *new robot installed to change tins*

Results

- Noise levels in the immediate area were reduced to below 90 dB and there was a noticeable benefit to noise levels in other areas of the bakery. The manual handling risk and tin and equipment damage were also reduced.

Case 12 Installing a new conveyor system

Noise source

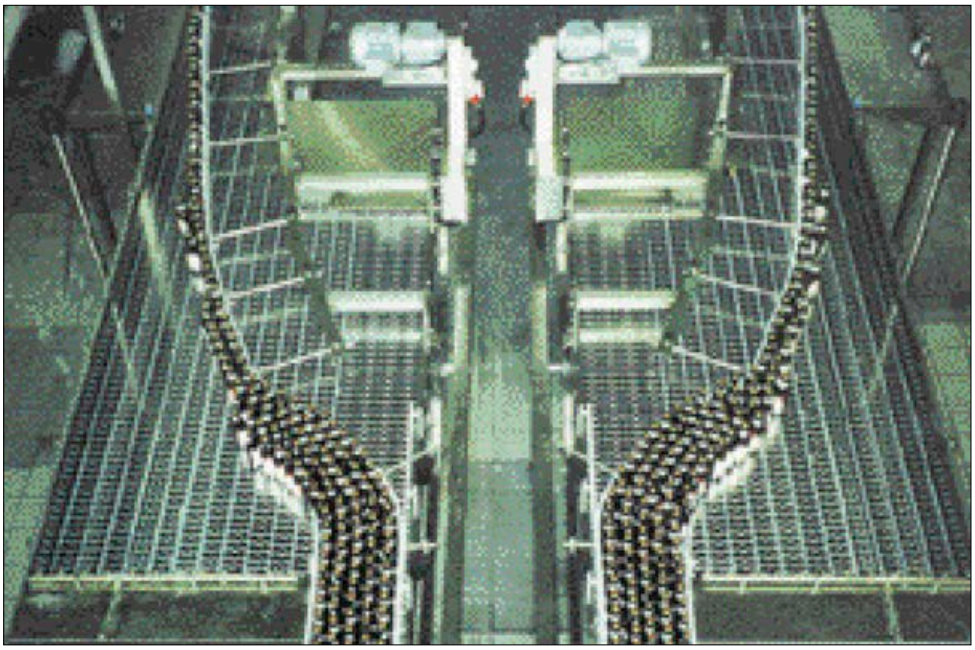
In the small-pack department of a brewery, conventional conveyors were used to transport bottles and cans.

Problem

The bottles and cans knocked together as they moved along the conveyors and produced noise levels in excess of 90 dB.

Finding solutions

The company fitted a pressureless combiner conveyor system, which operated on a frequency inverter with variable speed drives to modulate the speed of each different conveyor according to its needs. The company also fitted high-density plastic guide-rails and starwheels.



Solution: *new pressureless conveyor system*

Results

- The bottles and cans no longer knocked together and there was a reduction in noise levels to below 90 dB.

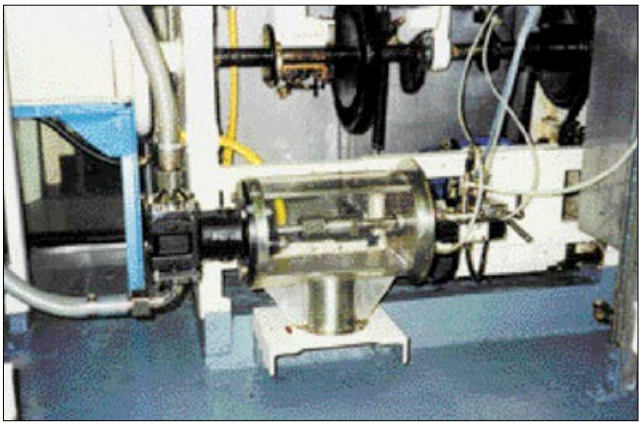
Case 13 Replacing water pumps with air pumps

Noise source
Three filler machines were driven by noisy water pumps.

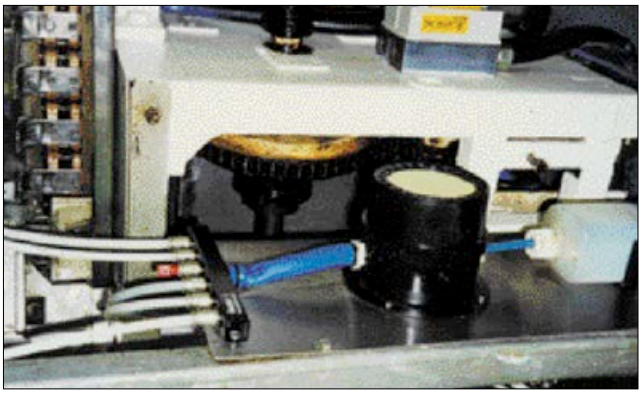
Problem
The filler machines were operating at noise levels of 90 dB.

Finding solutions
The company recognised that the noise levels should be reduced. The in-house engineer identified that the same equipment could be driven by air instead of water and that air silencers could be fitted.

Results
- Noise levels were reduced to 84 dB.



Problem: *water pump originally fitted*



Solution: *new, quieter water pump*

Case 14 Redesign of horizontal powder-feeder

Noise source

Vending machine drinks ingredients were filled automatically into cups on one range of machines and into foil sachets on another. The cup-fillers produced noise from mechanical impact, compressed air and vacuum sources. The major noise producers on the sachet-fillers were vibratory, horizontal powder-feeders. The combination of these resulted in high noise levels in the filling hall.

Problem

Over the course of a 12-hour shift, operators could be exposed to noise levels of 83–84 dB.

Finding solutions

The company identified a new design of horizontal powder-feeder that gave improved feed performance and was almost silent in operation. The cup-filler machines were enclosed in new sealed enclosures that satisfied safety, noise and hygiene standards.

Solution: new design of horizontal powder-feeder

Results

The combination of solutions resulted in such a decrease in noise levels that the company removed the hearing protection zoning from this area. The company was also able to simplify the guarding design to make both operation and servicing easier. Over a 12-hour shift, with the new arrangement, operators were exposed to only 80 dB.

Solution: new sealed enclosure for cup-filler machine

Case 15 Reducing noise in a bottling plant by modifying the building

Noise source

Manufacture of PET 500 ml bottles, rinsing, filling with soft drinks, packaging and conveying to the warehouse.

Problem

With four or five core machines on each production line in a low-ceiling building, the machines were a major contribution to noise.

Finding solutions

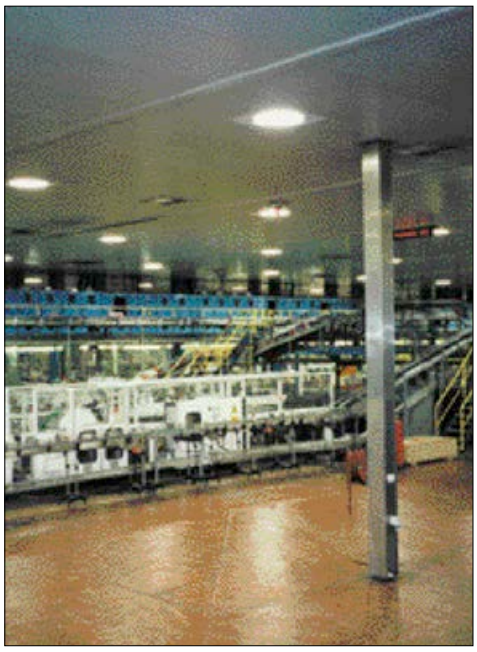
When designing a new building, noise reduction was a key driver. Initiatives that were implemented in the building design were:

- acoustic panels on the walls (previous constructions had not included this);
- removal of stainless-steel 'droppers' for services (previous constructions had over ten stainless-steel droppers per bay which increased reverberation);
- high ceiling to reduce reverberant sound levels.

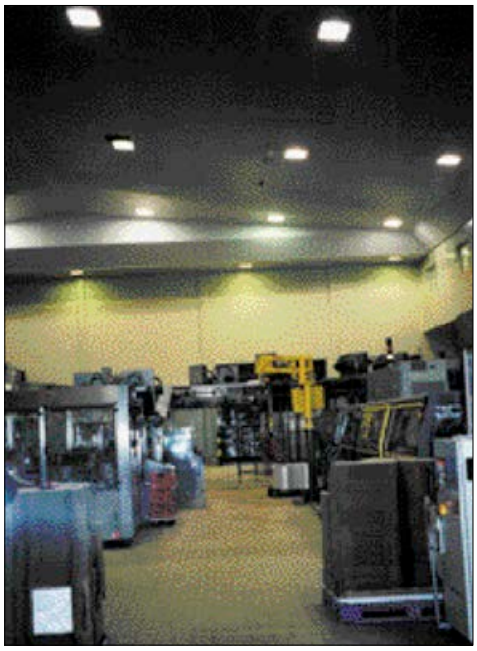
Machine suppliers were contracted to deliver a performance guarantee of less than 83 dB at source from their equipment.

Results

- Noise levels in the hall were 83 dB.
- Communication in the area was improved.
- The area was not a mandatory hearing protection zone.
- The area was a benchmark for future developments.



Problem: *original building with low ceiling and no acoustic wall panels*



Solution: *new design of building with high ceiling and acoustic wall panels*

Case 16 Replacing tracking material on conveyors

Noise source

In a bakery making fresh-frozen buns, metal track conveyors were used to transport the metal trays with buns from the pinner machine to the proofing machine.

Problem

The noise level in the area was 94 dB. Some of this noise was produced by the metal tracking coming into contact with the other metallic parts of the machine and the metal trays.

Finding solutions

The metal tracking on the conveyor was replaced with plastic (polyurethane) tracking, which was less noisy when it came into contact with metal.

Results

- The plastic tracking reduced the noise level in the area to 87 dB.
- Unlike the metal tracks, the plastic ones did not wear to produce sharp edges and therefore cut injuries to workers were reduced.
- The plastic tracks were cheaper to replace than the metal ones.
- The plastic tracks were easier to maintain.

Problem: *original metal track conveyor*

Solution: *new plastic tracking on conveyor*

Case 17 Fitting plastic chutes

Noise source

The company, which produced toffee, used metal chutes to transfer the toffee to a breaking machine.

Problem

The noise level for this process was 96–98 dB.

Finding solutions

The company replaced the metal chutes with plastic chutes.

Solution: *plastic chutes for toffee transfer*

Results

- Noise levels were reduced to 90 dB.

Case 18 Replacing electric spooler with compressed-air spooler

Noise source
The company used electric-powered, sausage-spooling machines.

Problem
The electric-powered spooling machines produced noise levels of 86–90 dB. The machines were also unreliable and posed an electric-shock risk in a wet environment.

Finding solutions
The company replaced the electric spoolers with compressed-air spoolers designed by their engineering department.

Solution: *new, quieter compressed-air spooler*

Results
The noise levels were reduced to less than 80 dB.

Case 19 Fitting plastic caps to fingers of indexing arm

Noise source

In a bakery making fresh-frozen buns, the dough was placed into trays at the pinner machine and then travelled on these trays to the proofer, where the yeast was activated. A tray-indexing arm was used to maintain the space between the trays as they passed from the pinner conveyor to the proofer conveyor.

Problem

The tray-indexing arm and the trays were both made of metal and produced a loud noise when they knocked together. The general noise level in the area was 94 dB.

Finding solutions

Plastic (polyurethane) caps were placed on the ends of the fingers of the indexing arm where they came into contact with the trays.

Solution: *tray-indexing are with plastic-capped fingers*

Results

- Noise levels were reduced to 87–89 dB.
- Damage to the surface of the trays was reduced.

Case 20 Conveyor speed setting

Noise source

During the finishing process, sugar confectionery was passed along a vibratory conveyor. This was used to prevent the product (which is inherently soft) from clumping together and sticking to the conveyor.

Problem

The operators occasionally changed the settings on the conveyor to maximum vibration to make their jobs easier. This change in setting resulted in higher noise levels.

Finding solutions

The company measured noise levels at each conveyor setting and decided on the appropriate setting to run the conveyor. Operators now have to get permission to change the setting and the change is logged. Other methods of noise control can often be incorporated in such circumstances.

Results

- Noise is kept to a satisfactory level.

Case 21 New design of bottling conveyor

Noise source

On a bottling line, bottles were transported from the depalletiser to be rinsed, filled, capped and labelled before being packed. The machines for these operations were linked together by conveyors and accumulation tables. The accumulation tables effectively squeezed the bottles from multi-lane into a single line, which resulted in the bottles being subjected to some considerable pressure and breakage.

Problem

- Bottles were banging together as they passed along the conveyors and onto the accumulation tables.
- The noise level associated with this process was 101 dB in places. Operators had to wear hearing protection over the course of an eight-hour shift.

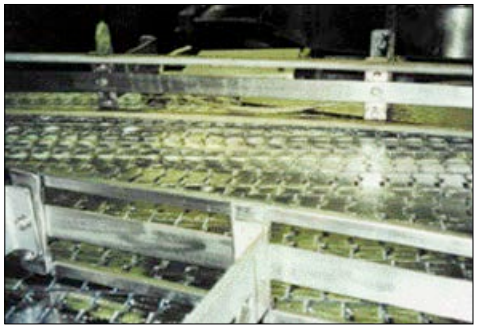
Finding solutions

A noise survey identified the areas with high noise levels. Initially the machine was enclosed, which reduced noise levels to 85–89 dB. However, operators often forgot to shut the enclosure doors after they had been working on the machine so noise levels remained high.

As a permanent solution, the company purchased a new design of conveyor in which the various chains forming the moving conveyor moved at different speeds and provided greater control over the movement of bottles. Sensors on the machines detected the number of bottles passing through them and the preceding part of the conveyor would automatically speed up or slow down accordingly.

This increased control over the progress of the bottles prevented them from banging together.

Solution: *new design of conveyor and accumulation table*



Solution: *close-up of variable speed chains*

Results

- The noise levels for the bottling line were reduced to 84 dB without enclosures.
- Staff were no longer required to wear hearing protection and were happier with the solution.
- The greater bottle control reduced bottle breakages on the line as bottles were no longer travelling under pressure.
- The efficiency of the line was increased as the bottles could accumulate at the end.

Case 22 Installing robots for lidding and de-lidding bread bins

Noise source

'Square' bread was baked in tins that were lidded prior to baking. Metal lids were placed on and removed from tins manually.

Problem

Manual lidding and de-lidding produced noise levels typically above 90–93 dB for the duration of lidded production.

Problem: *manual de-lidding of tins*

Problem: *storage of lids for manual lidding*

Noise was produced by:

- lids being lifted from tins and dragged across conveyor side-guides;
- impact of lids being placed on lid racks during a changeover to a non-lidded product;
- impact of lids being positioned on conveyor side-guides prior to placement;
- impact of lids being placed on tins.

The manual nature of the operation also presented manual handling risks and possible excessive wear and damage to lids.

Finding solutions

The company installed robots to remove lids from tins, convey lids to the lidding station and place lids on freshly filled tins as required. The system also utilised a lid store to eliminate rack storage and provide for controlled noise-free handling when lids were removed from the line.

Solution: *new robot installed for liding/de-lidding tins*

Solution: *new robot installed for liding/de-lidding tins*

Results

Noise levels in the immediate area were reduced to below 88 dB and there was a noticeable reduction in noise levels in other areas of the bakery. The manual handling risk and tin and equipment damage were also reduced.

Segregation

Case 23 Segregating pedestrians away from noisy area

Noise source

A factory produced fresh-frozen buns and frozen dough balls for pizza bases.

Problem

There was a noise level of 94 dB in the main production area located inside the entrance of the factory. As there was only one entrance to the factory, staff working in other production areas were required to walk through or near the main production to get to their workstations. One route ran through the centre of the production area and exposed employees to high levels of noise. As a result, the entrance to the factory was a compulsory hearing protection zone.

Finding solutions

Following a noise survey that identified high levels of noise in the centre of the main production area, a quieter pedestrian route was mapped out around the edge of the area. Noise levels on this route were less than 85 dB. Correct signage was displayed and people were notified of the changes.

Results

- Only staff entering the compulsory hearing protection zone in the main production area need to wear hearing protection.
- Staff are happier as it is no longer compulsory for them to wear hearing protection to gain access to other areas of the factory.
- Reduced expenditure on hearing protectors.
- Better flow of people through the factory.

Solution: *part of the new, quieter pedestrian route*

Case 24 Segregation of bowl chopper and mincers

Noise source

The company used a bowl chopper and mincers to produce sausages.

Problem

The bowl chopper and mincers produced a noise level of 88–94 dB, which affected up to 60 workers.

Finding solutions

During refurbishment of the sausage production hall, the company took the opportunity to move the bowl chopper and mincers to an isolated area away from workers.

Solution: *bowl chopper and mincer in isolated area away from main production area*

Results

- Only four employees are now exposed to the higher noise levels.
- Noise levels in the main production area are now reduced to below 85 dB.

Case 25 Segregating basket-washing plant

Noise source

At a bakery, plastic bread-baskets passed through a basket-washing machine before being reused.

Problem

The noise level recorded in the basket-washing plant was 88 dB.

Finding solutions

The basket-washing machine was segregated in a separate building to the main bakery.

Results

- The general bakery staff are unaffected by the noise from the washing machine.

Solution: basket-washing plant now housed in separate building

Solution: basket-washing machine in use

Case 26 Segregation air-compressor during installation

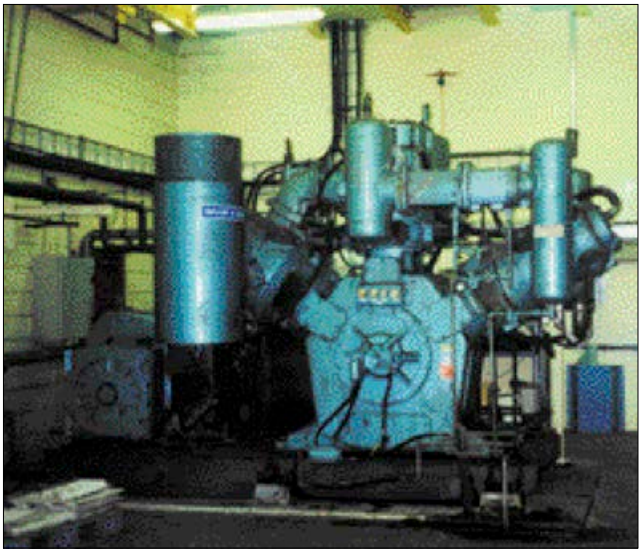
Noise source
At a cider mill, a high-pressure air-compressor was used for plastic-bottle-blowing.

Problem
When running, the air-compressor produced noise levels between 110 and 112 dB.

Finding solutions
When installing the compressor, the company segregated it in a separate room.

Results
The noise levels outside the compressor room were 60–70 dB.

Solution: entrance to separate room for air-compressor



Solution: air-compressor ready for use

Case 27 Removal of cap-hopper-vibrators

Noise source

Part of the PET bottling process required the cap closure to be fitted to the neck of the bottles. The caps were fed via airveyors from large, stainless-steel hoppers. Inside the hoppers the caps were continually shaken to prevent jams.

Problem

The caps vibrating against the stainless-steel hoppers were causing excessive noise levels.

Finding solutions

With a new production line, consideration was given to the noise levels in the working areas. The location of the cap storage and delivery systems was not critical so the decision was taken to move this process outside of the production bay into a purpose-built enclosure. The enclosure only needed to be visited three to four times per shift.

Solution: entrance to the new segregated enclosure for capstorage and delivery

Solution: stainless-steel cap-hoppers inside new segregated enclosure

Results

- A significant contribution to noise reduction in the production area.
- Increased segregation of forklift trucks due to deliveries of caps being made away from worker areas.
- Less waste generated in the production hall.

Case 28 Erecting a secondary roof over office

Noise source

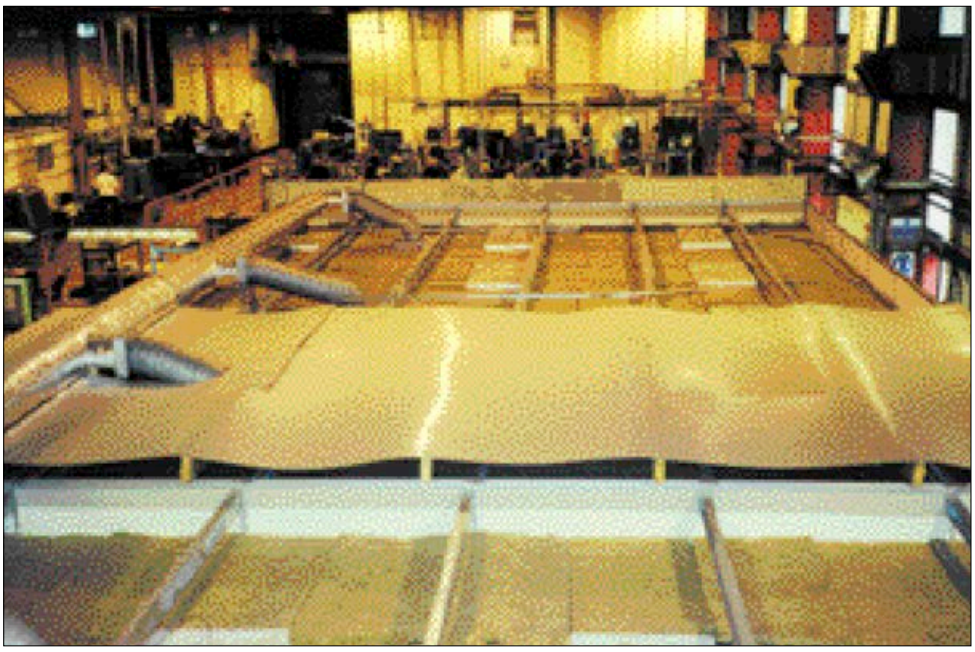
At a soft drinks company, gas cylinders were refilled in the main production area.

Problem

Noise levels of 68–70 dB were recorded in an office situated within the gas cylinder refilling area.

Finding solutions

The company installed a secondary roof over the original office ceiling. The roof was constructed of lightweight aluminium sheet and the void between the ceiling and the new roof was filled with sound-absorbent material.



Solution: *new, sound-insulated roof under construction over office*

Results

Noise levels within the office were reduced to 55–57 dB.

Case 29 Segregating air-compressor

Noise source

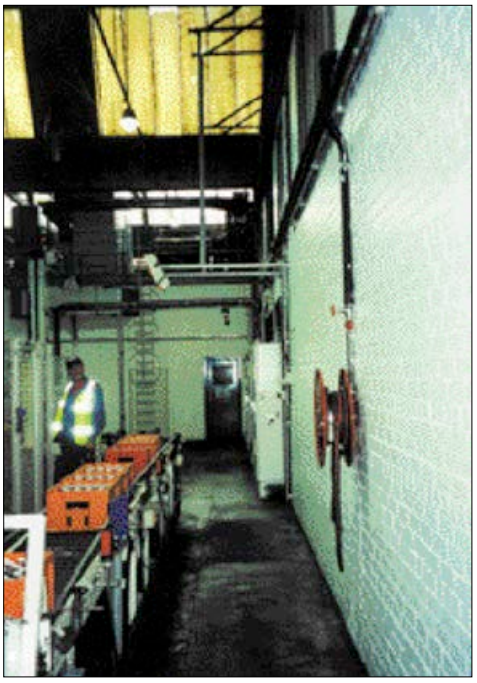
A soft drinks factory used a large air-compressor, air from which was used to operate machines on the bottling lines.

Problem

The air-compressor was located in the middle of the production area and produced noise levels of 94–95 dB.

Finding solutions

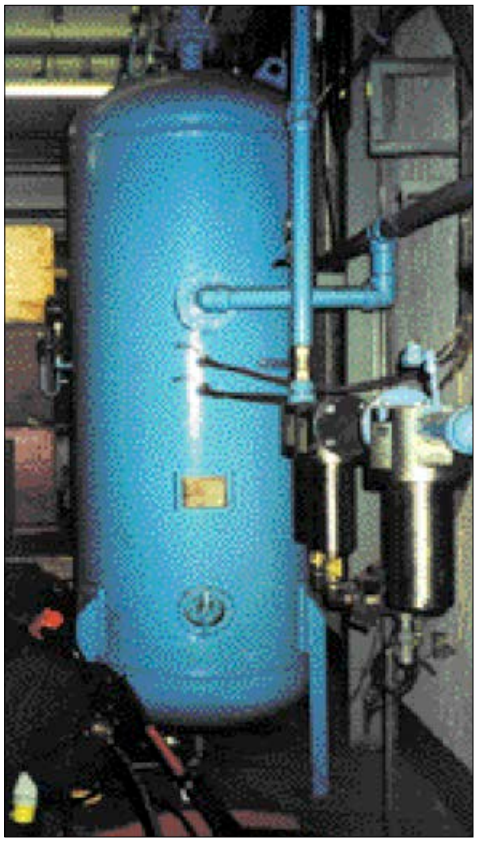
The company decided to move the compressor away from the production hall into an enclosed room near the warehouse. The room was a mandatory hearing protection zone but was unmanned unless the compressor was being maintained or cleaned, and in these cases, the compressor was normally turned off.



Solution: *air-compressor removed from production area*

Results

Noise levels in the production hall were reduced to 80 dB.



Solution: *air-compressor relocated in unmanned room*

Case 30 Erecting a dividing wall

Noise source

In the processing area of a pet food factory, whole grains were ground into a powder in the grinding room. Ingredients were then added and the mixture cooked in an extrusion machine. The mixture was then shaped and dried, before being packed in the packaging area of the factory.

Problem

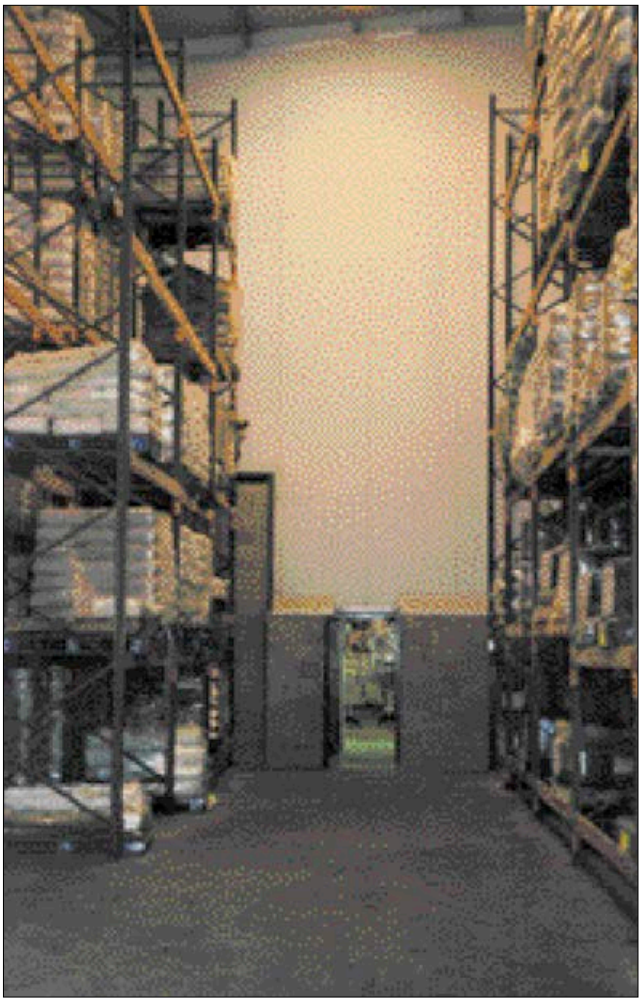
The processing area in the factory produced noise levels of up to 95 dB. Some of this noise was travelling to the packaging area and, as a result, the whole of the factory was a mandatory hearing protection zone.

Finding solutions

Following a noise survey that identified the high noise levels in the processing area, a solid block wall with acoustic panelling was built between the processing area and the packaging area. This was to reduce and absorb the noise travelling between the two ends of the factory.

Results

- Noise levels in the packaging hall were reduced so that hearing protection was no longer required.
- The wall increased hygiene in the factory as it prevented cross-contamination of raw materials and the finished product.



Solution: *new wall lined with acoustic panelling erected between processing area and packaging area*

Enclosure

Case 31 Enclosing bakery machinery in a soundproof room

Noise source

At a large bakery, a machine was used to blow debris out of bread-baking tins by means of air knives (compressed-air jets).

Problem

Employees working in the bakery were exposed to noise levels of 91–92 dB during this process.

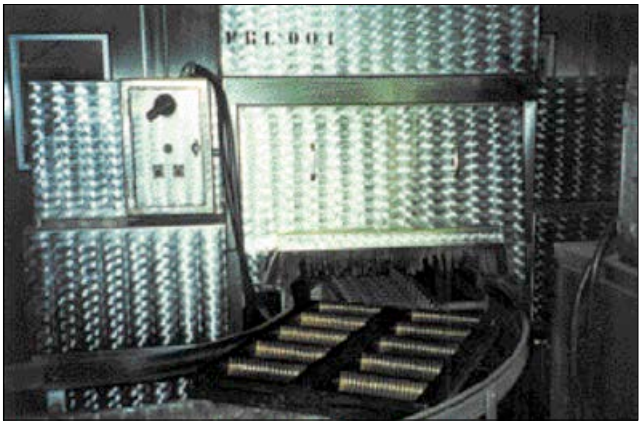
Finding solutions

The company built a soundproof room around the machine.

Results

Noise levels in the bakery decreased to below 85 dB.

Solution: *soundproof enclosure erected around noisy plant*



Solution: *small opening in enclosure to allow entry of baking tins*

Case 32 Enclosing a bottling line conveyor

Noise source

In the production hall of a soft drinks factory, conveyors were used to transport empty glass bottles from the washing machine to the filler machine.

Problem

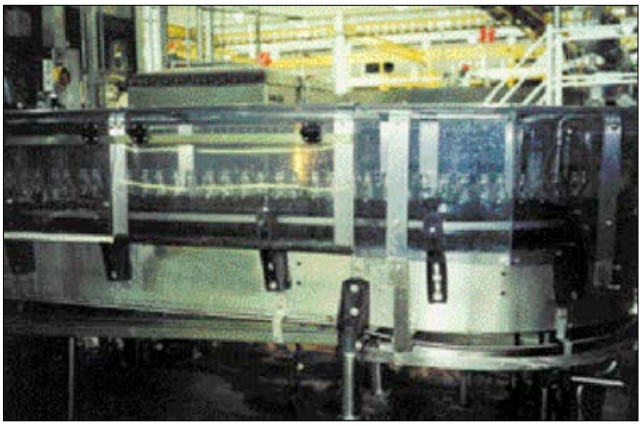
The glass bottles were knocking together on the conveyor while being transported and were producing noise levels above 90 dB.

Finding solutions

The company initially looked at enclosing the conveyor with stainless-steel panels to prevent contamination of the clean glass bottles. However, noise measurements indicated that enclosing the conveyor with perspex panels was a preferred option as it absorbed the noise from the bottles more effectively and reduced the noise levels.

Results

- Noise levels were reduced by 2–8 dB.
- The enclosure increased the safety from glass breakage accidents.
- The enclosure increased hygiene on the conveyor by decreasing contamination of the washed bottles.



Solution: *enclosed bottle conveyor*

Case 33 Enclosure of a blower machine for animal food

Noise source

A pet food factory manufactured dry food for dogs and cats. The dried food was stored in the packing hall of the factory in large, one-tonne bags, which fed onto a conveyor running beneath. The conveyor took the dried food some distance away to a packing machine, which filled boxes of finished product.

The company decided to replace the conveyor with a new piece of machinery that would transport the dried food from the one-tonne bag above to the packing machine by blowing it through metal tubing.

Problem

Operation of the blowing machine produced noise levels above 90 dB.

Finding solutions

The company identified the potential high noise level before the blowing machine was installed and enclosed it in sound-absorbent panelling to absorb the noise and prevent noise travelling through the packing hall.

Results

- The noise levels produced by the enclosed machine were reduced to below 90 dB and the noise levels in the packing side of the factory were maintained at the same level despite the introduction of the blower machine.
- The new machine was more efficient at delivering the product from storage to the packing machine.

Problem: *one-tonne bag of dried food suspended above original conveyor*

Solution: *new blower machine installed in enclosure (sound-absorbent side panels removed for clarity*

Case 34 Enclosing and segregating bottle-blowing machines

Noise source

In the production hall of a bottling factory, PET preforms (plastic, test-tube-shaped objects from which plastic bottles are made) travelled on conveyors to bottle-blower machines. At the blower machines, they were heated, placed into moulds and then blown into a bottle shape, before being labelled, rinsed, filled and capped.

Problem

The bottle-blowing machines were the noisiest pieces of equipment in the production hall. They produced noise levels of 94 dB.

Problem: *bottle-blowing machine in production hall before being relocated in separate room*

Finding solutions

Following a noise survey that identified the high noise levels produced by the machine, the bottle-blowers were relocated to a room away from the production line, and enclosed in a more effective enclosure.

Results

- Noise levels in the production hall were reduced to 89 dB.
- As a result of the relocation, all the bottle-blowing machines were located in the same area, where experienced workers could service them more easily.

Case 35 Acoustically enclosing a hammer mill

Noise source

At a brewery, a hammer mill was used to crack malt as part of the brewing process.

Problem

When running, the hammer mill produced noise levels of 102 dB.

Finding solutions

The company enclosed the hammer mill in an acoustic booth.

Solution: *hammer mill enclosed in acoustic booth*

Results

The noise levels outside the booth were reduced to 87 dB.

Case 36 Enclosing a rinser-filler-capper machine

Noise source

In the production hall of a soft drinks factory, plastic bottles were rinsed, filled and then capped by one machine before being packed.

Problem

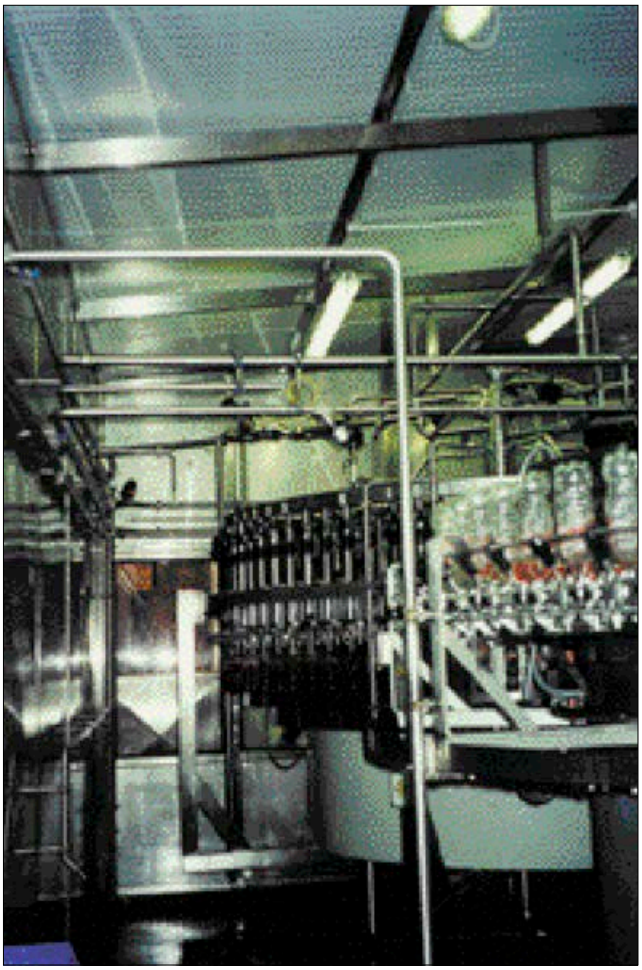
The machine produced noise levels of 85 dB.

Finding solutions

The company wanted to reduce the noise level from the machine even further. They enclosed the machine using a large steel frame and perspex sides and then padded the ceiling of the enclosure with a noise-absorbent material.

Results

The noise levels outside the enclosure were reduced to 73 dB.



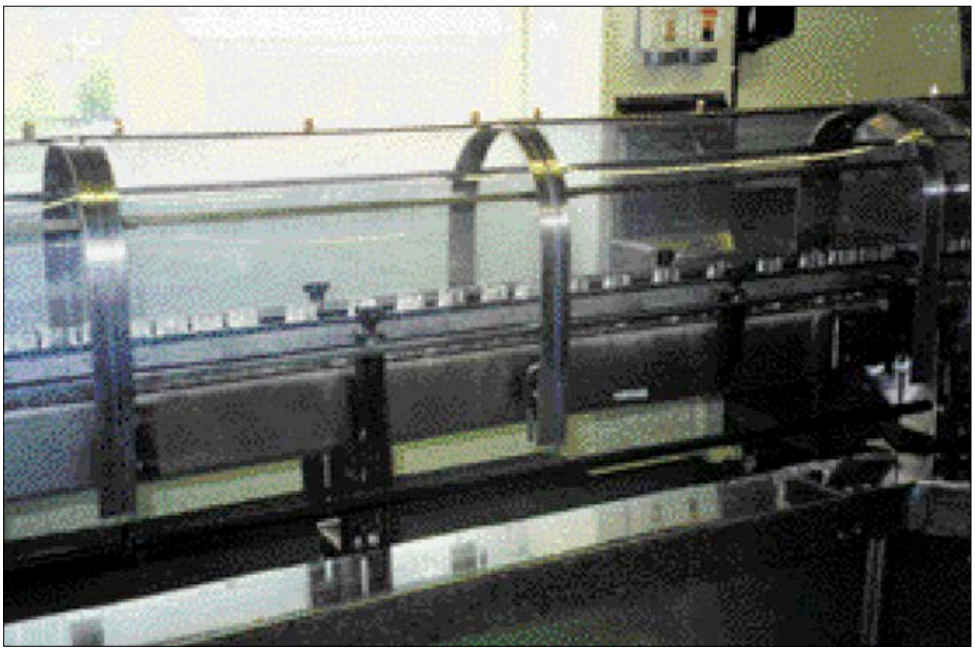
Solution: *machine enclosed by large steel frame fitted with noise-absorbent ceiling and perspex sides (photo taken from within enclosure)*

Case 37 Enclosure of conveyor

Noise source
Glass jars were transported along a conveyor from the jar cleaner to the filler.

Problem
The glass jars clashed together as they passed along the conveyor, producing a noise level of 96 dB.

Finding solutions
An acoustic enclosure was put over the conveyor. The company also changed the conveyor speed to reduce the amount of jar clashing.



Problem: *enclosure over glass jar conveyor*

Results
Noise levels were reduced to 86 dB.

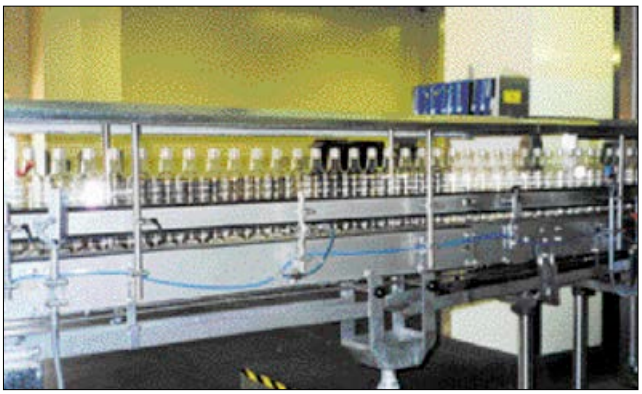
Case 38 Enclosing bottle-filler infeed

Noise source
Glass bottles moved along a filler infeed by means of a conveyor.

Problem
The bottles were banging together, resulting in noise levels of 96–100 dB.

Finding solutions
The company fitted flexible PVC line enclosures as part of their food hygiene improvements.

Results
Noise levels were reduced to 92 dB.



Problem: *glass-bottle-conveyor prior to enclosure*

Solution: *conveyor with enclosure fitted*

Acoustic panels and curtains

Case 39 Erecting an outer wall

Noise source

At a soft drinks company, gas cylinders were refilled in the main production area.

Problem

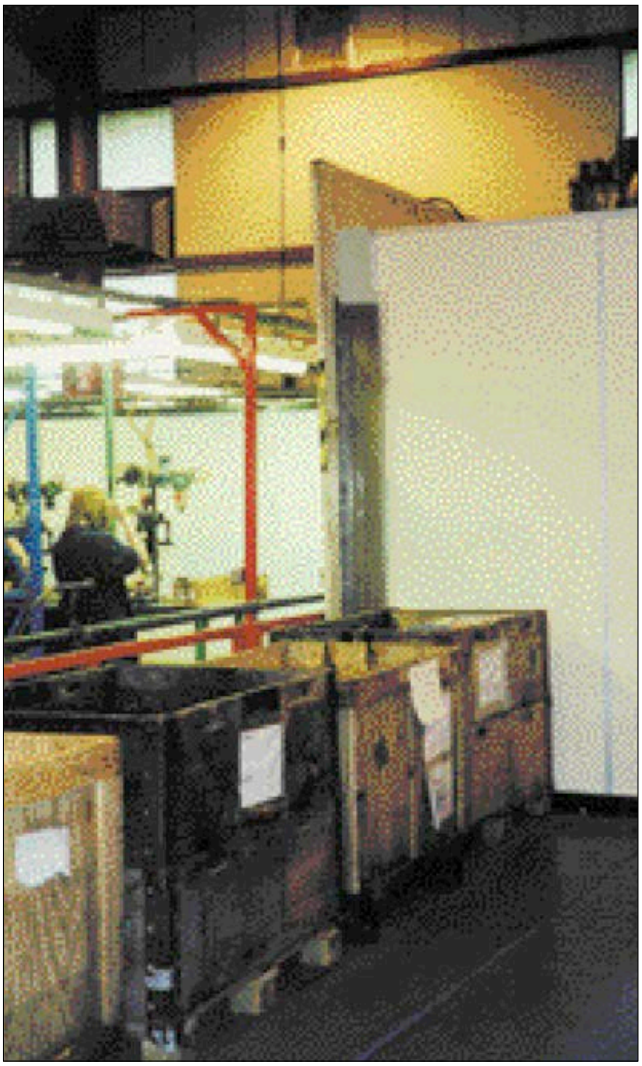
Noise levels of 70–71 dB were recorded in an office situated next to the gas-cylinder-refilling area. The office was used as an export sales call centre and the noise levels interfered with this operation.

Finding solutions

The company erected an outer wall between the existing office wall and the production area. The new wall comprised a sandwich of steel panels with sound-absorbent material between them.

Results

The noise levels in the office were reduced to 62–63 dB.



Solution: *new, sound-absorbent steel sandwich wall erected between production area (left) and office (white fabrication on right)*

Case 40 Fitting flexible PVC curtains

Noise source

At a confectionery company, toffee passed through a multi-head weigher before being decanted into boxes.

Problem

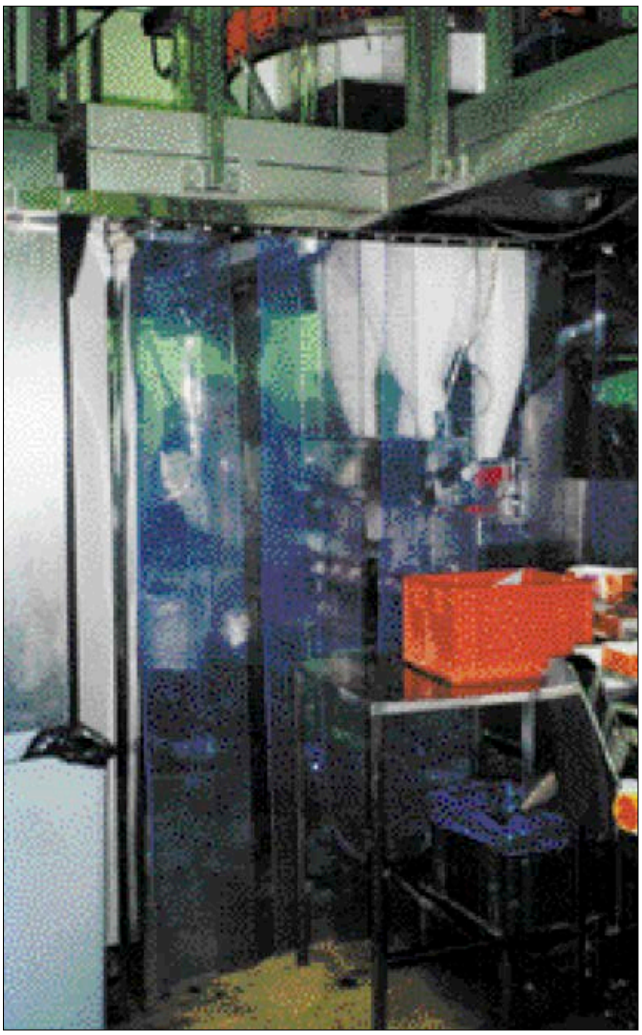
The noise level recorded at the multi-head weighing section was 92 dB.

Finding solutions

The company considered enclosing the multi-head weigher in an acoustic chamber. However, they had concerns about access to the weigher and were also concerned about controlling the temperature inside the chamber, and therefore rejected this option. The company finally decided to fit flexible PVC curtains around the weigher.

Results

The noise levels in this section were reduced to 88 dB.



Solution: *flexible PVC curtains fitted around multi-head weigher*

Case 41 Fitting baffles to ceiling

Noise source

In the small-pack department of a brewery, three packaging lines were housed in one room.

Problem

From past experience at other brewery sites, one packaging line alone produced noise levels of above 90 dB.

Finding solutions

When designing the small-pack room, the company fitted acoustic baffles to the entire ceiling to prevent noise bouncing back down to the packaging lines.

Solution: acoustic baffles fitted to ceiling

Results

The noise levels in the small-pack department were below 90 dB.

Case 42 Installing automatic doors

Noise source

Several processes throughout the factory of a sugar confectionery manufacturer required hearing protection.

Problem

The hearing protection zones were next to areas that did not require hearing protection and it was difficult to distinguish between them.

Finding solutions

The company erected walls made of sound-absorbent panels and installed automatic flexible PVC curtain doors between the hearing protection zones and the areas that did not require hearing protection.

Results

- Noise was reduced in the areas that were not hearing protection zones.
- The sound-deadening properties of the walls were kept intact by the use of the automatic doors.
- The boundaries between the hearing protection zones and quieter areas were made visible.

Solution: *automatic, flexible PVC curtain doors installed to segregate ear protection zone from quieter area*

Case 43 Fitting acoustic hood to filler pump

Noise source
A pump was used for filling product jars with a viscous product.

Problem
The pump operated at a noise level of 96 dB.

Finding solutions
The company improved the efficiency of the pump and added an acoustic hood.

Solution: *acoustic hood fitted over filler pump*

Results
Noise levels were reduced to 86 dB.

Case 44 Fitting acoustic panels to a bottle-transporter

Noise source

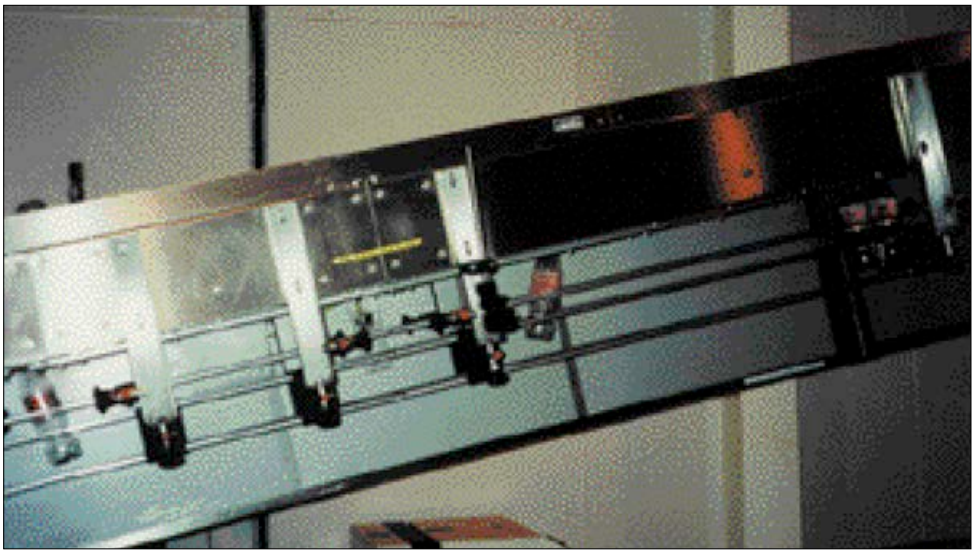
In the production hall of a soft drinks factory, plastic bottles were transported from the bottle-blowing machine to the rinser-filler-capper machine using air. Bottles were suspended by their necks and compressed air was used to blow them along a narrow channel to their destination.

Problem

The compressed air used in their transportation produced noise levels of 85–86 dB.

Finding solutions

Following a noise survey that identified the noise levels produced by the machine, acoustic panels were fitted to one side of the bottle-transporter to absorb the noise emitted.



Solution: *acoustic panel fitted to side of bottle-transporter which uses compressed air*

Results

The noise in the area was reduced to 73 dB.

Case 45 Enclosing hopper with flexible PVC curtains

Noise source

The company manufactured medicinal hard gums and soft pastilles for minor ailments such as sore throats. The hard gums were particularly noisy when falling from the multiple-head weighing machine into the hoppers, which fed into the sachet-bagging machines. The weighing machines were used for all types of products manufactured by the company.

Problem

Noise levels associated with this process were over 90 dB when the hard gums were being produced intermittently during the shift. Noise levels were much lower – less than 85 dB – when the softer pastille products were being weighed and bagged.

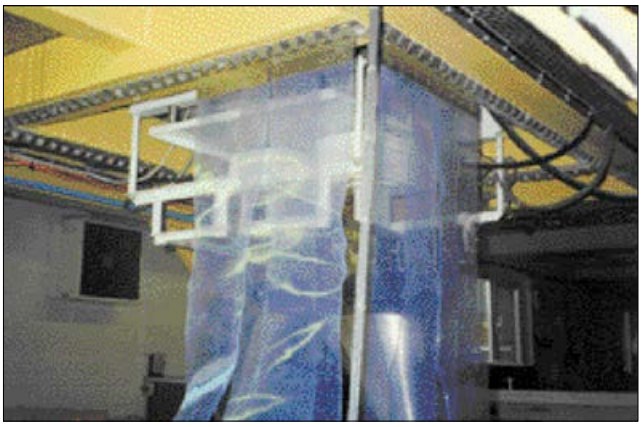
Finding solutions

The company wanted to find a solution to the noisy part of the process. They fitted a double set of hooks around the weighing heads/bagging hoppers, from which could hang a double-layer of 3 mm-thick, flexible PVC curtains. This meant that the curtains could be fitted and removed as necessary when the noisy products were being manufactured.

Results

Noise levels for the hard gum weighing and bagging process were reduced from above 90 dB to around 83 dB.

Solution: *weighing machines and hoppers with curtians removed*



Solution: *PVC curtain enclosure under construction (50% overlaps are required to be effective)*

Damping materials and silencers

Case 46 Coating hoppers, transfer points and chutes

Noise source

In a confectionery company, pieces of toffee passed through various hoppers, transfer points and 'trouser-leg' chutes.

Problem

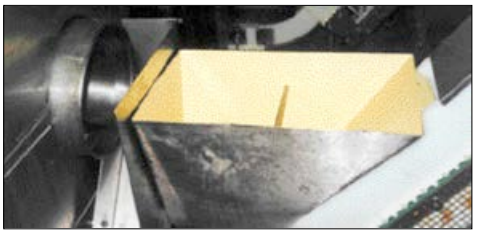
The noise levels recorded throughout this process were between 96–98 dB.

Finding solutions

The company internally coated the hoppers, transfer points and chutes with a food-grade damping material.

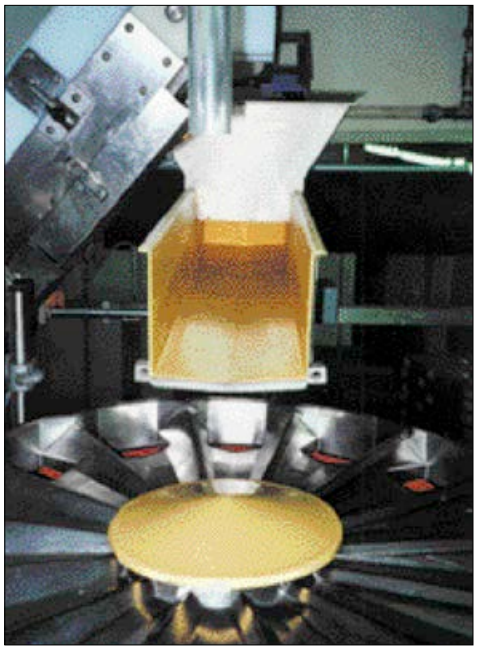
Result

Noise levels were reduced by up to 8 dB.



Solution: *close-up of internally coated hopper*

Solution: *hoppers internally coated with damping material*



Solution: *chute internally coated with damping material*

Case 47 Fitting rubber matting to shot-blast machine table

Noise source

At a soft drinks company, a shot-blasting machine was used to either remove paint from recycled gas cylinders, or to etch the steel of new gas cylinders prior to painting.

Problem

When exiting the shot-blasting machine, the gas cylinders were dropped onto a steel-plate table before being placed in stillage. The general noise level recorded in this area was 94 dB, with peaks as high as 110 dB.

Finding solutions

The company fixed rubber matting onto the steel-plate table.

Solution: *steel table covered with rubber mating to reduce impact noise*

Results

Noise levels in the area were improved by the removal of the local high peaks, although the background noise level remained the same.

Case 48 Reducing environmental noise from a grinder

Noise source

A pet food factory manufactured dry food for dogs and cats. Grinding machines ground whole grains (wheat and maize) down into a fine dust, which was then cooked, shaped and dried before being packed.

Problem

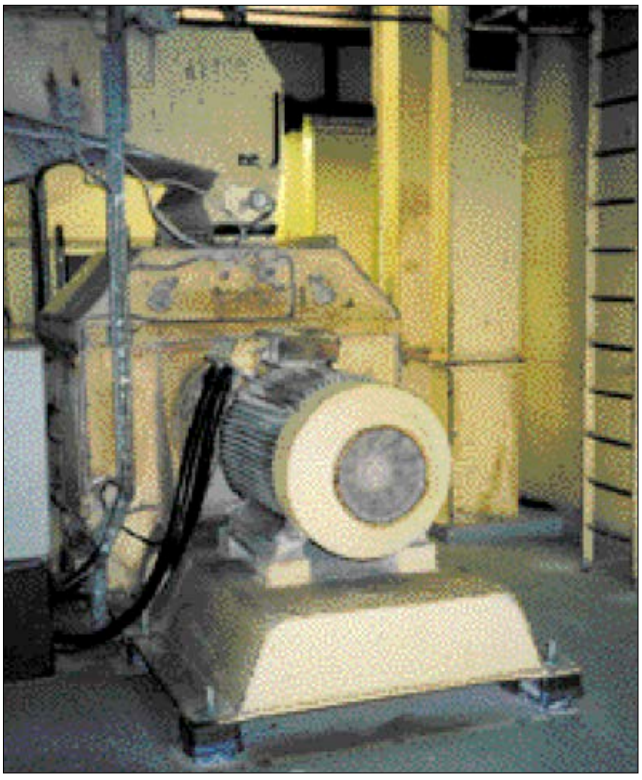
The company wanted to extend the site and applied for planning permission. There was a residential site situated close to the factory and its residents complained about the noise emanating from the grinding room and from the grinder exhausts that were situated on the outer wall of the factory facing the housing estate. The environmental noise measured at a distance of 90 metres from the factory was 53 dB and the company received an abatement notice from the council.

Finding solutions

Much of the noise was as a result of the grinding machines shaking and emitting these vibrations into the metal structure of the building and through the outer wall.

The company fitted anti-vibration mountings to the bottom of the grinders to reduce the vibrations of the machine and prevent them being transmitted to the structure of the building.

They also lined the whole room with noise-absorbing panels to absorb the internal reverberant noise and fitted absorbent lining and baffles to all the ductwork to absorb noise.



Solution: *anti-vibration mounts fitted to bottom of grinding machine*

Results

- The environmental noise was reduced to 43 dB.
- The residents of the housing estate were happier as the environmental noise levels were reduced.

Solution: *close-up of anti-vibration mount*

Case 49 Lagging container transport ductwork

Noise source

Plastic product containers were blown along ducting from the delivery hopper to the filler infeed.

Problem

- The plastic containers were rattling as they passed along the ductwork.
- There was a noise level of 92 dB.
- The work team complained of headaches.

Finding solutions

The team identified the simple, cheap solution of lagging the ductwork with noise-absorbent padding.

Results

- Noise levels were reduced to 84 dB.
- The team no longer complain of headaches.

Solution: transport ductwork (top of photo) lagged externally with noise-absorbent padding

Case 50 External coating of metal components in confectionery manufacture

Noise source

In the packing department of a sugar confectionery manufacturer, the product fell from an overhead conveyor into a weigh-head hopper and was then vibrated out to batch buckets. Each batch bucket deposited the correct weight of product into a bag.

Problem

This process produced noise levels of 92 dB.

Finding solutions

All metal components which came into contact with product were coated externally with a sound-deadening material.

Results

Noise levels were reduced to 84 dB.

Case 51 Fitting rubber caps to hydraulic dampers

Noise source

At a bakery, plastic bread-baskets were stacked using a stacking machine.

Problem

The basket-stacking machine produced a noise level of 92 dB. Small hydraulic dampers used in the basket transport were tipped at one end with a hard, plastic cap and impact on this cap was a source of noise.

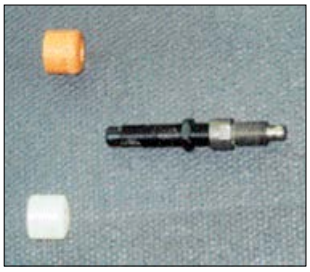
Finding solutions

Working with the equipment manufacturers, the company replaced the hard, plastic caps on the end of the hydraulic dampers with soft, rubber caps at minimal cost.

Solution: *bread-baskets in stacking machine*

Results

Noise levels were reduced to 83 dB.



Solution:

Case 52 Mounting crimping machine on rubber

Noise source

The company used a hand-operated crimping machine to seal lids onto metal foil packages containing ready-meals.

Problem

The crimping machine produced noise levels of 86–89 dB.

Finding solutions

The company mounted the crimper on two layers of rubber.

Solution: *hand-operated crimping machine mounted on layers of rubber*

Results

Noise levels were reduced to 85–86 dB.

Case 53 Laying rubber matting on floor

Noise source

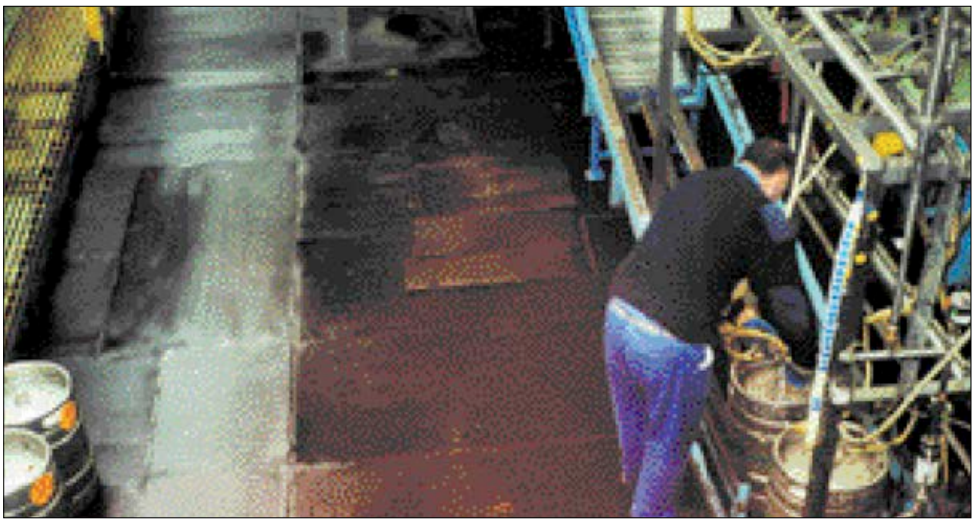
At a cider mill, sample kegs were taken from the line and decanted to check content and weight. When empty, the kegs were rolled onto the concrete floor.

Problem

High levels of noise were produced when the kegs were rolled onto the concrete floor.

Finding solutions

The company fitted rubber matting to the floor area where the empty kegs were rolled.



Solution: *rubber matting (black) on floor where kegs are rolled*

Results

The noise produced from rolling the kegs onto the floor was reduced.

Case 54 Fitting rubber matting to trolleys

Noise source

At a soft drinks company, metal 'A' frame trolleys were used to transport gas cylinders around the factory.

Problem

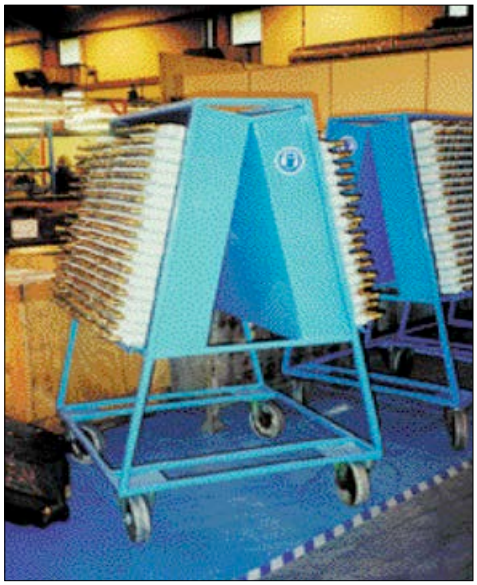
When they were being inserted into the trolleys, the gas cylinders produced a noise as they came into contact with the back of the trolley. Peak noise levels in this area were as high as 110 dB.

Finding solutions

The company fitted rubber matting to the backs of 15 trolleys.

Results

Peak noise levels were reduced.



Problem: *'A' frame trolleys to transport gas cylinders*

Solution: *rubber matting fitted to back of trolleys to reduce cylinder impact noise*

Case 55 Fitting silencer to de-gassing equipment

Noise source

At a brewery, empty tankers were 'de-gassed' to vent off any remaining CO_2 following transport of alcoholic liquids.

Problem

The 'de-gassing' procedure produced high-frequency noise levels of 92 dB, which affected the filter-room operatives and the brewery's residential neighbours.

Finding solutions

The company's engineers fitted a silencer to the 'de-gassing' equipment. The silencer had been reclaimed from a redundant compressor.

Solution: *silencer user to reduce venting noise during tanker de-gassing*

Results

Noise levels were reduced to 83 dB.

Case 56 Fitting silencers to refrigeration plant

Noise source

The company used evaporative condensers and refrigeration plant at their distribution depot.

Problem

The fans on the evaporative condensers and refrigeration plant produced high noise levels of 94 dB.

Finding solutions

Working with an external consultant, the company fitted silencers to the fans.

Results

There was a reduction in noise levels to 83–87 dB.

Maintenance

Case 57 Maintenance modifications to a mixing machine

Noise source

In a bakery, dough was mixed before being divided, proofed and baked.

Problem

The machine used to mix the dough produced upper noise levels of 94 dB.

Finding solutions

Following a noise survey that identified the high noise levels, engineers were called in to investigate ways of reducing the noise from the mechanical operation of the mixer.

- Bearings on the machine were replaced.
- Loose panelling around the base of the machine was replaced by new, close-fitting aluminium sheeting, which resulted in less vibration and consequently less noise.
- Compressed air exhausting from the mixer was also reduced.

Results

The upper noise levels were reduced to 91 dB and further noise reduction solutions might be possible.

Solution: *mechanical modifications on dough mixer halved noise level*

Case 58 Regular maintenance of machines to reduce noise from air leaks

Noise source
A soft drinks factory used compressed air to power parts of its machines.

Problem
The machines occasionally experienced air leaks that increased the overall noise levels in the factory.

Finding solutions
Every four to five weeks the company would run an ‘Air Leak Week’. At production team health and safety meetings during this week, team-leaders would highlight the importance of maintaining machines. Team-leaders would hand out red tags to team-members who would tie them onto those machines that had air leaks. Maintenance personnel would then check all the machines with red tags and repair the air leaks the following week.

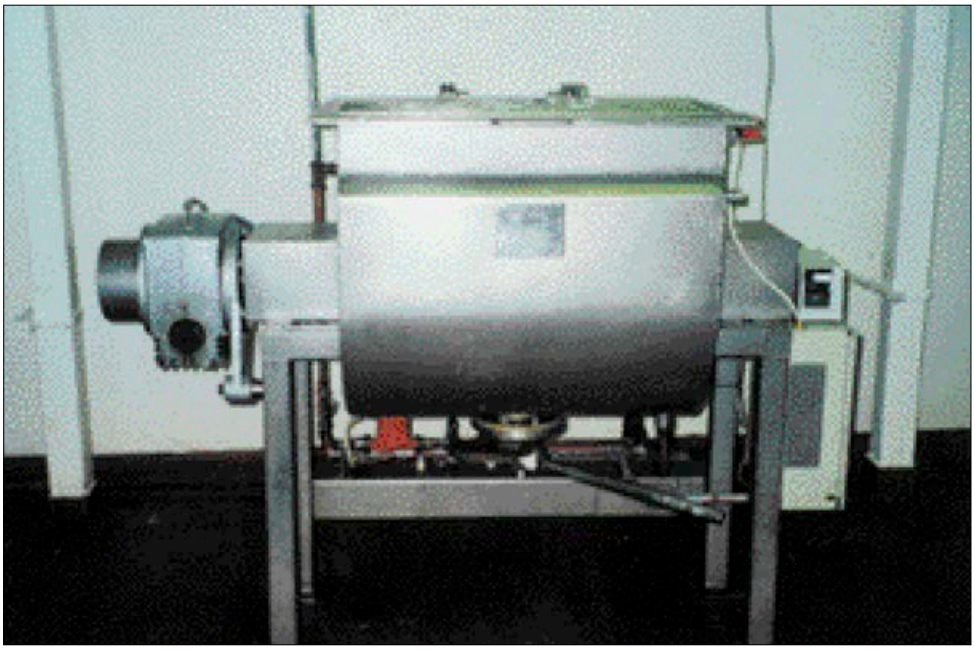
Results
- Maintenance of machines with air leaks reduced noise levels in the production hall by 3–4 dB.
- The company saved money by regularly maintaining machines and reducing compressed-air wastage.
- Regular maintenance of machines reduced injuries caused by air leaks.

Case 59 Lubricating gearboxes

Noise source
At a bakery, mixing machines were used to prepare fondant and chocolate.

Problem
The mixers produced noise levels between 80–85 dB.

Finding solutions
The company used a PTFE food-safe gel to lubricate the gearboxes of the mixers and discovered that this also reduced noise.



Solution: *mixing machine for fondant and chocolate*

Results
The noise levels were reduced by approximately 1.5 dB.

Case 60 Fitting and maintaining silencers on wrapping machines

Noise source

The company, which prepares sandwiches, used vacuum-wrapping machines that had compressed-air exhausts.

Problem

The compressed-air exhausts caused high, intermittent noise levels of 88–90 dB.

Finding solutions

The company fitted high-specification silencers to the compressed-air exhausts and introduced a system of planned, preventative maintenance to ensure noise levels remained reduced.

Results

Noise levels were reduced and maintained at below 85 dB.

Appendix 1

Typical noise levels in some food and drink industries

Typical noise levels that have been recorded in some food and drink industries are shown below.

These levels represent only a small sample of the many food and drink processes but show that high exposure values will often be reached if employees spend a significant part of their time in these areas.

Industry	Location	Noise level (decibels)
Drinks	Bottling halls	85–95
	Bottle filling/labelling	85–95
	De-crating/washing	85–96
	Casking/kegging	85–100
	Cooperage machines	Above 95
Meat	Animals in lairage	80–110
	Powered saws	Up to 100
	Blast-freezers/chillers	85–107
	Bowl choppers	Above 90
	Packing machinery	85–95
Milling	Mill areas	85–95
	Hammer mills	95–100
	Grinders	85–95
	Seed-graders	90
	Bagging lines	85–90
Bakery	Dough-mixing room	85
	Baking plant	85
	De-panning	90
	Bread slicing	85–90
	Fruit washing	92
Dairy	Production areas	85–95
	Homogenisers	90–95
	Bottling lines	90–95
	Blast-chillers	87–95
	Pneumatics	85–95
Confectionery	Hopper feed	95
	Mould-shakers	90–95
	Wrap/bagging	85–95
	High boiling	85

Appendix 2

Noisy processes and some solutions found to be successful

Process	Typical noise level in decibels	Solutions implemented
Glass-bottling lines	90–95 (dairy) 85–95 (brewing and soft drinks) 100 (high-speed bottling, 400–800 bottles per minute)	■ Replace glass bottles with plastic ones ■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Reduce inter-bottle impact: slow down speed of line and increase spacing of bottles ■ Damping of impact surfaces: fit damping material at impact points ■ Fit acoustic enclosure over bottle conveyor ■ Provide acoustic barrier around cap-feeder bowl and fit noise-reducing mountings ■ Limit worker exposure time: job rotation
Product impact on hoppers	95 (confectionery) Over 90 (frozen food) Over 100 (animal feed)	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Reduce product-hopper impact: reduce drop-height of product ■ Reduce or fill-in gaps at feed and take-off of pelletisers ■ Reduce impact noise: – use hopper made of sound-deadened steel – line inside of hopper with impact-deadening material – line outside of hopper with noise-damping material – line guards/panels with noise-damping material (can produce 5 dB noise reduction)
Wrapping, cutting wrap, bagging etc (eg sweets)	85–95	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Reduce drop-height of product ■ Enclosure: – line cover panels with noise-damping material – fill any gaps in cover panels with noise-absorbing material – fit full acoustic enclosure over bagging line ■ Regularly maintain machinery ■ Limit worker exposure time: job rotation ■ Provide noise refuges for workers

Process	Typical noise level in decibels	Solutions implemented
Bowl choppers (meat)	Over 90	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Maintenance: regularly maintain rotating parts, machine mountings and sharpen blades ■ Fit acoustic hood/enclosure over bowl chopper ■ Fit noise-damping material to bowl or panels ■ Segregate bowl choppers from quieter machinery/areas ■ Limit worker exposure time: job rotation ■ Provide noise refuges for workers
Pneumatic noise and compressed air	85–95	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Replace compressor with a less noisy model ■ Move compressor outside or to a people-free area or enclose compressor (but ensure no overheating) ■ Use low-noise air nozzles ■ Fit regulators to control air pressure ■ Fit manifolds/silencers on exhausts ■ Regularly maintain potentially noisy equipment
Milling operations	85–100	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Locate mill in a separate room away from workers ■ Enclose hammer mills, roller mills and mixers with acoustic enclosures ■ Fit noise-damping material to panels ■ Reduce drop-height of pellets and line hoppers with impact-absorbing material ■ Enclose outside of pipes carrying particulate product (eg with half-cylinder sheet-steel lined with 50 mm mineral wool slabs which can provide 10–15 dB noise reduction) ■ Limit worker exposure time: job rotation
Saws/cutting machinery	85–107 (meat)	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Ensure preventative maintenance/ inspection is carried out on blade alignment, blade sharpening, lubrication, floor mountings etc ■ Use noise-dampening on saw blades ■ Limit worker exposure time: job rotation

Process	Typical noise level in decibels	Solutions implemented
Blast chillers/freezers	85–107	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Replace plant with a less-noisy model ■ Enclose plant with acoustic panelling (eg sheet-steel outer skin, perforated-steel inner skin, 75 mm mineral wool slabs in between, can provide over 20 dB noise reduction) ■ Limit worker exposure time: job rotation ■ Noise refuges for workers
Manually pushing wheeled trolleys/ racks	Up to 107 (intermittent, from wheels/wheel bearings – especially those subject to high/ low temperatures in ovens/freezers)	■ Design out noise at source: specify good quality wheels/bearings when purchasing trolleys ■ Regularly maintain wheels/bearings ■ Improve flooring to reduce damage to wheels/bearings and cut down noise ■ Use conveyors to move product where possible ■ Improve layout to minimise movement of product
Packaging machinery	85–95	■ Design out noise at source: specify acceptable noise level when purchasing machinery ■ Install noise reducing enclosures ■ Fit silencers to noisy exhausts ■ Limit worker exposure time: job rotation

Further reading

http://www.hse.gov.uk/noise/publications.htm

Acknowledgements

The Health and Safety Executive acknowledges the generosity of the following companies:

Allied Bakeries Ltd

Bacardi-Martini Ltd

Coors Brewers Ltd

H P Bulmer Ltd

Cadbury Trebor Bassett

Colman's of Norwich Ltd

Ernest Jackson and Co Ltd

Four Square Catering and Vending Ltd

Kara Grain D'Or Ltd

Robinsons Soft Drinks

Samworth Brothers Ltd

Sayers Confectioners Ltd

SodaStream

Thorntons plc

Warburtons Ltd

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

British Standards can be obtained in PDF or hard copy formats from BSI: http://shop.bsigroup.com or by contacting BSI Customer Services for hard copies only Tel: 020 8996 9001 email: cservices@bsigroup.com.

The Stationery Office publications are available from The Stationery Office, PO Box 29, Norwich NR3 1GN Tel: 0870 600 5522 Fax: 0870 600 5533 email: customer.services@tso.co.uk Website: www.tsoshop.co.uk/ (They are also available from bookshops.) Statutory Instruments can be viewed free of charge at www.legislation.gov.uk/.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This document is available at: www.hse.gov.uk/pubns/books/hsg232.htm