Cutting costs and waste by optimising packaging use
Cutting costs and waste by optimising packaging use

This Good Practice Guide was produced by Envirowise

Prepared with assistance from:

Enviros Consulting Limited
If you can optimise the amount and types of packaging you use, you are likely to:

- achieve significant cost savings and thus improve your profit margin;
- minimise both your consumption of resources and the quantities of waste for disposal;
- improve your company’s image in the eyes of customers, shareholders and the public.

It will also help you to meet any obligations under the UK packaging waste regulations in the most cost-effective way. This Good Practice Guide is intended to help companies interested in reducing both the quantities of packaging that they use/handle and the associated costs. It is applicable to all companies, irrespective of size.

The Guide describes:

- the business benefits of better packaging management;
- the principles of packaging management and the importance of adopting a systematic approach to optimisation;
- the need to involve all employees in the improvement process;
- how to gather and analyse data on packaging use;
- how to prioritise improvement options;
- ways of eliminating and rationalising packaging;
- issues to consider when seeking to optimise different types of packaging while maintaining the same level of product protection;
- the use of dedicated re-usable packaging and the re-use of so-called one-trip packaging;
- the recycling of used packaging;
- how to reduce disposal costs.

Industry examples throughout the Guide illustrate the significant cost savings and other benefits achieved by companies that have already taken action to optimise their packaging use. A checklist and worksheets are provided to help you get started on your improvement programme. This Guide updates and replaces Envirowise publications GG140 and GG141.

Free advice and publications on all aspects of packaging management are available from the Environment and Energy Helpline on 0800 585794.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Introduction</td>
<td></td>
</tr>
<tr>
<td>1.1 Why look again at your packaging?</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Business benefits of better packaging management</td>
<td>2</td>
</tr>
<tr>
<td>1.3 The purpose of the Guide</td>
<td>2</td>
</tr>
<tr>
<td>1.4 Further assistance</td>
<td>3</td>
</tr>
<tr>
<td><strong>2</strong> Packaging and its management</td>
<td></td>
</tr>
<tr>
<td>2.1 The role of packaging</td>
<td>5</td>
</tr>
<tr>
<td>2.2 The principles of packaging management</td>
<td>5</td>
</tr>
<tr>
<td>2.3 The waste hierarchy - getting the right system</td>
<td>6</td>
</tr>
<tr>
<td>2.4 UK packaging legislation</td>
<td>7</td>
</tr>
<tr>
<td><strong>3</strong> A systematic approach to optimising packaging</td>
<td></td>
</tr>
<tr>
<td>3.1 Step 1: Winning support and the initial review</td>
<td>12</td>
</tr>
<tr>
<td>3.2 Step 2: Establishing a team and appointing a co-ordinator</td>
<td>13</td>
</tr>
<tr>
<td>3.3 Step 3: Gathering information on packaging use and disposal</td>
<td>15</td>
</tr>
<tr>
<td>3.4 Step 4: Analysing data and identifying areas for improvement</td>
<td>19</td>
</tr>
<tr>
<td>3.5 Step 5: Identifying and prioritising improvement options</td>
<td>21</td>
</tr>
<tr>
<td>3.6 Step 6: Producing an action plan</td>
<td>22</td>
</tr>
<tr>
<td>3.7 Step 7: Implementing the action plan</td>
<td>23</td>
</tr>
<tr>
<td>3.8 Step 8: Reviewing progress</td>
<td>23</td>
</tr>
<tr>
<td><strong>4</strong> Eliminating and rationalising packaging</td>
<td></td>
</tr>
<tr>
<td>4.1 Avoiding the need for packaging</td>
<td>24</td>
</tr>
<tr>
<td>4.2 Rationalising your packaging system</td>
<td>25</td>
</tr>
<tr>
<td><strong>5</strong> Optimising different types of packaging</td>
<td></td>
</tr>
<tr>
<td>5.1 Boxes and corrugated cases</td>
<td>27</td>
</tr>
<tr>
<td>5.2 Drums and intermediate bulk containers</td>
<td>28</td>
</tr>
<tr>
<td>5.3 Collation packs</td>
<td>30</td>
</tr>
<tr>
<td>5.4 Fill materials</td>
<td>30</td>
</tr>
<tr>
<td>5.5 Box closures</td>
<td>31</td>
</tr>
<tr>
<td>5.6 Shrink-wrap, stretch-wrap and plastic bags</td>
<td>32</td>
</tr>
<tr>
<td>5.7 Pallet loads</td>
<td>33</td>
</tr>
<tr>
<td><strong>6</strong> Packaging re-use</td>
<td></td>
</tr>
<tr>
<td>6.1 Design issues for packaging re-use</td>
<td>35</td>
</tr>
<tr>
<td>6.2 Assessing the costs and benefits of re-usable packaging</td>
<td>36</td>
</tr>
<tr>
<td>6.3 Systems designed for re-use</td>
<td>37</td>
</tr>
<tr>
<td>6.4 Re-using one-trip packaging</td>
<td>41</td>
</tr>
<tr>
<td>6.5 Managing re-usable packaging systems</td>
<td>43</td>
</tr>
<tr>
<td><strong>7</strong> Recycling packaging</td>
<td></td>
</tr>
<tr>
<td><strong>8</strong> Reducing disposal costs</td>
<td></td>
</tr>
<tr>
<td>8.1 Economics of compaction</td>
<td>51</td>
</tr>
</tbody>
</table>
## Industry examples

1. Rangemaster transit packaging redesign and optimisation  
2. Transit packaging savings for Everest Limited  
3. Britax improvements to transit packaging  
4. Marks & Spencer returnable transit packaging systems

## Moving forward

10.1 Sources of further help

## Appendix

Checklist and worksheets
Packaging management can be defined as a systematic approach that allows the most efficient use of packaging to reduce quantities, costs and waste without compromising its fitness for purpose. This Guide aims to provide clear, concise advice concerning the principles of transit packaging management and waste minimisation. It replaces and updates Cutting costs and waste by reducing packaging use (GG140) and Choosing and managing re-usable transit packaging (GG141) published in 1998 by the then Environmental Technology Best Practice Programme.

The Guide is concerned mainly with transit and collation packaging - whether used to supply materials, components, finished products, solids, powders or liquids. It therefore covers:

- bags, boxes and drums;
- filler materials, shrink-wrap and stretch-wrap;
- pallets, layer pads and slip sheets.

Transit packaging should be designed/chosen as part of a complete optimised packaging system, including primary packaging (e.g. point-of-sale packaging for food, toiletries and household goods). In some cases, transit packaging stays with the product through to the consumer and may even double as display packaging. The optimisation of sales packaging is considered in Packaging design for the environment: reducing costs and quantities (GG360R).

1.1 Why look again at your packaging?

The public often perceives packaging as being excessive and wasteful (such a perception can affect a company’s image and sales). However, packaging plays a crucial role in protecting raw materials through to manufactured goods and perishable foods. Inadequate packaging frequently leads to product damage, customer returns and waste - not only of the product itself, but also of the energy and materials used in its manufacture and transport.

However, a significant proportion of the packaging in use in the UK today (particularly transit packaging) is over-specified and single use. This wastes finite resources and adds to the UK’s growing waste disposal problem. As the industry examples in this Guide demonstrate, optimising packaging can save companies large sums of money.

Various regulations now govern the use and management of packaging. These are described in more detail in section 2.4.

- The Producer Responsibility Obligations (Packaging Waste) Regulations 1997 (as amended) place a weight-based recovery and recycling obligation on all parts of the packaging chain. UK targets will increase over the next few years to meet the requirements of the revised EU packaging waste directive, driving up costs significantly.
- The Packaging (Essential Requirements) Regulations 2003 (as amended) require certain conditions to be met in terms of the design of packaging.
- The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP 3) set out the requirements in relation to the packaging of hazardous substances.
Waste disposal costs are also set to rise as a result of the landfill tax escalator and the costs associated with implementing the EU landfill directive in the UK. The standard rate of the landfill tax increased to £15/tonne on 1 April 2004. In its 2002 Pre-Budget Report, the Government announced that the standard rate of landfill tax would subsequently be increased by £3 per tonne in 2005/06, and by at least that amount in the years thereafter, on the way to a medium-to long-term rate of £35 per tonne. Further information about the landfill tax is available from HM Revenue & Customs (call its National Advice Service on 0845 010 9000 or visit www.hmrc.gov.uk).

1.2 Business benefits of better packaging management

Waste minimisation involves reducing unnecessary resource consumption and material disposal in order to reduce the environmental burden and operating costs. Companies can typically save up to 1% of turnover or around £1 000 per employee through waste minimisation. Packaging is an important element of any waste minimisation programme.

The relationship between waste reduction and profit

A company with a £4 million turnover makes a profit of £300 000 (7.5%) each year. Waste costs the company around £120 000/year (about 3% of turnover) as a result of unnecessary material purchases and high disposal costs. Reducing these costs by only 10% would increase profits by £12 000/year (i.e., an extra 4%). Reducing waste by 20% would put an extra 8% on the bottom line.

There are clear economic and regulatory reasons to think carefully about the packaging that your company handles and the waste that it creates. This Guide can both improve your company’s environmental performance and make your company more profitable by:

- reducing your own direct packaging and material costs;
- reducing your suppliers’ costs (from which you can often benefit);
- reducing product damage and costly customer returns;
- reducing your UK producer responsibility obligation and hence the cost of compliance;
- reducing the cost of packaging recovery in countries with more stringent rules, such as Germany;
- reducing waste disposal costs and increasing revenue from the sale of packaging waste;
- improving overall site efficiency;
- making your company more attractive to ‘green’ customers and other stakeholders.

1.3 The purpose of the Guide

The Guide is intended to be used by managers in companies of all sizes seeking practical ways of reducing the quantities of packaging that they handle and hence their costs. This includes those attempting to make savings within the framework of an environmental management system (EMS) such as ISO 14001 or BS 8555:2003.1

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1 For free information and advice about implementing an EMS in your company, contact the Environment and Energy Helpline free on 0800 585794 or visit www.envirowise.gov.uk. For information about ISO 14001 and BS 8555, visit www.bsi-global.com.
The Guide is aimed at all sectors of manufacturing industry, goods distributors, wholesalers and retailers. It is relevant to those involved in:

- the design and specification of packaging, including packaging technologists;
- factory management, including logistics managers and manufacturing engineers;
- environmental management.

The Guide includes practical advice on how to:

- avoid the need for packaging, eg use of bulk delivery and on-site conveyors;
- minimise packaging use, eg optimisation, lightweighting and right-sizing;
- re-use packaging (the re-use of ‘one-trip’ packaging and re-usable systems);
- obtain value from wastes, eg through the sale of packaging materials for recycling;
- reduce the cost of disposal, eg through reducing volumes by compaction.

Industry examples are given throughout the Guide and in section 9 to illustrate the significant cost savings and other benefits of taking action to optimise your packaging use. Section 10.1 contains a list of useful contacts, while the appendix offers a useful checklist and worksheets for you to photocopy and use in your company.

1.4 Further assistance

This Guide complements other free Envirowise guides on packaging, eco-design and life-cycle assessment (LCA) such as:

- Packaging design for the environment: reducing costs and quantities (GG360R);
- Unpack those hidden savings: 120 tips on reducing packaging use and costs (EN250);
- Packaging reduction saves money: industry examples (GG411);
- Reducing the cost of packaging in the food and drink industry (GG157);
- Life-cycle assessment - an introduction for industry (ET257).

Envirowise has also published a number of free case studies on packaging and eco-design.

All Envirowise publications are available free of charge via the Environment and Energy Helpline on 0800 585 794 and from the Envirowise website (www.envirowise.gov.uk).

UK companies may also be eligible for free telephone advice and site visits on packaging (including packaging legislation and packaging design and management). Call the Environment and Energy Helpline on 0800 585 794 for more information or visit www.envirowise.gov.uk.

Also available is the Industry Council for Packaging and the Environment (INCPEN) Responsible packaging: Code of practice for optimising packaging and minimising waste. This can be downloaded as a PDF file from www.incpen.org (click on Publications and then Code of practice).
Rangemaster is a market leader in the UK in the manufacture of range cookers and kitchen sinks. Cost savings of over £100,000/year in materials alone have been achieved through redesign of its transit packaging to reduce the number of components, material costs and warranty claims for damage during transit. These savings gave a payback period of approximately one year on the investment in new machinery and tooling.

Eliminating packaging components and substituting materials have reduced the weight of packaging used by 125 tonnes/year. Labour savings have been achieved by incorporating label information into the printing on the outer packaging, reducing the forming and stapling of cardboard components, and packing accessories in ready-made spaces in a polystyrene moulding rather than in separate cardboard boxes.

Reducing the number of packaging components by 30% has improved housekeeping and reduced the amount of floor space required in the packing area. The increased strength of the packaging has also increased the storage efficiency of appliances awaiting dispatch. Transit damage is also reported to have fallen.

Rangemaster has identified a number of further improvements, one of which is expected to save around £15,000/year and to reduce packaging requirements by some 20 tonnes/year.

For more information, see industry example 1 in section 9.
2.1 The role of packaging

Packaging can have many complex functions and to fulfil these it has to be ‘fit for purpose’. In general, packaging has to:

- protect, contain and preserve the product;
- provide commercial and consumer information, eg bar codes and instructions;
- present and market the product (where used as part of a display);
- facilitate safe handling;
- provide evidence that the product has not been tampered with;
- ensure consumer acceptance, eg ease of opening, dispensing, closure and storage.

All packaging has to be able to protect its contents from sustaining damage during manufacture (ie on the packing line and in the warehouse), while in transit and during storage. In most cases, the packaging must therefore be able to resist many of the following:

- various loads, eg compression (stacking) and bursting (drums);
- drops from various heights (on to faces, edges and corners);
- vibration cycles of both low and high frequency;
- puncture by sharp objects;
- ingress by water and spilled chemicals;
- temperature and humidity variations.

2.2 The principles of packaging management

Packaging management is about optimising the use of packaging to reduce quantities, costs and waste. Ideally, it should encompass a systematic approach involving measurement, record-keeping and analysis.

The key principles of effective packaging management are:

- It must be undertaken within the context of the whole manufacturing and distribution system (from manufacturer to consumer). Dealing with packaging in isolation is likely to be counterproductive, resulting in product damage and other difficulties.
- Measurement leads to understanding, control and greater efficiency. Understanding the flow of packaging and the associated waste streams will ultimately lead to greater efficiency.
- You can nearly always improve an existing system. Technologies and costs change and, thus, what was uneconomic or not feasible a few years ago may now be a viable option. Don’t be put off by those who tell you, ‘That’s the way we’ve always done it’ or ‘We tried that and it didn’t work’.
- Evolution is usually easier and more effective than revolution. Keep things as simple as possible, do them at appropriate times (eg when considering new packing and warehouse equipment) and conduct appropriate tests and trials.
People make things happen. Involving all relevant staff - from packers on the shop floor to the production director - will make the waste minimisation process more effective.

2.3 The waste hierarchy - getting the right system

The waste hierarchy (see Fig 1) provides a broad framework that can help to guide your approach to your transit packaging. However, it should not be applied rigidly as the best environmental option will depend on the circumstances.

- **Eliminate/avoid.** If possible, get rid of some or all of the packaging, for example, by removing unnecessary layers or by changing handling practices.
- **Reduce.** Packaging should be optimised so as to minimise resource inputs (eg materials and energy) and package volume for a given life-cycle context, whether this involves a single trip or multiple trips. If there is no possibility of re-use, packaging should be optimised for one-trip use.
- **Re-use.** Packaging can be designed to serve its purpose over virtually any number of ‘trips’. In the right circumstances, an optimised re-use system can be better than an optimised one-trip system, eg where packaging can be back-hauled readily in product delivery vehicles.
- **Recycle.** Packaging can also be designed to make it less costly and/or environmentally damaging to recycle even if it has been re-used. Biodegradable packaging can be composted.
- **Dispose.** Design can still play a part, eg by maximising energy recovery while minimising residual waste. Disposal to landfill is the last resort.

Bearing in mind this hierarchy, it is important to optimise the whole packaging system (including primary, secondary and tertiary packaging) through design or specification/choice.

The environmental constraints should be considered alongside fitness-for-purpose constraints. The Packaging (Essential Requirements) Regulations 2003 only require the system of choice to be optimised. They do not require the optimum system to be identified. However, there are generally cost benefits from doing so.
To obtain the optimum packaging system, it is therefore necessary to think about the life-cycle of your packaging from when you fill it to customer use and disposal. This can be achieved by looking at the issues summarised in Table 1.

Table 1 Issues to consider when optimising your packaging system

<table>
<thead>
<tr>
<th>Stage</th>
<th>Questions to ask yourself</th>
</tr>
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<tbody>
<tr>
<td>Packing</td>
<td>How well will the packaging work in the context of the production/packing lines?</td>
</tr>
<tr>
<td></td>
<td>Will the line be automatic or manual?</td>
</tr>
<tr>
<td></td>
<td>What packaging and adhesives can be used (eg wrap-around corrugated and hot-melts)?</td>
</tr>
<tr>
<td></td>
<td>How will the product and its primary packaging fit with or into the distribution packaging?</td>
</tr>
<tr>
<td></td>
<td>Will it add to the strength and rigidity of the distribution pack?</td>
</tr>
<tr>
<td></td>
<td>Will it damage the distribution pack in any way?</td>
</tr>
<tr>
<td></td>
<td>Will extra filler material be needed to take up void space?</td>
</tr>
<tr>
<td></td>
<td>Will tape, staples or shrink-wrap be required?</td>
</tr>
<tr>
<td>Handling/distribution</td>
<td>Will the load be palletised or put on slip sheets?</td>
</tr>
<tr>
<td></td>
<td>What size will the pallet/slip sheet be?</td>
</tr>
<tr>
<td></td>
<td>Will the load be stacked on the pallet?</td>
</tr>
<tr>
<td></td>
<td>Will layer pads be used?</td>
</tr>
<tr>
<td></td>
<td>Will stretch-wrap or banding be used?</td>
</tr>
<tr>
<td></td>
<td>Will a fork-lift truck be used?</td>
</tr>
<tr>
<td></td>
<td>Will the palletised loads be stacked or racked?</td>
</tr>
<tr>
<td></td>
<td>What type of vehicle will be used?</td>
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<tr>
<td>Use and disposal</td>
<td>How will the customer handle the packaging?</td>
</tr>
<tr>
<td></td>
<td>Will the customer break down the pack into smaller units for onward distribution?</td>
</tr>
<tr>
<td></td>
<td>Will the pack be returned to you?</td>
</tr>
<tr>
<td></td>
<td>Will the packaging be re-used by the customer?</td>
</tr>
<tr>
<td></td>
<td>How will the packaging ultimately be disposed of?</td>
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</tbody>
</table>

When making choices about your packaging system, it is necessary to involve a wide range of people, both internally (eg procurement, manufacturing, design, health and safety) and externally (eg suppliers, customers and distributors). This enables you to share knowledge and experience and hence obtain the optimum solution that will suit all the parties involved.

The process of optimising packaging is described in more detail in section 3. For more information about packaging choice and design, see *Packaging design for the environment: reducing costs and quantities* (GG360R).

2.4 UK packaging legislation

This Guide is not intended to be a compliance guide, but it is essential that readers are aware of the following key regulations. Overleaf is a summary of the requirements of this legislation, which is not intended to be an exhaustive description of the requirements. Readers should seek further advice, particularly in relation to the different provisions that may apply in England, Wales, Scotland and Northern Ireland. The full text of all packaging legislation can be downloaded from www.legislation.hmso.gov.uk.
For free information and advice on how these regulations apply to your company and for news of any forthcoming changes to packaging legislation:

- contact the Environment and Energy Helpline on freephone 0800 585794;
- visit the Envirowise website at www.envirowise.gov.uk;
- visit the NetRegs website at www.netregs.gov.uk;
- contact the local office of the appropriate regulator or visit its website:
  - Environment Agency (in England and Wales) www.environment-agency.gov.uk;
  - Scottish Environment Protection Agency (SEPA) www.sepa.org.uk;
  - Environment and Heritage Service (in Northern Ireland) www.ehsni.gov.uk.

2.4.1 Producer Responsibility Obligations (Packaging Waste) Regulations 1997 (as amended)

These regulations aim to encourage companies to reduce quantities of packaging and to re-use/recover packaging and are enforced by the environment agencies. The regulations are referred to subsequently in this Guide as the packaging waste regulations.

The packaging waste regulations affect companies that:

- have an annual turnover of more than £2 million;
- handle (eg import, make, pack/fill or pass on) more than 50 tonnes/year of packaging.

Companies that meet these conditions must take responsibility for the recovery and recycling of their ‘obligation’ for packaging waste. The following are taken into account when calculating this obligation:

- the amount of obligated packaging handled;
- the obligation imposed on particular activities (ie raw material manufacturer 6%, converter 9%, packer/filler 37%, seller/final retailer 48%);
- UK recovery and recycling targets.

The packaging handled is the company’s annual throughput (in tonnes) of packaging during the last calendar year and includes packaging that is imported and packaging that is supplied on (whether this was imported or not). The main exemptions are packaging that is:

- discarded on-site unless it was imported packaging for which you were the end-user;
- exported (even by a third party);
- re-used (apart from its first use);
- reconditioned and second-hand packaging (eg pallets);
- leased or owned by others.

If your company is obligated, you are required to:

- register with, and provide data on the packaging handled to the relevant environment agency by 7 April of the year you become obligated;

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2 For example, an amended version of the EC packaging and packaging waste directive was published in February 2004. Member States have 18 months in which to transpose these amendments to the appropriate domestic legislation.
take responsibility for the recovery (including recycling and energy from waste) and recycling of your ‘obligation’ amount, overall and for particular materials (you can arrange for this to be done on your behalf);

certify and provide evidence - usually by obtaining Packaging Recovery Notes (PRNs) - that you have fulfilled your recovery and recycling obligations.

If you join a registered compliance scheme, you pass on your obligations but will have to pay a membership fee and pay for your PRNs.

For further information about the application of the packaging waste regulations in England, Wales and Scotland, see the User’s Guide available for downloading from the Department for Environment, Food and Rural Affairs (Defra) website (www.defra.gov.uk/environment/waste/topics/packaging/index.htm).

Separate but similar regulations apply in Northern Ireland. Companies are advised to contact the Environment and Energy Helpline (0800 585794) or the Environment and Heritage Service (www.ehsni.gov.uk).

2.4.2 Packaging (Essential Requirements) Regulations 2003 (as amended)

These regulations require certain conditions to be met in relation to the manufacture and composition of packaging and to its re-usability and recoverability. They complement the packaging waste regulations and are effectively eco-design regulations. They are enforced by local authority trading standards officers and apply to packers/fillers, importers of packaged goods from outside the European Economic Area (EEA) and brand owners (where the brand/trademark is shown). These regulations apply regardless of company size and apply only to packaging placed on the EEA market (packed/filled packaging) after 31 December 1994.

The three key legal requirements that companies must meet are:

- to comply with the limits on heavy metal content (lead, cadmium, hexavalent chromium and mercury combined in packaging and any of its components must be limited to 100 parts per million);
- to keep appropriate records for four years after the packaging was put on the market;
- to meet the ‘Essential Requirements’, which relate to:
  - minimising the volume and weight (for a given material/system), subject to ‘fitness-for-purpose’ criteria;
  - permitting re-use (fulfil a number of trips and meet health and safety requirements) or recovery;
  - allowing at least one of the following recovery options on disposal - materials recycling, composting/biodegradation, or energy from waste;
  - minimising the presence of noxious and/or hazardous substances in the packaging and hence the environmental impacts of its disposal.

The main exemptions include:

- re-usable packaging already in use, but not the first time it is put on the market (refurbished packaging is not exempt);
- packaging exported straight out of the EEA without being put on the European market.

3 See www.ehsni.gov.uk/environment/wasteManage/regulations_packaging.shtml
Some exemptions on the heavy metal requirements apply to certain types of re-usable plastic boxes and plastic pallets containing recycled material content.

The requirement for minimisation means that you have to keep reducing material weight and pack volume until a fitness-for-purpose limit is reached based on a specified criterion called the critical area. These requirements are:

- product protection;
- packaging manufacturing process;
- packing/filling process;
- logistics - transport, warehousing, handling, etc;
- product presentation and marketing;
- user/consumer acceptance - ease of opening, tamper-free evidence, etc;
- information provision, eg product information, instructions, bar codes and expiry dates;
- safety, eg safe handling requirements, child resistance, hazard warnings and pressure release closures;
- legislation - any requirements from national or international legislation or standards;
- other issues - economic, social, environmental implications not considered above.

The form of records is not specified in the regulations. The following are suggested:

- weight/volume minimisation - critical area and reason why;
- suitability for re-use and recovery;
- minimisation of hazardous substances and heavy metal content.

Records must be made available at the request of your local trading standards officer. Non-compliance is a criminal offence with the possibility of prosecution in a Magistrates or Crown Court, with a resulting fine.

For further information about the application of these regulations, see the Government Guidance Notes available for downloading from the Department of Trade and Industry (DTI) website (www.dti.gov.uk/sustainability/packaging.htm).

### 2.4.3 Regulations governing the packaging of hazardous goods

The *United Nations Recommendations on the Transport of Dangerous Goods*, known as the Orange Book, sets out the standards for the packaging of hazardous materials. In the UK, the regulations governing the carriage of dangerous goods by road and rail require that packaging meets these standards. These regulations include the *Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004*.

UN certified packaging is performance tested in the UK by NAMAS accredited laboratories; certificates for approved dangerous goods packaging are issued by Pira International.

Packaging for certain chemicals supplied in the UK also has to meet the Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (known as CHIP 3). These cover labelling, safety data and require that packaging be ‘suitable’.

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4 National Accreditation of Measurement and Sampling - a scheme administered by the United Kingdom Accreditation Service (UKAS).
For more information about the packaging of dangerous goods, see:
- www.hse.gov.uk/cdg/index.htm
- www.hse.gov.uk/chip/

2.4.4 Food contact applications

The use of packaging for food contact applications is governed by:

- Food Safety Act 1990;
- Materials and Articles in Contact with Food Regulations 1987 (amended 1994);
- Plastic Materials and Articles in Contact with Food Regulations 1998 (as amended).

The general contact with food regulations apply to all materials and articles that (in their finished state) are intended to come into contact with food. There is a general requirement that:

‘Such material shall be manufactured ... in such a way that in normal or foreseeable conditions of use they do not transfer their constituents to foods ... in quantities which could endanger human health ... or bring about an unacceptable change in its nature, substance or quality’.

The materials covered by these regulations include regenerated cellulose film.

Under the plastic materials regulations, a material does not meet the standards if:

- it is manufactured with a prohibited monomer or additive;
- residual quantities or specific migration limits (SML) are breached, eg the SML for vinyl chloride (found in PVC) is 0.01 mg per kg of food.

There is no law in the UK that precludes the use of recycled material per se in food contact applications and there are several good examples of its use.

For more information on the latest regulations governing the packaging of food, visit the Food Standards Agency’s website (www.food.gov.uk/foodindustry/regulation/).
A systematic approach to optimising packaging

A systematic and continual improvement approach to packaging reduction is the most cost-effective (see Fig 2).

### 3.1 Step 1: Winning support and the initial review

The first step involves convincing senior management (e.g., the production director or managing director) that packaging is an area that would benefit from a waste minimisation approach. This may be difficult without some supporting evidence gained in an initial review. The initial review should involve:

- Walking around the site to identify areas of waste (e.g., excessive use of expensive filler materials) and opportunities for improvement. Use the Packaging improvement options checklist in the appendix as a guide. Key questions to ask include:
  - Are certain packs very similar in size? Could packaging supply be rationalised?
  - Does any packaging seem excessive? Could it be optimised, e.g., layers be removed or redesigned/specied? Could lighter materials be used?
  - Is packaging being damaged? If so, how is this related to product damage?
  - Is one department/product using more packaging per item than another? Is this justifiable?
  - Is any of the incoming packaging appropriate for re-use as product packaging?
  - Could re-usable packaging systems be introduced for certain customers/suppliers (see section 6)?

- Estimating the savings associated with a few of the more promising potential improvement options. This involves considering:
  - the approximate quantity of material that can be saved per unit (e.g., pallet load);
- the cost of that material;
- the overall number of units per year.

To help you to calculate the potential cost savings, the appendix contains a Cost savings worksheet and a Re-usable packaging: cost benefit worksheet.

Presenting the potential savings to senior managers to gain their support and commitment for further work.

### 3.2 Step 2: Establishing a team and appointing a co-ordinator

It is useful to have one overall project co-ordinator or ‘champion’ to lead and facilitate the work. The co-ordinator should preferably be someone with:

- sufficient authority, time and available resources to make things happen;
- a good knowledge of the company’s operations;
- the ability to listen to the views of others and make objective decisions;
- enthusiasm and belief in waste minimisation.

For most companies and particularly small and medium-sized enterprises (SMEs), the co-ordinator’s job will be combined with other responsibilities. Your logistics manager or environmental manager are suitable choices.

In most companies, the responsibility for transit packaging and packaging waste is spread over a number of internal functions/departments. It is, therefore, essential to get the right people involved, including:

- procurement/purchasing staff;
- environmental/waste management staff;
- manufacturing and logistics managers;
- packaging designers and technologists/developers (if there are any in-house);
- marketing and product development staff (if the packaging is also display packaging);

It is also important to talk to key external organisations:

- packaging suppliers (they normally have the design capability);
- material and component suppliers (you may be able to re-use their packaging);
- customers (they may specify and even supply the packaging you use).

This approach is sometimes referred to as concurrent engineering. For more information, see Saving money through waste minimisation: teams and champions (GG27).\(^5\)

### 3.2.1 People issues

Any quality management system benefits from staff training and awareness-raising and the same is true when it comes to packaging management. The following activities are worth considering.

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\(^5\) Available free of charge through the Environment and Energy Helpline on 0800 585794 or via the Envirowise website (www.envirowise.gov.uk).
• Train all new packers and machine operators:
  - to operate machinery correctly;
  - in the efficient use of materials;
  - in quality control and fault recognition practices.

Thorough initial training is better than on-the-job training, which will inevitably result in production errors and therefore waste. Regular refresher courses are also useful.

• Provide staff training that emphasises the environmental and economic implications of waste as well as the health and safety aspects. Short lectures and visits (eg to other sites) can help staff to understand and address the issues.

• Make operators aware of the financial value of the materials that they are handling and the environmental consequences of waste. It is more meaningful to say ‘We can save £10,000 a year’ rather than to say ‘We can reduce waste by 1%’.

• Prepare written procedures and manuals that help people, for example, to use equipment efficiently. Display written procedures on posters/charts close to the relevant area.

• Encourage employees to report changes in waste levels and to talk to managers about particular production problems. Operators usually ‘know their machines’ and are in the best position to observe changes and recommend corrective action and improvements.

• Establish a waste-saving suggestions scheme, preferably with a reward attached. Acknowledge successful suggestions and where a suggestion cannot be implemented, explain why. Otherwise, the sense of participation may be lost.

• Provide feedback at all levels. Publicise information about waste production and progress in reducing waste within the company, eg using newsletters.

• Recognise waste minimisation achievements. If staff are doing well, tell them, as this will help to maintain interest and motivation. If practicable, set up a recognition or bonus scheme linked to the savings being made through reduced material use and waste production. Alternatively, make a donation to a charity nominated by staff.

• If your company has more than one site, encourage the environmental/waste representatives to meet/communicate on both a formal and an informal basis in order to exchange ideas and disseminate information.

**Staff training and awareness-raising**

One high-street chemist takes a comprehensive approach to training. Packaging developers, for example, are given extensive training through the company’s environmental challenge course, which includes:

• an overview of European regulatory requirements;

• optimum packaging design and design for recovery and recycling.

An online design guide has been developed for the company’s intranet to provide technical information and examples of best practice for development teams across the company. The site includes regulatory information and compliance checklists as well as eco-design guidelines and information on labelling requirements. A Green Dot calculator can provide the packaging waste fee for any product in five different countries.

The environmental area of the company’s website gives details of company policies and statements on environmental issues as well as reports on progress against corporate environmental targets.
3.3 Step 3: Gathering information on packaging use and disposal

3.3.1 Data gathering for compliance reasons

The packaging waste regulations require companies to gather data on the weight of packaging ‘handled’ that are as reasonably accurate as possible. This is essentially the packaging that you supply on or which you have imported and disposed of.

For most companies, this means that you need to think about all the packaging associated with supply, ie:

- display packaging weight × number of product units supplied;
- collation packaging (boxes/fill/shrink-wrap, etc) weight × number of collated units supplied;
- transit packaging (pallets/layer pads/stretch-wrap, etc) weight × number of transit units (eg pallet loads) supplied.

This information can all be determined from sources\(^6\) such as:

- the ‘bill of materials’ or recipes that are used for loads, eg the information that identifies how many items of each type of packaging/material go to make up a palletised ‘unit’;
- packaging specifications and weight data from your packaging suppliers;
- actual weighing trials (eg carry out ten or more measurements using calibrated scales to obtain a reliable average);
- sales records that indicate the total amount of product sold in the period of interest.

Many companies have developed spreadsheets and databases that record the exact amount of packaging material associated with each product supplied. They can then calculate the total supplied packaging from their sales records.

The simplified example in the box overleaf, featuring a fictitious company, illustrates how the total packaging weight per unit of product, and overall packaging use, can be calculated.

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\(^6\) Companies are no longer allowed to supply data for the purposes of the packaging waste regulations based on estimates obtained with the packaging regulations ready reckoner available from the former Department of the Environment, Transport and the Regions (DETR).
Calculating and tracking the supplied packaging weight (and cost) per unit of production is a good way of monitoring the efficiency of packaging use and thus achieve quantity and cost reduction targets.

In terms of the packaging waste regulations, it is also necessary to consider imported packaging for which you were the end-user. You can do this either by checking what goes into your skip(s) or, more accurately, through purchase records and knowledge of the packaging supplied to you.

ABC Automotive makes and supplies car headlight bulbs to several car manufacturers across the EU.

In terms of supply, the same packaging is used for all customers; 25 bulbs are supplied in a small corrugated box, separated by corrugated board partitions with additional paper ruffle material to provide extra cushioning.

According to the various supplier specifications, the corrugated boxes weigh 400 g each and the partitions weigh 80 g/box. Around 1 metre of paper ruffle material, weighing an average of 100 g, is used for each box. Eight corrugated cases fit onto a standard Euro pallet (30 kg). Typically, 30 metres of 40 µm thick, 1 metre wide stretch-wrap (weighing 1 200 g in total) are used to stabilise the load.

Therefore, material use per bulb is as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrugated board</td>
<td>(400 + 80) / 25</td>
</tr>
<tr>
<td>Paper</td>
<td>100 / 25</td>
</tr>
<tr>
<td>Stretch-wrap plastic</td>
<td>1 200 / (25 × 8)</td>
</tr>
<tr>
<td>Wood</td>
<td>30 000 / (25 × 8)</td>
</tr>
</tbody>
</table>

In the year in question, the company supplied 500 000 bulbs. In terms of packaging, it therefore supplied:

\[
\begin{align*}
\text{Corrugated board} & = \frac{19.2 + 4}{1000} \times 500\,000 = 11,600\,\text{kg (11.6 tonnes)} \\
\text{Paper} & = \frac{4}{1000} \times 500\,000 = 3,000\,\text{kg (3 tonnes)} \\
\text{Stretch-wrap plastic} & = \frac{6}{1000} \times 500\,000 = 75,000\,\text{kg (75 tonnes)} \\
\text{Wood} & = \frac{150}{1000} \times 500\,000 = 75,000\,\text{kg (75 tonnes)} \\
\end{align*}
\]

However, 70% of the packaging is exported from the UK on one-trip pallets (including 10 tonnes/year of re-used pallets). All of the UK pallets are re-used, with 20% being replaced each year.

In terms of the packaging waste regulations, this means that the supplied packaging of interest is:

<table>
<thead>
<tr>
<th>Material</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and board</td>
<td>0.3 × 11,600 = 3,480 kg (3.48 tonnes)</td>
</tr>
<tr>
<td>Plastic</td>
<td>0.3 × 3,000 = 900 kg (0.9 tonnes)</td>
</tr>
<tr>
<td>Wood</td>
<td>0.3 × 0.2 × 75,000 = 4,500 kg (4.5 tonnes)</td>
</tr>
<tr>
<td>Total</td>
<td>8,880 kg (8.88 tonnes)</td>
</tr>
</tbody>
</table>

The total of 8.88 tonnes is well below the 50 tonne threshold for obligation under the packaging waste regulations.
that you dispose of. The calculation is similar to the one shown above for the goods you sell on as illustrated in the example below from the same fictitious company.

**Calculating packaging waste**

ABC Automotive imports its various raw materials and components directly.

In the previous year, the packaging of its items purchased from abroad amounted to:

- Cardboard boxes = 9.2 tonnes (sent for recycling)
- Steel banding = 12.4 tonnes (scrap for recycling)
- Wooden pallets = 26.4 tonnes (8.2 tonnes re-used for export and 18.2 tonnes scrapped).

The company also returned 12 tonnes of re-usable plastic boxes to its suppliers overseas.

In terms of the packaging waste regulations, the imported waste packaging of interest is:

- Paper and board = 9.2 tonnes
- Steel = 12.4 tonnes
- Wood = 18.2 tonnes.

This gives a total for the company of (9.2 + 12.4 + 18.2) = 39.8 tonnes imported + 8.88 passed into the UK packaging chain. This gives a total of 48.68 tonnes, ie just under the 50 tonne threshold for the packaging waste regulations.

### 3.3.2 Data gathering for waste minimisation purposes

As well as gathering data for compliance reasons, you should also consider how you can gather and use data for the purposes of reducing packaging quantities. **Remember: if you don’t measure it, you can’t manage it!**

As shown in section 3.3.1, you can calculate what comes in as purchased packaging and supplier packaging. You can also track/calculate what goes out as product packaging and back to the supplier. Returnable packaging can be tracked, for example, using bar codes and chips. As skip waste is not generally weighed, it is often more difficult to determine overall levels of packaging waste.

One possible method is a mass balance approach that compares the inputs, outputs and stock changes (ie increases and decreases) in a given period (eg one month or a quarter) to establish how much packaging is wasted. Fig 3 shows the situation for ABC Automotive for cardboard packaging only.
In this example, the inputs (I) consist of:

- supplier (filled) packaging, including returnable systems, used in the supply of parts, materials, etc (a);
- empty (bought) packaging used to pack the product, including top-up of returnable systems (b);
- product packaging that is returned for re-use (g).

The outputs (O) consist of:

- Supplier packaging returned to the supplier (part of a) (c).
- Product packaging supplied-on (f).
- Waste packaging (e). This usually includes waste supplier packaging (ae) plus some waste product packaging (be) from the packing lines, damaged re-usable boxes, pallets, etc. This may be sold or disposed of to a waste contractor.

Stock changes can also be important, for example:

\[ b \text{ (at end of period)} - b \text{ (at start of period)} = \text{Stock change (d)} \text{ (eg 35–20 = 15 tonnes).} \]

A stock increase over the period is positive and a decrease negative. The same stock change issue can also apply to packaging from suppliers that is re-used and your own re-usable packaging systems.

The mass balance can be expressed as follows:

\[ I = O + d, \text{ ie inputs equal the outputs plus the stock changes} \]
Hence:

\[ a + b + g = f + c + e + d \]

Waste \( (e) = a + b + g - c - d \)

This calculation can be carried for each packaging type or material to identify how much waste is occurring. While this might look a little daunting, the principle is simple: what goes in must come out!

### 3.3.3 Different approaches to data collection and recording

Companies adopt various approaches to the collection of packaging data. Most collect packaging weight data from packaging suppliers and/or weigh empty packaging to ensure accurate data. These data are often entered into a spreadsheet for reporting and analysis purposes. However, some companies are taking a more sophisticated approach as outlined in the industry example below.

#### Gathering packaging data

A high-street chemist has developed a database that automatically integrates all packaging specifications, bills of materials, and purchase, sales and waste information to allow detailed analysis. The database even deals with different plastics and composites separately (thus going beyond the reporting requirements of the packaging waste regulations). The database is seen as a long-term investment that will allow all future reporting and analysis needs to be met as well as providing data for other projects such as packaging rationalisation initiatives.

### 3.4 Step 4: Analysing data and identifying areas for improvement

Analysis of your data on packaging use and disposal can be very worthwhile in terms of saving money. It can be performed for the whole site or for a department, product or process.

#### 3.4.1 Key performance indicators

Useful key performance indicators (KPIs) for packaging management include:

- packaging supplied per item, eg kg/item or kg/tonne;
- packaging cost per item, eg pence/item or £/tonne;
- packaging waste per item, eg kg/item or kg/tonne.

This information immediately allows a number of questions to be asked.

- How does the packaging of one part or product compare with that from another?
- Does one product appear to be using excessive levels of packaging and, if so, is it really a special case?
- How does total packaging use and waste in one department, division or site compare with another?
- Do packaging use and waste levels vary with production volumes and, if so, how?
- Is it possible to identify good practice in terms of the types and levels of packaging used?
3.4.2 Simple graphical techniques

Fig 4 is a scatter graph showing how product packaging might vary for two processes (e.g., packing lines) with changes in production volume. A ‘line of best fit’ has been drawn through each set of plotted points. Points that lie above this line indicate a higher than normal packaging consumption, while points that lie below indicate a lower than normal consumption. Similar graphs can be drawn for supply packaging, total waste, etc.

Fig 5 uses the same data as Fig 4, but they have been adjusted to show packaging use per unit of production for each month. This provides a clearer picture of what is happening. In this case, process A is clearly consuming significantly more packaging than process B, with particularly high consumption in May, June and November.

Analysis of this type should help you to identify areas for investigation, i.e., areas of high or inconsistent packaging consumption and waste. These areas can then be investigated to establish the real issues and problems. Make sure you involve all relevant staff, including the shop-floor staff, in these investigations. Remember that the people at the ‘coalface’ (e.g., the packers) are often in a good position to help with constructive comments and suggestions.

7 The points on a scatter graph are not usually in time order; but this is possible, for example, if production rises steadily throughout the year.
As well as analysing the data, it is useful to convert each waste quantity into a financial value that takes account of both material and disposal costs. Cost data of this type will provide useful ammunition when you are trying to persuade senior management to investigate and implement packaging improvements.

**Fig 5 Packaging consumption per unit of production - monthly variations**

**Free help from Envirowise**

*Measuring to manage: the key to reducing waste costs* (GG414) explains how to use KPIs and describes simple graphical techniques for analysing data. The guide is available free of charge through the Environment and Energy Helpline on freephone 0800 585794 or via the Envirowise website ([www.envirowise.gov.uk](http://www.envirowise.gov.uk)). The Helpline can also:

- suggest other relevant Envirowise publications and other sources of information;
- arrange for you to receive free telephone advice from an Envirowise expert;
- arrange for a confidential, on-site waste review (known as a FastTrack visit*) from an environmental expert to help you identify opportunities for resource efficiency and thus reduce costs;
- arrange for a counselling visit* from an Envirowise consultant to discuss a specific environmental issue at your site (e.g. analysing your packaging data).

Visit the Envirowise website at [www.envirowise.gov.uk](http://www.envirowise.gov.uk) to download publications, request a FastTrack visit and find out more about KPIs.

*An on-site waste review or counselling visit is usually intended for companies with fewer than 250 employees.

### 3.5 Step 5: Identifying and prioritising improvement options

Once you have identified where there may be scope for improvement, you can consider the options and rank them in order of priority. The [Packaging improvement options checklist](#) (see the appendix) may be useful here in helping you to identify opportunities for packaging avoidance, optimisation and re-use. Sections 4-6 contain further information on these aspects of packaging management.
At this stage, it is important to involve all the people in your team (see section 3.2) and, if the proposed changes will significantly affect them, your suppliers and customers. Brainstorming sessions can be useful to draw out the best improvement options and their respective advantages and disadvantages. Staff suggestion schemes, linked to some sort of reward, can also be useful in terms of generating improvement ideas (see section 3.2).

Don’t be put off by those who tell you, ‘That’s the way we’ve always done it’ or ‘We tried that and it didn’t work’. Technologies and costs change; so what was not possible or economic a few years ago may well be now.

Consider each improvement option in terms of:

- Its cost to the company.
- Its likely benefit/savings.
- The level of difficulty in implementing it. This will be linked to the cost to the company in terms of the amount of time and effort that will need to be expended.

Table 2 offers one simple approach to judging possible improvement options.

<table>
<thead>
<tr>
<th>Option</th>
<th>Capital cost</th>
<th>Feasibility</th>
<th>Net annual benefit</th>
<th>Overall priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>£££££</td>
<td>✓ ✓</td>
<td>££££</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>££</td>
<td>✓ ✓ ✓ ✓</td>
<td>££</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>£</td>
<td>✓ ✓ ✓ ✓</td>
<td>£</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>£££££</td>
<td>✓ ✓ ✓ ✓ ✓</td>
<td>££££</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>££</td>
<td>✓ ✓ ✓</td>
<td>££</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>£££</td>
<td>✓ ✓ ✓</td>
<td>££££</td>
<td>4</td>
</tr>
</tbody>
</table>

1 = highest priority; 6 = lowest priority

The following procedure can be used to determine the costs and benefits more accurately:

- Estimate your current annual total transit packaging costs. This will include:
  - the cost of buying new packaging;
  - disposal costs and associated management time;
  - compliance costs.

  These are your base-line costs.

- Establish the costs associated with the new packaging. With regard to re-usable systems (see section 6), complete the Re-usable packaging: cost benefit worksheet (see the appendix) for each of the proposed re-usable packaging schemes.

- Assess the cost benefits and payback of each re-usable packaging scheme as follows:

  Annual scheme savings = New annual costs – Base-line annual costs

  Scheme payback = On-going scheme costs/Annual scheme savings.

3.6 Step 6: Producing an action plan

Once you have considered the various options, your next step is to prepare an action plan. Giving priority to the easier and low-cost measures will achieve quick results. This will motivate everyone
concerned and give them confidence to tackle the more difficult and perhaps more costly measures later.

Practical handling/distribution trials (perhaps involving relevant suppliers, distributors and customers) are generally necessary before new packaging systems can be approved. In many cases, laboratory test work will need to be carried out - either in-house or by an external specialist - to investigate the effects of change on product protection in terms of load, resistance to shock vibration, etc.

Your action plan should include **SMART** targets:

- **Simple**, Measurable, Achievable, Realistic targets within appropriate Timescales.

You may find it appropriate to set different targets for individual sites, departments, product groups, etc as well as for the company as a whole. Typical targets might include:

- to reduce the level of shrink-wrap used by 20% per production unit in the next year;
- to increase the proportion of packaging that is re-used by 40% in the next year;
- to recycle all expanded polystyrene (EPS) by the end of the next year.

Consult as many staff as possible to obtain their comments on the practicality of the plan and any potential barriers to its implementation, as this will give them ownership of the project. It is also important to make everyone aware of the potential benefits of the measures (improved profitability, better job security, etc). This can be achieved through team briefings, presentations, newsletters and the use of notice-boards.

The action plan and its targets should be agreed at board level, with the management fully committed to its implementation. To help gain management commitment, use the **Cost savings worksheet** (see the appendix) to help you assess the likely cost savings for each action.

### 3.7 Step 7: Implementing the action plan

Implementing the action plan will require considerable teamwork, which is more likely to be effective if you have already followed steps 1-6 closely. Implementation may involve all sorts of measures from packaging redesign to the introduction of re-usable systems.

Again, it is important to get everyone involved in plan implementation from the managing director down to those, for example, who collect and segregate packaging materials. It is also essential to keep people informed of the measures being taken and the progress being made through newsletters, etc, to maintain interest.

### 3.8 Step 8: Reviewing progress

Once the action plan is in place, review progress against targets regularly - perhaps every six months initially and then on an annual basis. You may also find it helpful to review:

- how successful the monitoring system has been in terms of the accuracy and relevance of the data collected;
- how successful the team itself has been.

Remember that the composition of the team may need to change as the work progresses.
Eliminating and rationalising packaging

4.1 Avoiding the need for packaging

In some cases, the need for packaging can be avoided, eg by a change in working practices or through the introduction of a new item of equipment.

A number of UK textile companies have been able to eliminate or reduce plastic bag waste from their supply of yarn. In many cases, cones of yarn were supplied in individual plastic bags within a sealed cardboard case. Most companies, however, find one large plastic bag adequate and with darker colours, where the risk of noticeable contamination is small, no plastic bag at all is required if the cardboard case is well sealed with tape. This simple measure has resulted in substantial cost savings for many companies, in terms of both reduced yarn costs and lower disposal costs.

- **Avoid extra layers.** Poor practices, of the ‘belt and braces’ kind, result in goods being packaged in too many layers. For example, goods are sometimes wrapped in plastic bags within plastic bags within boxes within shrink-wrap, where at least one layer is redundant.

- **Improve cleanliness.** Improving cleanliness in the workplace and throughout the distribution chain reduces the risk of product contamination and hence the need for product packaging.

- **Improve handling.** Improving product handling (eg through staff training and improved equipment) reduces the risk of product damage and hence the need for packaging.

- **Just-in-time delivery.** Just-in-time (JIT) delivery can mean that the product spends less time in the warehouse and therefore is not subjected to the same level of risk in terms of contamination and physical damage. In addition, a JIT system may mean that packaging does not need to be stacked, thus reducing the need for compression strength.

- **Bulk delivery.** In many cases, materials can be delivered in bulk, thereby avoiding the need for packaging. This is particularly the case with liquids and powders where bulk delivery can eliminate the need for drums, intermediate bulk containers (IBCs), etc.

- **Change the product itself.** In some cases, a minor redesign of a product (eg a slight change to a dimension or a material) may allow significant gains in terms of the packaging used to protect it. Does the product really need to be that fragile or that awkward a shape? These issues should be taken into account when a product is being redesigned.

- **Alternative on-site handling and distribution.** Liquids and powders can be piped around site, while certain light objects can be moved around site pneumatically. Some objects can be moved quickly using conveyors.

- **Alternatives to pallets.** Quite heavy loads can be handled using slip sheets and push-pull units or, where the load is particularly light (ie within manual handling limits), by hand (see section 6.3).
Eliminating fill materials from transit packaging

Littlehampton Book Services (LBS) is a major UK-based book distributor. Its activities include receiving stock, storage, picking, packing and dispatching books. Books are delivered to LBS from the UK and abroad in cardboard cartons, shrink-wrapped bales or loose on wooden pallets. LBS repacks the books according to customers’ requirements; the orders can vary from single books to carton or pallet quantities.

Instead of using cardboard cartons filled with shredded paper or polystyrene chips for protection for the majority of book packages, LBS now uses a system that envelops the books in shrink-wrap on a conveyor system. This has eliminated the need to use a fill material. The system cost approximately £1 million to install, including the conveyors and electronic controls. The shrink-wrapped books are placed in cardboard cartons for dispatch.

The company has seen significant benefits in terms of improved productivity and reduced material costs. The warehouse management system is able to maximise the use of the carton by calculating the ‘fill’ of the box based on the weights and dimensions of the books. All boxes are assembled automatically on-site, on demand, using a base and a sleeve. Once the box is full, the contents are shrink-wrapped and then lidded. Uniformity of box sizes ensures maximum pallet fill.

Customers were initially reticent about accepting the new packaging. However, they now recognise that the new system offers them benefits, including:

- lower packaging waste disposal costs;
- improved housekeeping;
- not having to deal with small fill items such as polystyrene chips.

The new system allows much greater transparency and control of orders and stock movements. These benefits contributed to the approach receiving management approval and support. In addition, the new system means that the company’s obligations under the packaging waste regulations have not increased with the growth in product output.

4.2 Rationalising your packaging system

While it may not necessarily reduce the amount of packaging, rationalising your packaging supply can bring significant cost benefits.

4.2.1 Standardisation

Standardisation of packaging offers various benefits, including:

- economies of scale;
- flexibility;
- reduced warehousing needs.

The industry example in the box overleaf and industry example 1 in section 9 illustrate how much can be saved just by looking more critically at the range of packaging used.
4.2.2 Bespoke packaging

Standardisation is fine up to a point, but the more standardised the packaging becomes, the less well it tends to suit the product, with more space wasted and more filler materials required. Several of the industry examples in this Guide show how bespoke packaging can offer substantial benefits in terms of reduced material use and improved product protection. The packaging can be designed to match perfectly the requirements of:

- the product;
- the manufacturing system;
- the distribution system;
- customer requirements.

So, should you opt for standardisation or customisation? For companies with a large product range but with relatively little size and shape variation, standardisation can have major benefits. For companies that have a small but varied product range, bespoke packaging may be the best approach. In most cases, it will be necessary to compare the costs and benefits of the two approaches.
Optimising different types of packaging

If it is not appropriate to re-use packaging (see section 6), optimised one-trip packaging should be used, ie packaging that is designed to fulfil the needs of only one journey.

Optimising the level of packaging involves both good packaging design and good working practices in its use. Industry example 2 at Everest Limited (see section 9) demonstrates how optimisation of packaging through a clear understanding of its function can lead to significant benefits.

While great strides have been made in recent years through the so-called ‘right-sizing’ and ‘lightweighting’ of primary consumer packs, less has been achieved with regard to transit packaging.

Packaging design/specification should involve consideration of:

- the format of the container/collation unit;
- the size and shape of the container;
- the structural design of the container (eg the use of ribs for strengthening);
- the type of material used;
- the grade (eg thickness) of material used.

The use of computer-aided design (CAD) and sophisticated techniques such as finite element analysis (FEL - stress analysis) can greatly improve the design process. Many packaging suppliers use these techniques to optimise the packaging design. Packaging design for the environment: reducing costs and quantities (GG360R)\(^8\) examines the various tools and techniques that designers can use in packaging eco-design and considers the options for packaging design.

Whatever the approach, the aim should be to achieve fitness-for-purpose while also achieving:

- the minimum packaging material use per product and the minimum pack volume as required by the Packaging (Essential Requirements) Regulations 2003 (as amended) (see section 2.4.2);
- the maximum amount of product per pallet/container and hence per lorry/storage area.

Fitness-for-purpose considerations need to take account of requirements both within your site and downstream. The aim is to optimise the total packaging system and it is important to consider the effects of reducing the secondary and tertiary (transit) packaging on primary packaging and product damage.

For more information about the requirements for packaging design in the UK, see:

- BS EN 13428:2004: specifies packaging requirements specific to manufacturing and composition - available from BSI (www.bsi-global.com);
- Packaging design for the environment: reducing costs and quantities (GG360R)\(^8\);

\(^8\) Available free of charge through the Environment and Energy Helpline on 0800 585794 or via the Envirowise website (www.envirowise.gov.uk).
5.1 Boxes and corrugated cases

Optimising a pallet transit system

Schering Health Care is a subsidiary of Schering AG, an international pharmaceutical company with its headquarters in Germany. Schering’s UK site receives approximately 780 tonnes/year of goods that have been manufactured at other Schering sites in Europe. The goods are broken down into smaller quantities and dispatched to UK customers.

Until late 2003, most of the European suppliers sent goods to the UK in ‘pal-boxes’ - a large triple-walled box made of cardboard attached to a pallet. Because the pal-boxes were often re-used, they needed to be stored before a returning vehicle could take them back to the manufacturer. The pal-boxes were also heavy and attracted an obligation when first used (not when re-used) under the UK packaging waste regulations.

Following discussions with the suppliers, the protection offered by the pal-box was shown to be unnecessary and the goods are now imported on a pallet without the box attachment and using only shrink-wrap to protect the goods. Since the change, the company has not seen any noticeable increase in damage to stock.

The new system offers the following benefits:

- Approximately 50 m$^3$ of valuable warehouse space is no longer taken up with storing pal-boxes for their return to the manufacturing sites on the continent.
- The company no longer needs to pay for a separate vehicle to return the pal-boxes to the supplier, instead pallets are returned (back-hauled) via a vehicle that visits the site every two months to deliver goods and returns to the manufacturing sites with the packaging. This has attracted further environmental savings through using less fuel for transport.
- Schering Health Care has not submitted data under the packaging waste regulations since the pal-boxes were eliminated. However, the company estimates that the savings made through importing less cardboard will be significant.
- Since the changes, the company estimates that transit packaging has fallen by 1.5 tonnes/year. Schering expects this figure to increase significantly in the future.

- **Is a box really necessary?** In some cases, shrink-wrap can be more efficient. For example, one major UK supermarket chain estimates that, for some of its products, shrink-wrap can offer the same level of protection as a cardboard box at 30% of the weight.

- **Is the box design optimum?**
  - Do the flutes run vertically to provide the maximum compression/stacking strength?
  - Could the box be made smaller if the product was re-oriented or less filler material was used?
  - Could the box dimensions be changed to reduce material use for the same enclosed volume?

- **Is the box space fully utilised?** It is essential to minimise empty space between items and in the ‘head’ of the box. This is fundamental to reducing distribution costs. If the headspace is greater than 5 or 6 cm, you should probably be using a smaller box. Software is available that allows you to calculate which items fit best in which order, so as to maximise utilisation.
5.1.1 Minimising material use in corrugated boxes

It is possible to reduce the amount of material required to manufacture a box, without reducing its volume, by altering the dimensions. This is best illustrated using an example (see Fig 6).

Box A is a low wide box, 300 mm deep \times 300 \text{ mm wide} \times 150 \text{ mm high} (volume = 0.0135 \text{ m}^3). Its manufacture requires 0.556 \text{ m}^2 of material (a 1209 \text{ mm} \times 460 \text{ mm sheet}).

By changing the dimensions to Box B, a tall slim box, 300 mm deep \times 150 \text{ mm wide} \times 300 \text{ mm high}, material use is reduced to 0.418 \text{ m}^2 (a 909 \text{ mm} \times 460 \text{ mm sheet}) while retaining the same volume. Some 25\% less material is required to manufacture the box due to the more efficient cutting/construction that this arrangement allows. Because the boxes are constructed with flutes running vertically to provide strength, the same effect cannot be achieved by turning Box A on its side.

The change in dimensions also allows more boxes to be carried by a 1200 \text{ mm} \times 800 \text{ mm standard Euro-pallet}, i.e. a 25\% increase from 48 of Box A (six layers of 4 \times 2) to 60 of Box B (three layers of 4 \times 5). The height of the load remains 0.9 metres.
5.2 Drums and intermediate bulk containers

- **Have you considered alternatives to steel drums?** Although steel drums still offer many benefits (e.g., strength and durability) for fluids and fluidic materials such as powders and beads, there may be a better alternative.
  - Plastic drums and containers can offer a lighter, re-usable, recyclable and long-lasting alternative to steel. They weigh typically around 8 kg rather than 18 kg for a 210-litre drum, can be used for 15 or more trips and are rust-free.
  - Intermediate bulk containers (IBCs) typically have a capacity of 1 000 litres. They fit well onto standard pallets, use transport space efficiently (being approximately cube shaped) and offer stable stacking. They represent a good delivery compromise between drums (which are flexible in use) and tankers.
  - Most plastic containers are made of high density polyethylene (HDPE), which is very resistant to chemical attack (e.g., from hydrocarbon solvents). However, it is important to make sure that the plastic used is appropriate for the chemical to be carried.
  - Corrugated drums can be used for dry fluidic materials, such as polymer beads, that tend to make ordinary rectangular corrugated cases bulge out. Corrugated cases are much lighter than steel drums, can offer improved transport efficiencies because they use space more efficiently, and can be re-used and easily recycled.

- **Are your drums of the optimum design?** Ensure that the drums you use are as lightweight as possible (within the usual fitness-for-purpose constraints) and that you take into account whether or not they will be re-used. Recent innovations in drum design (e.g., improved seam constructions and blow moulding techniques) have made steel and plastic drums considerably lighter. Ask your supplier about drum weights and construction. If the drums are to be used for the transport of dangerous substances, make sure that the drums meet the relevant UN recommendations (see section 2.4.3).

5.3 Collation packs

- **Are collation trays necessary?** In many cases, companies are finding that shrink-wrap alone is adequate.9
- **Can larger denominations or different formats be used?** Putting more items into a box, for example, can save a lot of packaging material. Just changing the pack format can bring significant benefits (see the industry example below).

**More efficient collation format**

Working with one of its main customers, one company devised a more stable and trayless collation unit for some of its products. This involved switching from a $3 \times 4$ shrink-wrap format to a $6 \times 2$ format. This simple change allowed:

- the amount of shrink-wrap used to be reduced;
- an increase of 10% in the amount of product carried per pallet load;
- double stacking on vehicles (through increased stability).

Material and transport savings have been substantial.

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9 The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004, which came into effect in May 2004, bring UK legislation in line with the rest of Europe regarding the packaging of dangerous goods. Goods such as aerosols can no longer be packaged without a collation tray (i.e., not shrink-wrap only). For more information, contact HSE (www.hse.gov.uk).
5.4 Fill materials

- Can you eliminate/reduce the need for fill material by altering box design? If vertical loads and jolts are not a problem, you may be able to use filler material just in the lateral spaces and thus eliminate headspace filler. Some companies have eliminated filler materials (e.g., expanded polystyrene (EPS)) by using corrugated boxes and paper ruffle or lattice.

In some cases, you may be able to use corrugated board partitions and folds to provide the separation cushioning required. Even the most delicate of objects (e.g., glasses and electric light bulbs) can be protected in this way.

- Are corrugated separators being used in the optimum way? The side walls of a corrugated box provide vertical compression or stacking strength. Any separator flutes should run horizontally to provide lateral strength. Partitions should protrude a little (a few mm) above the inside depth of the box to ensure that they are held firmly in place when the box lid is closed.

- Is the best filler material being specified/used? Paper and used corrugated board may offer an adequate and cheaper alternative to EPS blocks, foam, and other loose fill. Machines are available that will ruffle paper rolls or make a lattice from old cardboard boxes. These can be bought or leased. Using paper and board in this way can, in some instances, also facilitate recycling (a single material is easier to deal with than a dual material). Moulded fibreboard also offers good performance for certain types of product and distribution system.

Switching from expanded polystyrene to paper filler materials

In the late 1990s, an electronics company near Manchester replaced its polystyrene bead product packaging with crushed paper. The company now buys rolls of inexpensive recycled paper, which is crushed into a concertina ruffle on a small, dedicated machine. The machine cost only a few thousand pounds and paid for itself in seven months through reduced material costs. The paper ruffle can withstand several trips to a sister company in Germany and is used to pack components being sent back to Manchester.

5.4.1 Cardboard and expanded polystyrene

There is no such thing as the best packaging material. Materials and packaging types have to be chosen to provide fitness-for-purpose with the minimum environmental impact. There are however, certain material characteristics that you should take into account when deciding which packaging to use.

Cardboard

Corrugated board and moulded board (as used in egg boxes) are relatively cheap, reasonably light and flexible to use. They offer good product protection, can be re-used and are easy to recycle. Corrugated cases are also collapsible and hence efficient to transport.

Changing the design of corrugated packaging is relatively simple, with a much shorter lead time than that required to retool for plastic mouldings.

Corrugated board comes in various forms, from coarse-fluted triple-wall and double-wall designs to smooth micro-fluted designs that provide good printing surfaces. Corrugated board generally contains high proportions of recycled materials and comes from a renewable source (i.e., trees).

Corrugated and moulded board packaging attracts a low fee in countries where differential rates are charged for the recovery of packaging materials (e.g., Germany and Sweden).
Expanded polystyrene (EPS)

EPS is extremely light (being 98% air), has a strong compressive strength and offers extremely good cushioning and thermal insulation. It is also resistant to moisture, salt, numerous types of acid and most oils but does dissolve in certain organic solvents. EPS comes from a non-renewable source and generally contains no recyclate.

There are now recycling schemes in place throughout the UK for EPS. However, the storage and transportation of such low density material presents a barrier to its recycling (an HGV can typically carry only 0.5 tonne of EPS).

EPS attracts heavy fees in some EU countries that charge for packaging recovery.

5.5 Box closures

**Can staples be avoided?** Staples tend to cause problems in that they:

- can cause injury to the person opening the box;
- usually cause the box to be torn, reducing the possibility of re-use;
- make a box more difficult to recycle.

**Is it really necessary to use adhesive tape as a closure?** If contamination is unlikely to be a problem and it is not necessary to provide tamper proofing, you may be able to close a corrugated box simply by interlocking the flaps. In addition to reducing the use of expensive adhesive tape, this approach will make recycling easier.

**If adhesive tape is used,** you may be able to:

- Optimise the amount of tape used. Does the tape need to be so wide (5 cm wide tape is usually adequate)? Does it need to wrap so far down and around the side of the box? Taping a long way down the side (ie the non-opening part) of the box generally adds little in terms of the security of the closure.
- Only use H-shaped taping (ie taping along the open edges as well as across the flap join) when the box contains a heavy load or where dirt must be prevented from entering the box.
- Use H-shaped taping to provide a seal in place of internal plastic bags.
- Take advantage of any improved box rigidity associated with tape use.
- Use paper tape rather than plastic tape to facilitate recycling.
- Use an automatic taping machine. These generally reduce the amount of tape consumed.

**Is strapping a better option?** Plastic strapping or banding is often the better option where a box has a separate/detachable lid and/or base. Edge protectors are only needed for high strapping loads, eg when attaching the box to a pallet.

**Can removable plastic tabs be used to lock the base and top to the rest of the box?** This is becoming increasingly common for large boxes where re-use may be necessary (eg packaging of computer equipment).

5.6 Shrink-wrap, stretch-wrap and plastic bags

**Could a different thickness of material be used?** Many companies find that they can reduce the grade of material used, say from 50 µm to 30 µm, without any reduction in product protection.

**Could a different polymer be used to provide the same level of protection at lower cost and/or weight?** Some plastic wrapping materials are far stronger, for example, in terms of stretch and puncture resistance, than others.
Could stretch (pallet) wrap be applied automatically? Automatic or semi-automatic pallet wrappers cost a few thousand pounds and can help to reduce the use of stretch-wrap and improve productivity.

5.7 Pallet loads

Is the pallet area fully utilised? Keeping to ISO standard box footprints will help to ensure this. For example, you can get four 600 mm × 400 mm boxes per layer on a 1 200 mm × 800 mm Euro-pallet and five of them on a 1 200 mm × 1 000 mm ISO pallet (see Fig 7). Palletisation software will help you to optimise the load; it will also allow you to assess the implications of possible changes in box dimensions. Industry example 3 at Britax Excelsior Ltd (see section 9) explains how transit packaging improvements have enabled it to fit 16 units on a pallet instead of ten.

Is the load stabilised efficiently? Using stretch-wrap to stabilise pallet loads can be wasteful. In many cases, the amount of overlap (roping technique) and number of complete layers is excessive. Where it is essential to use stretch-wrap, make sure that the amount used is appropriate to the box size, weight, stack height, etc. Low stacks of lightweight items, for example, normally need less stretch-wrap than high stacks of heavier items. Machine-applied stretch-wrap is generally more effective than manually applied stretch-wrap and provides a better quality, more uniform wrap. Efficient pre-stretch wrapping machines are now available for this purpose.

In some cases, shrink-wrap or strapping/banding may be a better choice. You can use strapping to attach the load firmly to the pallet and to compress loads, thus stabilising them further. Vertical strapping, for example, can be used in conjunction with layer pads and trays to provide stability to a stack of glass bottles. Strapping can also be used to stabilise very heavy loads such as engines and gearboxes. Steel, as opposed to plastic, strapping is only necessary for particularly heavy loads.
You can also stabilise loads using:
- spot gluing;
- adhesive tape;
- clips (eg for open boxes and trays).

Fork-lift load stabiliser attachments, which exert pressure from above or from the sides, help to keep the load stabilised during movement. This type of device may eliminate the need for stabilisation packaging when loads are only being moved around the site.

**Is the pallet of the optimum design?** There are ways of minimising the material content of pallets that are not part of a closed-loop re-use system. Lightweight, one-trip wooden pallets are available that weigh up to 10 kg less than a regular pallet, and corrugated-board pallets have recently become available. The latter are very strong and light (typically around 2.5 kg for a two-way 1 200 × 1 000 mm pallet), and usually contain a high proportion of recycled material. They are particularly attractive to those using air freight where weight is crucial. Care should be taken when sourcing wooden pallets to ensure that they have been correctly manufactured from the appropriate materials.
Packaging re-use

Returnable systems offer the best economic and environmental solution where a closed-loop distribution system exists and/or where transportation distances are relatively short. Back-haulage (bringing back packaging on the return journey after delivery of goods) allows re-usable packaging to be returned efficiently for re-use. However, such systems may not be appropriate where overseas customers/suppliers are involved, although collapsible/lightweight packaging can sometimes be returned economically in shipping containers.

The more standardised your packaging, the more readily re-usable it will be. Various CEN¹⁰ working groups are working to increase the standardisation of packaging and thus allow packaging made in one EU country to be readily re-used in another. BS EN 13429:2004¹¹ on packaging re-use is the European standard for the design and claims for re-usable packaging.

Packaging re-use is not only applicable to dedicated systems. Many opportunities exist for re-using so-called one-trip packaging (see section 6.4).

As well as cost savings, re-using packaging can offer other benefits:

- improved environmental performance;
- improved company image;
- can help as part of a more comprehensive waste minimisation programme.¹²

Information about the various systems designed for re-use is given in section 6.3, while section 6.5 offers practical advice on the management of re-usable packaging systems.

6.1 Design issues for packaging re-use

- Are containers lightweight as well as durable? For example, corrugated plastic or double/triple-wall coated board can act as alternatives to solid plastic or wooden crates.
- Are containers modular (eg a container made from moulded plastic components that slot together) and repairable? Such containers may be more expensive and possibly less robust than single piece containers.
- Are containers adaptable? For example, can different moulded liners be used with standard boxes to accommodate various products?
- Could old containers be reinforced (better materials, edge strengthening, lamination, etc)?
- Are containers easy to open and reclose/secure (eg with interlocking lid tabs) without risk of injury or damage to the packaging?
- Can containers be designed to make them easy to fill and empty? For example, some automotive suppliers use plastic tote boxes with a folding side to allow easy access. This allows items to go straight to the customer’s production line (the so-called Kanban system).
- Are containers collapsible and/or stackable/nestable for easy storage and return?

¹⁰ Comité Européen de Normalisation (the European Committee for Standardisation).
¹¹ Available from BSI (www.bsi-global.com).
¹² For free advice and publications on how to implement a systematic waste minimisation programme, contact the Environment and Energy Helpline free on 0800 585794 or visit the Envirowise website (www.envirowise.gov.uk).
Are labels easy to remove/attach, eg are there pouches or slots to take a standard label/plate?

Are containers easy to clean/wash? Avoid seams, nooks and crannies, and make sure it is easy to fit and remove seals.

Where possible, specify the use of recycled materials in re-usable systems such as plastic crates. This helps to create a market for recyclate and hence your scrap containers.

It is also important to think about reducing contamination to allow re-use. Can you reduce the contamination of used packaging to facilitate re-use and/or reduce disposal costs? Careful emptying and segregation of containers (ie not mixed with other wastes) will improve their chances of re-use.

Packaging design for the environment: reducing costs and quantities (GG360R)\textsuperscript{13} gives further information on packaging design for re-use.

6.2 Assessing the costs and benefits of re-usable packaging

A packaging re-use scheme will only be cost-effective if:

- its annual operating costs are less than those of your current one-trip packaging system;
- the annual cost savings give an acceptable payback on the one-off costs of setting up and implementing the scheme.

Potential cost savings from switching to re-usable packaging include:

- reduced raw material costs;
- reduced waste disposal costs;
- reduced costs of complying with the packaging waste regulations.

One-off ‘up-front’ costs include:

- the initial purchase of re-usable containers;
- modifications to handling (including cleaning and refurbishment) and transport facilities;
- additional costs of the tracking system, eg software packages, bar code labelling/reading equipment, electronic ‘chips’ and detectors;
- staff time to set up the scheme.

You may be able to reduce these initial costs by leasing the containers rather than buying them or by using a slightly less sturdy design. In some cases, lightweight and collapsible corrugated plastic boxes rather than solid plastic totes are perfectly adequate. Some companies have obtained as many as 200 round trips from these containers and even used them to transport goods overseas in shipping containers.

To be realistic, any comparison of annual operating costs needs to take into account:

- the additional benefits of packaging re-use in terms of reduced handling, storage, etc;
- the lifetime of any possible re-use scheme so that it allows for the expected increases in one-trip packaging disposal costs, etc, due to the incremental increase in landfill tax in future years.

\textsuperscript{13} Available free of charge through the Environment and Energy Helpline on 0800 585794 or via the Envirowise website (www.envirowise.gov.uk).
The payback issue varies in importance depending on whether you are purchasing or renting the packaging, and on the level of payback that is acceptable. If you are renting the packaging and paying an annual fee to a third party to manage the scheme, the one-off costs will be low and payback will be less important than if you are investing capital in a substantial number of containers for a scheme that you are intending to manage yourself. In the latter case, the acceptable level of payback will depend on your business. You should, however, take into account the lifetime of the re-usable packaging. For example, if the containers will last for an average of ten years, then a four-year payback period might be attractive.

You can use the Re-usable packaging: cost benefit worksheet in the appendix to determine the costs and benefits to your company of a re-usable packaging scheme.

### 6.3 Systems designed for re-use

Re-usable systems that have been designed for many years of use are becoming increasingly common in the UK, within both industry and the retail sector. The most common forms are summarised below. Further details of the various systems can be obtained from manufacturers.

**Pallets.** Pallets are one of the oldest forms of re-usable system. Traditional re-usable wooden pallets (as opposed to lighter and cheaper one-trip varieties) can be used 200 times or more. Standardisation has allowed pallets to be used wherever they end their journey. Rugged plastic pallets (some made from recycled plastic) are also now available, as are lightweight (one-trip) corrugated board pallets.

**Drums and IBCs.** Like pallets, drums are one of the oldest forms of re-usable system. Steel and plastic drums usually come in 205 litre (40 gallon) and smaller sizes. Intermediate bulk containers (IBCs) usually have a capacity of 1 000 litres. Flexible (collapsible) IBCs are also available.

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**Crates, boxes and trays.** The main UK packaging manufacturers can supply almost every conceivable type, shape and size of crate, box and tray, including fixed, folding and wheeled (dolly) types. While traditionally these were made of wood, a huge variety are now available in plastic. The range of re-usable packaging introduced by Marks & Spencer, which is also electronically tagged for improved management, is described in industry example 4 (see section 9).

**Separators, layer pads and collars.** Various types of corrugated board and plastic separators and layer pads are available. Both keep layers of goods apart and provide extra stability. These may be flat (eg layer pads) or moulded to accommodate specific shapes (eg bottles). Collars/frames, cornerpieces and edge-protectors (wooden, plastic or cardboard) can also be used around the top of the load to improve stability and to protect the load from any banding.

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**Benefiting from multi-trip layer pads**

A major glass manufacturer supplies bottles to the international drinks industry and operates two glass manufacturing plants. Its factories have recently benefited from significant cost and environmental gains made following changes to the way they use multi-trip transit packaging.

After manufacture, the glass bottles are stacked on pallets ready for dispatch to customers. The bottles were previously stacked with corrugated fibreboard in-between layers, and the pallets were stretch-wrapped for stability and ease of handling. The corrugated fibreboard and stretch-wrap were both one-trip packaging, which was thrown away by the company’s customers.

Other drawbacks of using one-trip fibreboard layers in-between glass bottles included:

- handling difficulties - if the fibreboard got wet it became weaker, leading to potential damage problems for customers as the lower layer of bottles moved though the wet fibreboard to the layer above, and when the bottles were removed from the pallets automatically;
- dust - though a minor issue, the company took back bottles for re-washing when packaging dust was found in them;
- hygiene - fibreboard cannot be washed or disinfected and there are potential contamination issues concerning a starch-eating insect that can inhabit fibreboard;
- recycling - the company had no control over the packaging when it was sent to customers and so could not arrange for the fibreboard or plastic film to be recycled.

The company began to address these issues in the 1990s by looking into alternatives to fibreboard layers for its transit packaging. After discussion with a packaging supplier, the company adopted a system of leasing returnable plastic layer pads on a per trip basis. As a third party, the supplier closes the loop by collecting the layer pads from customers. The pads are disinfected, washed, dried and stretch-wrapped (to avoid contamination) onto pallets before being returned to the company.

Although the company needed to invest in machinery upgrades to accommodate the change to plastic layer pads, implementation was straightforward with no major problems.

The use of multi-trip layer pads has reduced overall operational costs by around 30% compared with the original one-trip system. The cost of complying with the packaging waste regulations has also fallen. Since 1999, the amount of single-trip stretch-wrap and fibreboard bought by the company has decreased by 200 tonnes/year and 550 tonnes/year, respectively. In addition, leasing has resulted in a number of operational benefits.
Benefiting from multi-trip layer pads (continued)

- Plastic layer pads are more hygienic than fibreboard because the pads are disinfected and are able to seal shut the top of the bottle during transport. Washing and disinfecting uses an inline system with no manual handling, leaving the layer pads free from contamination and suitable for use with bottles intended for foodstuffs.
- The majority of pallets no longer require stretch-wrap because the layer pads are robust enough to be transported with only a vertical compression strap and a wooden/steel top frame, which is also re-usable and is rented from the layer pad supplier. This saves money and reduces plastic packaging waste.
- A reduced need to purchase bulky stocks of packaging materials has allowed the company to improve housekeeping and increase the available floor space in the warehouse.
- The company has noticed that many of its customers are switching to plastic layer pads, suggesting that its customers are satisfied with the changes to the transit packaging. The main benefit to the customers is that they no longer have to pay for the disposal of large quantities of fibreboard and plastic film.

The company still uses a limited amount of fibreboard layers because a number of their customers do not have the automatic de-palletisation equipment necessary for plastic layer pads. The company expects more customers to introduce the equipment to take advantage of the benefits of re-usable plastic layer pads. In addition, the company is currently carrying out trials with a view to reducing the gauge of stretch-wrap used on fibreboard pallets.

- **Pallet boxes/systems.** These consist of a robust fork-lift base and lid that lock to a deep and heavy duty (double or triple-wall) corrugated board sleeve (top to bottom of load), which is generally collapsible. Most of the main packaging manufacturers produce a range of systems. The lighter systems typically weigh around 30 kg - no more than a typical wooden pallet. Plastic and wooden pallet boxes are also available for heavier duty applications, although these typically weigh around 60 kg.

- **Slip sheets and push-pull systems.** Slip sheets are plastic or corrugated sheets that can be placed under loads, as an alternative to a pallet. They offer significant benefits as they are very light, take up very little space and are cheaper than pallets. Slip sheets are handled using a special type of fork-lift attachment called a push-pull unit. This hydraulic device allows loads of over 2 tonnes to be pulled onto polished platen forks, lifted and then pushed off again. While the attachment typically costs around £6 000 and load handling can be a little slower than with a conventional fork-lift, the advantages include:
  - much lower palletisation costs (a pallet typically costs £7, a slip sheet £1 - £2);
  - lower transportation weights (a typical pallet weighs around 30 kg compared with less than 2.5 kg for a slip sheet) and hence better fuel efficiency, less pollution and lower distribution costs;
  - potentially better utilisation of vehicle/container space (up to 10% improvement) and hence lower distribution costs;
  - less final waste or elimination of need to return the pallet.

Research in the USA has shown that slip sheets cost a fraction of the cost of ordinary pallet systems - typically around 25% over a five-year period. Slip sheet systems are particularly attractive where transport costs are high, eg involving overseas shipments.
Using slip sheets to facilitate handling

The Ellingham Grain Store at Beccles in Suffolk prepares, packs and exports dried peas and beans. The dried goods are delivered in bulk to the company and are then packed into 25 kg plastic bags and containerised for export to developing countries. In September 2003, the company invested in 40 re-usable plastic slip sheets and the necessary push-pull machinery to facilitate handling.

The sacks are loaded automatically onto a slip sheet. Each 1.25 tonne load is pushed into a container using a push-pull unit, the slip sheet being retained for re-use. Overseas, the container is emptied by hand.

Before slip sheets were introduced, the company loaded the containers by hand. The use of slip sheets means that the time spent loading a container (approximately 23 tonnes) has fallen from 2 hours to 40 minutes. The elimination of manual handling has also had health and safety benefits. The plastic slip sheets can be re-used up to 30 times. In the first few months of operation, no slip sheets have been damaged or discarded.

Palletised loads could be used, but the pallets would take up valuable room in the warehouse at Ellingham and in the container. They would also add weight and increase transport costs. At the destination, fork-lifts would be required, which is not currently the norm. Overall, the new system has improved loading efficiency without the need for palletisation and significant extra shipping costs.

- Metal cages and stillages. Collapsible wheeled roll cages or stillages are still widely used in the UK, eg to collect waste packaging around large retail stores. They are now less widely used for external transport.

- Specialist re-usable systems for a specific product or application. Although more expensive than using ‘off the peg’ packaging, such specialist systems can offer distribution and handling benefits and reduce costs in the longer term.

- Certain types of primary packaging, eg textile yarn cones, can also be re-used within a closed loop system.

Wine imports on slip sheets

Oddbins Ltd is a UK-based importer, retailer and wholesaler of wines, spirits and soft drinks. All goods pass through the company’s warehouse before onward distribution to its 225 UK stores. Before slip sheets were introduced in the 1990s, transport containers were loaded and unloaded with wine cases either by hand or occasionally on pallets. This was a time-consuming and labour-intensive process.

Oddbins now imports wines from a number of suppliers on slip sheets, including wine from South Africa, Australia, New Zealand and Chile. Suppliers load cases of wine onto the slip sheets, which are pushed into a container. The container is unloaded efficiently at the UK warehouse using a push-pull unit. The plastic slip sheets are not re-used by Oddbins because the loads are broken down into shipments for individual stores. However, this approach has led to a number of significant benefits, including:

- transport savings - 8% more wine cases fit into a container using slip sheets instead of pallets;
- reduced cost of complying with the packaging waste regulations (less wood is imported);
- reduced disposal costs - imported pallets were previously disposed of because they were not a standard European or UK size;
- reduced labour costs - unloading a container by hand took 8 - 12 man hours (using three people). Unloading from slip sheets with a push-pull unit takes less than 1 man hour.
6.3.1 Using reconditioned and leased packaging

Many companies use reconditioned transit packaging such as boxes, drums, pallets and crates to minimise their transit packaging costs. To these companies, the appearance of the packaging is of little consequence as long as it is clearly marked. Over 60% (by weight) of steel drums are reconditioned for re-use in the UK, while over 15% of plastic drums are re-used.

Leasing is also common for drums, IBCs, pallets, crates, layer pads, collars, etc and can be organised through various third-party organisations. These companies provide packaging ‘pools’ whereby high quality re-usable packaging is passed through the supply chain to the customer location and then on to regional packaging depots for inspection/repair/cleaning, before starting its journey again with the next local company. This allows efficient re-usable transit packaging services to be provided without manufacturers and retailers having to become involved in complex logistics or having to buy large quantities of packaging.

Reconditioned and leased packaging is also exempt under the packaging waste regulations and can thus reduce your obligation or keep you below the 50 tonne/year threshold.

6.4 Re-using one-trip packaging

Although dedicated re-usable systems generally offer the best solution, ‘one-trip’ packaging can sometimes be made multi-purpose or re-used several times to reduce costs.

**Transit display case for garden hoses**

A packaging manufacturer has developed a new design for the storage and transport of a range of hoses and components to garden centres and DIY outlets. The design displays products attractively in a module that makes efficient use of space within both the pack and the retail area. It is tough, durable and accommodates six varieties of hose and three varieties of components.

- **Could transit packaging be made multi-purpose?** New corrugated and plastic transit cases are now available that double as in-store display cases, with the lids and sides acting as the display framework with the products visible inside. A number of large retail chains now use such transit packaging, sometimes with a pallet-style base or wheeled base (see industry example above).

- **Could nominal one-trip packaging be re-used?** In many cases, several trips can be achieved from what is nominally one-trip packaging. This can result in significant cost savings and other benefits.
Could any of your packaging be re-used on-site or by employees? Cardboard boxes and plastic bags used to supply raw materials or components can often be re-used to:

- package the final product (e.g., as relabelled boxes or filler material);
- transport it around the site;
- store waste materials.

Care should be taken to avoid possible product contamination. In some cases, staff may be able to make use of packaging such as plastic bags at home.

Could used packaging be sold for re-use? You may be able to sell your waste corrugated cases to a cardboard box merchant for re-use rather than to a paper/board merchant for recycling. This will maximise your revenue. Similarly, you may be able to send used drums for reconditioning and sell wooden pallets to a pallet merchant.

Could used packaging be given away for re-use by others? If you cannot re-use or sell your used packaging, you may be able to give it away for re-use or recycling. You could, for example, give it to local companies and sister companies or donate it to schools, scout groups, theatres, etc. or to the many not-for-profit scrap stores in the UK (e.g., www.childrensscrapstore.co.uk). Local waste exchange schemes, environment business clubs, waste minimisation clubs, etc., can facilitate such exchanges. Contact the Environment and Energy Helpline free on 0800 585794 for information on such schemes and clubs.

Although it will not raise revenue, this approach will at least reduce the volume of your general waste and hence your disposal costs. You will, however, need to investigate the implications for your Duty of Care for the disposal of waste.

Can you segregate used packaging effectively at source? A little effort on the shop floor or in the warehouse in segregating packaging materials and keeping them clean can increase the opportunities for re-use and/or material recycling. Separating used packaging before it becomes mixed in the skip will help to reduce contamination.

Can you set up a system for preparing drums, IBCs and other liquid containers for re-use? Some companies benefit significantly from the on-site drainage, washing, relabelling and re-use of drums and other containers.
Is the design of the packaging inhibiting re-use? For example, you may be able to encourage the re-use of corrugated cases by eliminating staples. Reducing the range of pack sizes and colours may also assist re-use. See Packaging design for the environment: reducing costs and quantities (GG360R)\(^{14}\) for advice on this issue.

### Benefiting from re-use in the toiletries sector

Empty plastic product bottles are delivered in collapsible corrugated trays to the factories of a large UK manufacturer of toiletries and cleaning products. These trays are re-usable and last for about four trips on average. This means that, of the 1,200 tonnes/year of corrugated trays required for bottle delivery, 900 tonnes are now diverted from the waste stream for re-use, with an associated cost saving of around £900,000/year.

Occasional promotions within the UK require liquid product to be modified and repacked after it has left the factory. In the past, this meant that the original wraparound cases were destroyed, with products being repacked in new (0201-style) cases. Having investigated the options with its corrugated case suppliers, the company adopted a new corrugated wraparound case which includes perforations along the top panel. This effectively converts the case into a pseudo-0201 case and allows it to be opened for repacking and resealed using tape. This design change essentially halved the amount of packaging traditionally used. In a promotion involving 600 tonnes of fabric liquid, for example, the new design reduced the amount of corrugated cases required by about 60 tonnes and resulted in packaging cost savings of approximately £14,000.

### 6.5 Managing re-usable packaging systems

Re-usable systems will only save you money if the containers are actually re-used and the system is operated efficiently. This means:

- keeping the number of units to a minimum;
- recovering the packaging quickly - preferably through back-haulage or onward distribution.

Re-usable packaging systems may be owned and/or managed by you, by a large customer or supplier, or by a third-party operation. Some of the key issues are described overleaf.

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\(^{14}\) Available free of charge through the Environment and Energy Helpline on 0800 585794 or via the Envirowise website (www.envirowise.gov.uk).
6.5.1 Managing the scheme

Managing a re-usable packaging scheme can be quite simple when you use your own vehicles for deliveries and packaging returns for a few UK customers. However, larger schemes and those involving contracted-out haulage can become complicated.

A scheme is unlikely to work smoothly if you simply add the associated responsibilities to those of already overloaded staff. Any scheme that is worth doing is worth doing properly. You will need to ensure that people with the appropriate skills are given sufficient time to manage the process of handling, transportation, cleaning and refurbishment, and tracking.

With large schemes, it may be cost-effective to have a dedicated manager with no other duties. Although you will maintain greater control by operating your own packaging re-use scheme, you may wish to consider asking a specialist third party to manage the scheme. This can be more cost-effective, in some cases, than doing it in-house.

6.5.2 Number of units required

One important issue is ascertaining the correct number of containers required - given that a significant number will be in transit, at customer/supplier premises or being prepared for re-use. The longer the delay, the greater the total number you will need to maintain the flow of goods.

Example calculation

\[
\begin{align*}
\text{Deliveries per year (336 working days)} &= 10,080 \text{ container units (30 per day on average)} \\
\text{Average time for delivery} &= 0.33 \text{ days (8 hours)} \\
\text{Average time for return of containers} &= 10 \text{ days}^{15} \\
\text{Average cleaning and refurbishment time} &= 1 \text{ day} \\
\therefore \text{Packaging cycle time} &= 11.33 \text{ days} \\
\text{Hence, basic number of units required} &= 30 \times 11.33 = 340 \text{ units (rounded up)}
\end{align*}
\]

However, it is also necessary to have:

- 3 days’ supply (about 25%) to cover variations from average = 90
- 5% replacement stock for damaged/lost packaging in first year = 22 (rounded up)

\[
\therefore \text{Total number required} = 452
\]

Total capital cost @ £6 per box = £2,712

6.5.3 Transport and logistics

Ideally, you should collect re-usable packaging as you deliver and then back-haul it. This is straightforward if only one delivery is being made, but when several deliveries are made in one trip, the recovered packaging has to be carried onwards with the goods being delivered. This means that, in these cases, the collected packaging may have to be off-loaded before subsequent consignments can be delivered. This problem can be avoided if side loading/unloading is possible or the returned packaging is collapsible.

The availability of appropriate transportation staff can be particularly important. Normal delivery drivers or contractors may have to be prepared to put in extra effort collecting and loading the empty containers at the customers’ premises, either routinely or on an occasional basis when this cannot be undertaken by the customer.

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15 Assuming some are back-hauled after weekly delivery and some after fortnightly delivery.
Making the customer responsible for collecting together the empty containers for return will help to ensure smooth running of the scheme.

Other potential problems (particularly for small companies dealing with much larger ones) in operating your own packaging re-use scheme include:

- limited influence with your customers in ensuring the timely return of containers;
- limited control over transportation, where this is contracted-out, due to the relatively low volumes of packaging involved;
- complicated arrangements where it is necessary to collect a small number of containers or irregular consignments from several sites.

Some supermarket companies use ‘pools’ of standard re-usable plastic containers, which are transported between the different suppliers, regional distribution centres and stores. In some cases, onward distribution methods are used whereby vehicles delivering goods might then pick up empty packaging to return to another site.

6.5.4 Scale of the scheme

Small-scale schemes can work well when you have a limited number of suppliers/customers, and where suppliers/customers are concentrated regionally. For example, some textile spinners with local customers successfully operate yarn cone deposit and return schemes.

Large-scale packaging re-use schemes are generally more efficient than smaller ones. They typically involve a few large retailers or manufacturers and a large number of smaller suppliers. These larger schemes offer a number of advantages:

- Managers can negotiate better prices for larger container orders and tend to have more influence over the prompt return of containers.
- The greater number of site locations, journeys and containers involved makes it easier and cheaper to smooth out local variations and maintain packaging stocks at the level required to match demand.
- It is possible to satisfy an urgent demand for empty containers from stocks at local depots. This limits the cost of urgent deliveries, while allowing the long-distance transfers between depots to be made less urgently and in bulk (at a much lower cost).

6.5.5 Tracking and timely return of containers

One of the key issues in any scheme is tracking containers and obtaining their timely return from suppliers/customers. One option is to draw up a formal contract spelling out each party’s responsibilities, emphasising the associated benefits and outlining the penalties for not complying. If you feel that this approach could sour your relationship with your customer, opt for a more informal ‘gentlemen’s agreement’ - but remember that such agreements are hard to enforce and could lead to arguments that will damage your relationship anyway.

It is important to have some sort of tracking system that allows you to identify the number of containers at each possible location.

- Use delivery information to identify what containers have gone where.
- Ask the delivery driver to issue a receipt for empty packaging that is returned.
- Enter this information into a spreadsheet or database to record how many containers are in each location and overall available stock levels.
A range of technologies are available for tracking individual containers and their contents. These include standard and two-dimensional bar codes, magnetic memory chips and tags. These technologies are now quite cheap and can be specified when the container is ordered. Where the value of the contents is high, distance-readable tags that use radio frequencies or microwaves can be used. For example, radio frequency identification (RFID) technology is now available with certain pallet pool systems.

These technologies can allow specific containers/products, rather than just numbers of containers, to be tracked effectively through the supply chain. This can lead to improved efficiency and cost savings. For more information, call the Environment and Energy Helpline free on 0800 585794.

6.5.6 Container cleaning and refurbishment

Make sure that re-usable packaging is segregated, cleaned, checked for damage and refurbished as appropriate before each re-use. The consequences of a container failing during service include:

- contaminated or damaged product;
- missed deadlines;
- damage to handling facilities or injury to staff.

Failure can also undermine the credibility of a re-use scheme if people, rightly or wrongly, attribute that failure to the fact that the container has been re-used.

You will need to monitor or review the results of cleaning/repair to maintain acceptable standards. You will also need to ensure that the checks carried out cover all of the key aspects of the packaging, from seals and surfaces to lifting and handling points. Full records of damage to containers can help to highlight and eliminate bad handling practices.
A UK manufacturer of vehicle exterior mirrors for major car manufacturing plants in the UK and abroad now handles very little disposable packaging for UK and European destinations. This follows a shift towards the use of returnable crates and pallets through improvements being made with two major customers. Both spares and parts are packed in multiple-trip packaging.

Parts are transported to UK locations in a plastic container with an integral inner. This means that no additional protection, such as polythene bags, is required. Before this, the parts were packaged in cardboard boxes with polythene bags.

Original parts are sent to some of the car manufacturing plants in a returnable container and pallet; protection for the glass is provided by a single-trip polythene bag and foam. A variety of containers are used, most of which stack for easy return to the manufacturer’s plant.

Large re-usable plastic containers are used for bulk shipping to another major customer’s sites throughout Europe. The containers collapse flat for return to the manufacturer’s site. The containers are robust, but cardboard and polythene bags are required to separate the parts. Single-trip cardboard boxes were used previously.

Most of the crates and boxes are purchased and owned by the car manufacturers, but some are rented from them by the company. However, all of the companies benefit from the arrangement through:

- reduced costs of buying new packaging over the long term;
- reduced costs of packaging waste disposal for both the company and its customers;
- improved housekeeping at the point where parts and spares are packed and unpacked;
- lower cost of compliance with the packaging waste regulations - despite increased production, PRN requirements have fallen by 50 tonnes/year since 1998.
If the right merchant recycler or waste exchange company can be found, most clean packaging materials can be sold or, at least, removed free of charge. Careful segregation, storage and presentation (eg baling) can help to secure a decent price.

Reducing packaging disposal costs through segregation

Prompted by the packaging waste regulations, a company in the north of England investigated all aspects of its packaging, including waste disposal. The company soon realised that, while corrugated transit cases were kept separate for recycling, all primary and secondary packaging waste was being thrown into the general waste skip. The company immediately began to segregate these packaging wastes, replacing a single large skip with three smaller ones for cardboard, plastic and general waste. Waste removal costs fell by 45%. The company also installed a baler to reduce disposal costs further.

Are you segregating wastes effectively at source to make recycling easier? Separating packaging waste before it becomes mixed up in the skip will reduce contamination (eg from tape, labels, staples and chemicals). In some cases, a little effort in segregating packaging materials and keeping them clean can significantly improve recycling opportunities. Many companies use colour-coded boxes around the shop floor/warehouse to allow the easy segregation of materials. It is important to ensure that these boxes are close to the waste-producing process and to make staff aware of ‘bin’ locations through training, team briefings, plans on notice-boards, etc.

Could packaging be emptied better and/or cleaned to allow reconditioning or recycling? Careful emptying/cleaning of drums, for example, will improve the chances of the drums being taken for reconditioning and, in some cases, can make a chemical drum ordinary waste rather than hazardous (special) waste.

Is the packaging designed to facilitate recycling? For example:

- Certain laminated board materials (eg those covered in polyethylene) and adhesives/hot melts can cause problems at paper mills reprocessing this type of packaging. Clean, single polymer and unpigmented/clear materials without sticky labels are the most attractive plastic materials to reprocessors.

- Mixed materials (eg metal or plastic closures on a cardboard box) can also present problems. As a general rule, single material designs are desirable (even down to the type of polymer used, eg polypropylene and polyethylene). Some polymers are compatible in the sense that they can be separated readily (see Packaging design for the environment: reducing costs and quantities (GG360R)16).

Is the packaging correctly marked to clearly indicate the types of material used? This is important to allow easy material separation from mixed waste streams. Plastics, for example, can be embossed with the appropriate symbol so as to eliminate the need for a separate label. See Packaging design for the environment: reducing costs and quantities (GG360R) for further information. BS EN 13430:200417 specifies the requirements for packaging recoverable by material recycling.

16 Available free of charge through the Environment and Energy Helpline on 0800 585794 or via the Envirowise website (www.envirowise.gov.uk).

17 Available from BSI (www.bsi-global.com).
Could the packaging be composted? For example, paper and board are compostable and can be mixed with garden waste in outdoor windrows to produce quality compost. Your local authority or waste management contractor may be able to take packaging waste for composting. BS EN 13432:2000\(^{18}\) specifies the requirements for packaging recoverable through composting and biodegradation.

Once collected, can materials be kept uncontaminated to increase their value? Careful storage in covered and clearly labelled skips and bins can help to ensure that materials do not become mixed or contaminated by other materials (eg paper in the plastic skip or vice versa), water, food (which can attract vermin), etc. Wet paper loads may be rejected by merchants/recyclers because they are difficult to handle.

Can you improve the cost-effectiveness of recycling by bulking up? Recycling may not be economic for sites with low tonnages. However, tonnages can be increased (bulked up) by bringing material from several sites through back-haulage in vehicles used for delivery to a central point. Larger tonnages in one place are far more attractive to merchants/recyclers.

Making recycling possible through ‘bulking up’

In 2001, a large UK retailer examined the possibility of back-hauling plastic and card packaging materials from its superstores to its main distribution centre. The cost was around £17 000/ year (including the annualised cost of a baler, roll-cages and labour). However, the benefits included around £45 000/year in avoided waste disposal costs and revenue of some £25 000/year from recyclables. The net cost saving was therefore around £53 000/year.

\(^{18}\) Available from BSI (www.bsi-global.com).
Reducing disposal costs

Ideally, waste packaging should be reconditioned or recycled wherever possible. However, even if it has been re-used, packaging will ultimately have to be disposed of. As noted earlier, the implementation of EU legislation in the UK and the landfill tax escalator will increase the cost of landfilling quite dramatically in the short to medium term. However, there are a number of measures that you can take to minimise your waste disposal costs.

- **Is hazardous packaging waste segregated properly?** Mixing hazardous (special) waste with non-hazardous waste makes the whole load hazardous and increases costs dramatically. Hazardous waste generally costs hundreds rather than tens of pounds per tonne to dispose of. In addition, it has to be sent with a ‘consignment note’, with additional administration and cost implications.

- **Are the best skips being used?** Ask your waste management company if you can receive/rent covered front-end loader (FEL; 2 - 8 m$^3$) or larger rear-end loader (REL; 9 - 11 m$^3$) units rather than ordinary open skips. FELs and RELs can be emptied into a waste collection compactor vehicle. This is cheaper than having whole skips removed and replaced.

- **Are you getting the most out of your waste containers?** Containers/skips are often used inefficiently and emptied when only partially full. This increases your waste disposal costs as the number of collections (lifts) and transport costs are a key element of pricing.
  - Consider asking for collection on demand or at more appropriate intervals.
  - Where you have several skips, make it clear which ones are in use. Otherwise, you may find that all the skips fill up at the same rate and that no single skip is full on collection day. You may even need to lock those that are not in use.

- **Are you using the largest containers you can?** Assuming that there are no health or environmental risks associated with longer storage (eg odour and leakage), it is generally best to use the largest skips possible (within any space constraints); although rental costs will be higher, there will be fewer ‘lifts’.

- **Is it worth buying or leasing volume reduction equipment?** Such equipment includes shredders, balers, compactors, roll packers (a steel roller on a hydraulic arm for large open skips) and drum crushers. These devices can reduce the volume of general and compressible waste such as card to about 20% of its original volume.

- **Are you getting the best waste disposal deal?** Waste removal costs can vary greatly between waste management companies and it is best to shop around for the most appropriate ‘deal’. Charging regimes are based on container rental, transport costs and disposal costs (gate fee plus landfill tax). They are also based on assumptions, which can be incorrect, about waste composition and tonnage. Ask what these are and correct them as necessary. You can also specify that a certain minimum percentage recycling is carried out and ask to share any resulting revenue with the contractor.
Are you getting good data from your contractor? Ask your contractor to provide waste disposal data by weight to help with your monitoring and waste minimisation work. Some companies may also help you by reviewing your waste management procedures and containers. Some might even help with waste minimisation work.

Could you purchase and operate high-value equipment jointly with other companies? This is likely to be most practical for companies that are part of a group or that have close relationships with companies in the local area, perhaps through a local waste management or minimisation club. Companies with a small volume of waste can benefit from such an approach.

Is the volume of waste large enough to make energy recovery viable? Options include a small energy-from-waste plant or a combined heat and power (CHP) plant. Large companies can bring together waste from all their sites to make this feasible, while smaller companies could collaborate. Most packaging waste - particularly plastic packaging - has a high calorific value. Those interested in this approach are advised to talk to a specialist consultant, who can establish the feasibility of such an idea and inform you of any financial support that may be available. The Environment and Energy Helpline on 0800 585794 can put you in touch with a suitably qualified expert.

Are you complying with the law on waste disposal? Whether sending waste for recycling, treatment or disposal, you must comply with the Duty of Care. Information is available from Defra (www.defra.gov.uk/environment/waste/management/doc/) or via the Environment and Energy Helpline (0800 585794).

Unless you transport the material yourself as the producer of that waste, you should use an appropriately registered/licensed waste carrier. Transfer notes must be used with the waste identified using the six-digit European Waste Catalogue (EWC) code. For guidance about use of this code, contact your local environment agency office.

Particular procedures have to be followed with regard to hazardous waste. Sources of information and advice on the latest rules include:

- Envirowise - contact the Environment and Energy Helpline (0800 585794) or visit www.envirowise.gov.uk and click on Legislation;
- the Environment Agency (www.environment-agency.gov.uk), including Interpretation of the definition and classification of hazardous waste (Technical guidance WM2) which can be downloaded from the website;
- NetRegs (www.netregs.gov.uk).

**Switching from skips to FEL containers**

A company in Wales generated seven open skips of general waste per week at a cost of approximately £55 per ‘lift’. Waste disposal was therefore costing the company £18 500/year. At the suggestion of its waste management contractor, the company switched from skips to FELs, which the waste contractor then supplied free of charge. With careful filling, the company now manages with six FELs of the same size as the original skips. These are emptied each week at a cost of £12 each; a total cost of around £3 500/year. This simple change is saving the company £15 000/year in waste disposal costs.

### 8.1 Economics of compaction

The volume of waste is dramatically reduced by compaction and far fewer collections are required. But because waste disposal costs relate to weight as well as the number of lifts, they typically fall by around 50% - less than might be expected.
Although new equipment can be expensive (e.g., over £20,000 for a new compactor), refurbished equipment is generally much cheaper (e.g., less than £10,000 for a compactor). Leasing is another option and typically costs £40 - £60/week (i.e., £2,000 - £3,000/year) for a small to medium-sized compactor (including maintenance costs). Therefore, the breakeven point on leasing typically comes when the waste bill is greater than £4,000 - £5,000/year.

Cheaper mini compactors, including small hydraulic devices and manual compaction frames that can be attached to a wall or a skip, can be used with 1,100 litre Euro bins. The manual devices, while providing less compaction, can cost as little as £200. These devices can be used as cost-effective intermediate compaction before the waste is emptied into a larger skip.

**Benefits of segregation and compaction**

A clothing manufacturer in Northern Ireland used to have three skips of general waste per day. Improved segregation of fabric and packaging allowed this waste to be sold for recycling, while a compactor was bought to deal with the mixed waste residues. The compactor is emptied only once per week (albeit at a higher cost), giving an overall saving of £13,000/year.
Industry examples

Rangemaster transit packaging redesign and optimisation

Rangemaster is a market leader in the UK in the manufacture of range cookers and kitchen sinks. Most of the range cookers are sold in the UK, but the company also exports to Europe, Australia and the USA. In 2003, Rangemaster began to make significant savings and efficiencies by changing its transit packaging.

Problems with the old-style transit packaging

Before 2003, range cookers were packaged in heavy duty cardboard boxes. Inside the box, support and extra protection were provided by a large range of additional packaging items including:

- polystyrene corners;
- top and bottom polystyrene mouldings;
- plastic/paper mix edge guards;
- cardboard and polystyrene spacers;
- a cardboard base tray;
- wooden struts.

In addition, a number of accessories and components were packed into individual boxes before being packaged in the outer cardboard box. A variety of multi-lingual information labels were applied manually to the outside of the cardboard box.

This approach to packaging was labour-intensive. Approximately 65 different packaging components were needed for the range of cooker parts.

Packaging redesign improvements

Rangemaster realised that investment was needed to achieve better packaging specifications, which would, in turn, lead to valuable savings in material reduction and warranty claims for damage during transit. Environmental improvements are also considered important as the site is ISO 14001 registered.

The company identified a packaging supplier that offered the design capabilities and testing facilities required to develop a new range of packaging materials. Rangemaster invested around £110 000 in a new shrink-wrap machine and the tooling required to produce packaging that could accommodate the variety of range cookers the company manufactures.

Rangemaster and the packaging supplier designed the new packaging to be as generic as possible, increasing the number of common elements between the styles of range cookers. The number of unique packaging components was reduced to 45 - a reduction of 20.

The weight of the packaging was reduced by eliminating components and substituting materials. For example, polystyrene replaced the wooden supports and improved protection, and shrink-wrapping replaced the outer cardboard box. In addition, smaller packaging components such as labels and small cardboard boxes for accessories (previously used in large quantities) were eliminated. Information is now printed on the outside of the pack and accessories/components are packed into ready-made spaces in the top polystyrene moulding without the need for cardboard boxes.
Benefits of updated transit packaging

Altering the transit packaging has resulted in a number of benefits:

- Rangemaster has achieved cost savings of over £100,000/year in material savings. These alone give a payback period of approximately one year on the investment in machinery and tooling.
- The weight of the packaging has fallen by 2.5 kg/pack. This has resulted in an overall packaging weight reduction of 125 tonnes/year.
- The cost of one full-time employee has been saved. Labour saving has been achieved through:
  - a reduction in label requirements;
  - a reduction in forming/stapling of cardboard components;
  - eliminating the need to make up boxes for accessories.
- Increasing the commonality of packaging components has improved housekeeping. Less floor space is needed in the packaging area as fewer packaging components are used. In 2003, new models were added to the company’s range but only two new items of packaging were needed to accommodate them.
- The growing trend for range cookers to be delivered direct to the end-user for fitting has resulted in more packaging being returned to the manufacturing site. Because its design is more robust, major elements of the new pack can be re-used (provided it is in a suitable condition).
- Transit damage to side panels was a significant problem, but current indications suggest that this has decreased since the packaging has changed. The old packaging was designed to protect the appliance in ‘normal’ handling conditions; the new packaging went through rigorous tests to demonstrate protection under ‘abusive’ handling conditions.
- Storage is more efficient. Because the new packaging is stronger, the appliances can be stacked six-high in the warehouse instead of five-high.

The quoted cost savings do not take account of the reduction in labour requirements, warranty improvements and the additional savings that will be realised when Rangemaster submits data to its compliance scheme in order to fulfil its obligations under the packaging waste regulations.

Future improvements at Rangemaster

The company aims to make further cost, weight and performance improvements. A number of potential improvements have already been identified including reducing the gauge of the shrink-wrap, strengthening the end-caps and reducing the number of edge guards.

The reduction in the number of edge guards is expected to save about 0.35 kg per appliance. This equates to a packaging reduction of around 20 tonnes/year and cost savings of about £15,000/year.
Transit packaging savings for Everest Limited

Everest Limited is a home improvement company specialising in the manufacture and fitting of double-glazed windows, doors and conservatories. The company operates an on-going programme of streamlining packaging with a view to achieving cost and environmental benefits. Every three to four years, packaging is reviewed and changes are implemented. Recent changes to transit packaging have resulted in significant benefits.

Transit packaging before the changes

Packaging around sealed glass units and the window units (frames and glass) is seen as essential to ensure that the units are not damaged both during manufacture and during transport to customers’ homes for fitting.

The company transports sealed glass units for conservatories, large windows and replacement glass without the frame. The glass was previously transported using a polystyrene ‘U channel’ - a polystyrene block with a channel carved out for the edge of the glass. The U channel was used on all sides of the glass units. Cardboard was wrapped around the polystyrene to prevent plastic banding from cutting into it.

Sealed window units are manufactured by Everest’s sister company. All units sent to Everest branches were packed, as with the glass units, using a polystyrene U channel, cardboard and banding. Everest paid approximately £7 per unit to its sister company for the cost of materials and labour for wrapping the units. In addition, window frames complete with glass were wrapped in stretch-wrap for transport to protect the edges of the frames from damage and being marked when transported by installers to customers’ houses.

Year-on-year improvements

Everest has implemented changes over a number of years. One of its most established changes was the elimination of stretch-wrap around the window frames; Everest looked to European companies for best practice and found a German double-glazing unit manufacturer that had no increase in damaged units despite not protecting the frames with packaging.

Everest stopped stretch-wrapping the frames with the introduction of a new delivery system. Completed windows have small skids fitted to the underneath of the frame and are then loaded onto barrows for dispatch to the appropriate branches. This reduced the number of times each frame was handled, thus significantly reducing any possible damage.

In 2002, the company addressed the issue of packaging around sealed glass and window units. The company approached its packaging supplier with a view to redesigning the packaging to provide the necessary support and protection, but at a lower financial and environmental cost.

The improved packaging uses foam protectors applied using double-sided low-tack tape only to the corners of the glass. The foam is supplied in a 250 metre reel, which has a triangle-shaped mitre cut out at 16 cm intervals to allow it to be bent around a corner, forming a mitred joint. The joint is held in place using the tape, which is easily removed when the windows are fitted. Foam is only added to the two sides of the glass to facilitate handling and to improve staff safety for non-toughened glass.
Benefits

The improved packaging has resulted in a number of benefits, including significant cost savings.

For example, Everest has saved around £90 000/year by changing to foam corner protectors for sealed glass and window units. These savings have been achieved through a combination of:

- reduced time and labour requirements - the new packaging is quicker to apply;
- reduced material costs - the cost of the packaging as supplied by the manufacturer has fallen by over £5 per unit;
- reduced disposal costs - the packaging is removed by Everest from the customer’s property when fitting is complete (previously Everest paid for the disposal of the card and polystyrene).

Production has increased by 10% without the need for extra staff. In addition, the company has a reduced obligation under the packaging waste regulations; the annual tonnage of paper and plastic reported has reduced by 11 tonnes and 15 tonnes, respectively - saving over £1 500 in PRN costs for 2002.
Britax improvements to transit packaging

Britax Excelsior Ltd designs, manufactures and markets children’s car seats, pushchairs and travel systems. Over recent years, Britax has made various improvements to its packaging systems, which have been prompted by a range of factors including cost and environmental performance and the packaging waste regulations. The changes are linked to the improved transport, handling and storage of goods and components. Three initiatives are outlined below.

Packaging around components

Components were previously delivered in cardboard boxes on pallets with shrink-wrap to Britax’s manufacturing plant from a number of suppliers. This system has now been replaced by plastic ‘porta-collars’. The collars can be placed on pallets in layers to form a re-usable outer box, which is built up to the required depth of the goods. The process of unpacking the pallets is made easier by the porta-collars, which are removed in layers as the components are used. There are no additional transport costs associated with the re-usable packaging; the porta-collars stack flat when the pallet is empty and are sent back to the supplier via a returning vehicle.

The porta-collars were made using 130 tonnes of Britax’s own waste plastic material, which was reground to form the porta-collars. This saved Britax 20% on the purchase price of the porta-collars and also recycled a significant quantity of plastic.

Additional benefits offered by the porta-collars include:

- improved storage - pallets with porta-collars can be stacked more efficiently than cardboard boxes and are more stable during storage;
- improved product protection - the rigid porta-collars offer improved component protection and a reduction in damaged stock;
- better transportation - a fully loaded vehicle can transport more pallets with porta-collars;
- better housekeeping - improved bulk storage has led to better stock rotation and the use of a just-in-time approach for the assembly of products.

Storage of metal parts

Metal parts used in the manufacture of Britax’s products were previously delivered to the manufacturing site in large metal stillages. Owing to the size and handling requirements of the stillages, they could only be stored at ground level. This meant that their storage was not space efficient.

Metal stillages have been replaced with returnable plastic bins; the bins are returned to the supplier via the returning vehicle, forming a closed-loop system which does not require additional vehicle journeys. Britax shares the costs and savings of the bins with the component supplier. When the metal stillages were removed from service, they were either recycled through a local metal recycler or returned to the supplier.

The plastic bins have led to the following benefits.

- Manual handling has improved because the plastic bins are smaller and thus weigh less when full. The 15 kg limit for manual handling is therefore not exceeded.
The boxes can be stored in racking, thus maximising storage efficiencies.

Quality control has improved and the components suffer less damage with the new transit packaging.

Car seat cartons

When Britax’s car seats are ready for distribution within the UK, they are packed in an ‘L-shaped’ box, which closely corresponds to the shape of the seat. A rectangular box was used before the transit packaging improvements.

The main benefit of this new shape transit box is the improved transport and storage; 16 new-style boxes will stack safely on a pallet instead of ten with the old-style packaging. This means that Britax and its customers benefit from more cost-effective transport and warehouse storage. In addition, the new shape gives more stability to the pallets and the use of plastic sealing tape has fallen by 20%.

Conclusion

Britax has a history of achieving cost and environmental benefits through improved packaging management. The benefits are seen through direct financial savings as well as indirect savings such as greater efficiencies in transportation and storage. The company is continually reviewing packaging options and the standardisation of colours, components and suppliers in order to make reductions in the packaging costs associated with the production and transport of its goods.

The streamlined approach to packaging and an efficient data management system mean that the company finds it easy to collect data in order to comply with the packaging waste regulations and remains registered directly with the Environment Agency.
Marks & Spencer returnable transit packaging systems

Marks & Spencer is a major UK retailer of clothing, foods and homeware. Efficient distribution is essential to the company in order to supply its 340 stores. Considerable savings have been made through the introduction of a number of changes to its transit packaging system in order to improve the distribution of fresh food and flowers.

Transit packaging improvements

Since Marks & Spencer began selling fresh food in the late 1960s, there has been little change to the transit packaging used to distribute the food. At that time, the company adopted an innovative approach to packaging by using returnable plastic food delivery trays to transport goods from the manufacturer to its distribution centres and on to the retail outlets.

However, the trays were based on imperial measurements. This caused problems in the 1990s with the increased use of returnable trays that involved delivery vehicles, refrigerators and handling equipment standardised around metric dimensions. Given the huge costs involved in replacing the trays, the company waited until 2002 to make the changeover to a metric system in a way that provided numerous benefits.

The food delivery trays are being updated further by the introduction of radio frequency identification (RFID) tagging. The tags allow efficient distribution of stock, which can be tracked from leaving the manufacturer to its arrival at the retail outlet. This eliminates the need for manual scanning or counting.

Based on the success of the re-usable food delivery trays, a re-usable plastic box for transporting flowers was introduced in 2003. Until then, suppliers delivered flowers to the distribution centres for the retail outlets in one-trip cardboard boxes. These cardboard boxes have been replaced with re-usable plastic boxes owned by the supplier, which have a plastic cover to protect the flower heads.

Benefits and savings

Rather than disposing of the imperial food delivery trays, 2.7 million trays were sent to a manufacturer and were regranulated for use in a new metric version. The imperial trays provided 80% of the material needed for the new metric trays; the rest was derived from virgin plastic. Many of the old imperial trays were over 20 years old, and Marks & Spencer believes that the new versions will last as long.

This approach avoided the disposal of over 6 000 tonnes of plastic and eliminated the need to buy 6 000 tonnes of virgin plastic. The company can now fit 15% more trays into its distribution vehicles, as the metric footprint of the tray sits better in the vehicle fixtures. This has also provided transport savings of several millions of pounds.

The metric trays are smaller than the imperial version, which has provided benefits in terms of distribution quantities. Marks & Spencer is now able to move smaller quantities of food lines without needing to transport mixed trays of goods.

The introduction of re-usable flower boxes is expected to save an estimated 2 000 tonnes/year of cardboard from requiring disposal.
Logistics issues

A simple closed-loop system has been introduced for the return of the food trays. The fresh food products are all own-brand goods, manufactured by companies that often supply only Marks & Spencer. This means there is no confusion over returning transit packaging belonging to other companies. When the company makes a delivery to a retail outlet, the empty trays are picked up and returned to the manufacturer.

The logistics for the flower boxes was initially more difficult as there were potential problems with transporting the boxes back to suppliers. These have been overcome by working with suppliers and maintaining only a few collection/distribution points. Flowers are packed into the re-usable boxes at UK suppliers or agents before onward transport to distribution centres.

Additional savings

The company’s suppliers have also benefited from re-usable transit packaging because the elimination of one-trip cardboard for both the food delivery trays and flowers has reduced their obligation under the packaging waste regulations.
Moving forward

The industry examples in this Guide demonstrate that many companies are achieving significant cost savings and other benefits by improving their transit packaging. Many of these companies have found that the data collection required under the packaging waste regulations has been useful in uncovering numerous opportunities to save money and improve their environmental performance.

A careful and systematic approach to packaging management can bring numerous benefits that should far outweigh the costs involved. Improving your packaging management can:

- reduce your own direct packaging and material costs;
- reduce your waste disposal costs;
- reduce your suppliers’ costs (from which you can benefit);
- reduce product damage and costly customer returns;
- reduce your obligation under the UK packaging waste regulations and hence the cost of compliance;
- reduce the cost of compliance with packaging legislation in other EU countries;
- increase revenue through recycling;
- improve overall site efficiency;
- make your company more attractive to ‘green’ customers.

To achieve cost savings and other benefits from optimising your packaging use:

- Obtain the backing of senior management for a programme to improve packaging management.
- Appoint a project ‘champion’.
- Gather data so that you understand fully how packaging is used in your company. Use the checklist and worksheets in the appendix to help you.
- Draw on the experience and ideas of employees, packaging manufacturers, customers and suppliers.
- Identify areas where you are using more packaging than necessary and where packaging could be optimised through elimination, reduction and re-use. Use the advice given in this Guide to help you.
- Identify opportunities for the replacement of one-trip packaging with re-usable systems.
- Consider whether you can rationalise your packaging to reduce costs.
- Evaluate and prioritise possible improvement options in terms of the likely costs and benefits, and the practicalities of implementation.
- Set in motion an implementation plan with appropriate targets and timetable, and defined roles and responsibilities.
- Establish clear guidelines and agreements with suppliers and customers where re-usable systems are involved.
- Seek help from Envirowise and other organisations as appropriate.
- Review progress after the first year and then regularly as required.
10.1 Sources of further help

10.1.1 Envirowise

The Environment and Energy Helpline on 0800 585794 can:

- put you in touch with a technical expert - free of charge;
- provide free, up-to-date advice on environmental issues;
- tell you about relevant environmental and other legislation that could affect your business;
- send you copies of free, relevant Envirowise publications;
- suggest other sources of information;
- arrange for a free, confidential on-site waste review (known as a FastTrack visit) by an Envirowise advisor;
- arrange for a free, confidential on-site packaging design review (known as a designtrack visit) by an Envirowise advisor;
- arrange for a counselling visit from an Envirowise consultant to discuss a specific environmental issue at your site (e.g. analysing your packaging data).

All Envirowise's free information and advice can be accessed via its website (www.envirowise.gov.uk).

Useful Envirowise publications include:

- Unpack those hidden savings: 120 tips on reducing packaging use and costs (EN250);
- Packaging design for the environment: reducing costs and quantities (GG360R);
- Packaging reduction saves money: industry examples (GG411);
- Reducing the cost of packaging in the food and drink industry (GG157).
- Life-cycle assessment - an introduction for industry (ET257).

10.1.2 Other useful contacts

The website addresses of other sources of advice and information about various aspects of packaging management are listed in Table 3. If you do not have access to the Internet, contact the Environment and Energy Helpline (0800 585794) for more contact details.
<table>
<thead>
<tr>
<th>Name</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Packaging legislation and standards</strong></td>
<td></td>
</tr>
<tr>
<td>Envirowise</td>
<td><a href="http://www.envirowise.gov.uk">www.envirowise.gov.uk</a></td>
</tr>
<tr>
<td>Her Majesty’s Stationery Office (HMSO)</td>
<td><a href="http://www.hmso.gov.uk">www.hmso.gov.uk</a></td>
</tr>
<tr>
<td>Department for Environment, Food and Rural Affairs (Defra)</td>
<td><a href="http://www.defra.gov.uk">www.defra.gov.uk</a></td>
</tr>
<tr>
<td>Department of Trade and Industry (DTI)</td>
<td><a href="http://www.dti.gov.uk">www.dti.gov.uk</a></td>
</tr>
<tr>
<td>Environment Agency</td>
<td><a href="http://www.environment-agency.gov.uk">www.environment-agency.gov.uk</a></td>
</tr>
<tr>
<td>Scottish Environment Protection Agency (SEPA)</td>
<td><a href="http://www.sepa.org.uk">www.sepa.org.uk</a></td>
</tr>
<tr>
<td>Environment and Heritage Service, Northern Ireland</td>
<td><a href="http://www.ehsni.gov.uk">www.ehsni.gov.uk</a></td>
</tr>
<tr>
<td>Health and Safety Executive (HSE)</td>
<td><a href="http://www.hse.gov.uk">www.hse.gov.uk</a></td>
</tr>
<tr>
<td>Local Authorities Co-ordinators of Regulatory Services (LACORS)</td>
<td><a href="http://www.lacors.com">www.lacors.com</a></td>
</tr>
<tr>
<td>(Trading Standards Body)</td>
<td></td>
</tr>
<tr>
<td>BSI</td>
<td><a href="http://www.bsi-global.com">www.bsi-global.com</a></td>
</tr>
<tr>
<td><strong>Packaging and the environment</strong></td>
<td></td>
</tr>
<tr>
<td>Industry Council for Packaging and the Environment (INCPEN)</td>
<td><a href="http://www.incpen.org">www.incpen.org</a></td>
</tr>
<tr>
<td>European Organization for Packaging and the Environment (EUROPEN)</td>
<td><a href="http://www.europen.be">www.europen.be</a></td>
</tr>
<tr>
<td>Pira International</td>
<td><a href="http://www.piranet.com">www.piranet.com</a></td>
</tr>
<tr>
<td>DSD (German Green Dot Scheme)</td>
<td><a href="http://www.gruener-punkt.de">www.gruener-punkt.de</a></td>
</tr>
<tr>
<td><strong>Trade associations/advisory bodies</strong></td>
<td></td>
</tr>
<tr>
<td>Association of Drum Manufacturers</td>
<td><a href="http://www.the-adm.co.uk">www.the-adm.co.uk</a></td>
</tr>
<tr>
<td>Association of Plastics Manufacturers in Europe</td>
<td><a href="http://www.apme.org">www.apme.org</a></td>
</tr>
<tr>
<td>British Coatings Federation (BCF)</td>
<td><a href="http://www.coatings.org.uk">www.coatings.org.uk</a></td>
</tr>
<tr>
<td>British Glass</td>
<td><a href="http://www.britglass.co.uk">www.britglass.co.uk</a></td>
</tr>
<tr>
<td>British Plastics Federation (BPF)</td>
<td><a href="http://www.bpf.co.uk">www.bpf.co.uk</a></td>
</tr>
<tr>
<td>Confederation of Paper Industries Corrugated Sector</td>
<td><a href="http://www.paper.org.uk">www.paper.org.uk</a></td>
</tr>
<tr>
<td>Institute of Grocery Distribution</td>
<td><a href="http://www.igd.org.uk">www.igd.org.uk</a></td>
</tr>
<tr>
<td>Institute of Packaging</td>
<td><a href="http://www.iop.co.uk">www.iop.co.uk</a></td>
</tr>
<tr>
<td>Metal Packaging Manufacturers Association</td>
<td><a href="http://www.mpma.org.uk">www.mpma.org.uk</a></td>
</tr>
<tr>
<td>Packaging Federation</td>
<td><a href="http://www.packagingfedn.co.uk">www.packagingfedn.co.uk</a></td>
</tr>
<tr>
<td>Rapra Technology (Rubber and Plastics Research Association)</td>
<td><a href="http://www.rapra.net">www.rapra.net</a></td>
</tr>
<tr>
<td>Steel Can Recycling Information Bureau</td>
<td><a href="http://www.scrib.org">www.scrib.org</a></td>
</tr>
<tr>
<td>Timber Packaging and Pallet Confederation (Timcon)</td>
<td><a href="http://www.timcon.org">www.timcon.org</a></td>
</tr>
<tr>
<td>UK Aluminium Packaging Recycling Organisation (Alupro)</td>
<td><a href="http://www.alupro.org.uk">www.alupro.org.uk</a></td>
</tr>
</tbody>
</table>
Checklist and worksheets

The following are provided for you to photocopy and use in your organisation:

- Packaging improvement options checklist;
- Cost savings worksheet;
- Re-usable packaging: cost benefit worksheet.
# Packaging improvement options checklist

**Area/department:** .................................................................

<table>
<thead>
<tr>
<th>Avoiding the need for packaging</th>
<th>Investigate further</th>
<th>Implement now</th>
</tr>
</thead>
<tbody>
<tr>
<td>Could the product or its primary packaging be changed (eg made more robust)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could workplace cleanliness be improved?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could handling practices/equipment be improved?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could ‘just-in-time’ delivery be introduced?</td>
<td></td>
<td></td>
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<tr>
<td>Could raw materials be delivered in bulk?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could product redesign reduce the need for packaging?</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Optimising the level of packaging</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Is the type of packaging optimum (eg box or shrink-wrap)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the best material being used (eg plastic or cardboard)?</td>
<td></td>
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</tr>
<tr>
<td>Could a lighter grade of material be used (eg 20 µm rather than 40 µm thick)?</td>
<td></td>
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<tr>
<td>Could the structural design be improved (eg direction of flutes in corrugated packaging)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the shape and size optimum? Is volume being wasted?</td>
<td></td>
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</tr>
<tr>
<td>Is the packaging too standardised (ie would a more bespoke design help)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the packaging too varied (ie would rationalisation help)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are collation trays really necessary?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could larger denomination packs be used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is so much void space and filler material necessary?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the best type of filler material being used (eg paper ruffle)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could staples be avoided?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is tape being used efficiently?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are pallets really necessary or could slip sheets be used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the pallet the optimum design for its purpose (ie one-trip or multi-trip)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is pallet area being fully utilised?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is too much stretch-wrap being used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could strapping/banding be more efficient?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Would layer pads help to stabilise the load?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Would fork-lift stabilisers help to reduce the amount of packaging required?</td>
<td></td>
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</tbody>
</table>

GG482 published by Envirowise Environment and Energy Helpline 0800 585794
## Packaging improvement options checklist (continued)

<table>
<thead>
<tr>
<th></th>
<th>Investigate further</th>
<th>Implement now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Re-use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could re-usable systems be introduced cost-effectively?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could adaptable, multiple-use packaging be introduced?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could one-trip packaging be made multi-purpose (e.g., transit and display)?</td>
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<tr>
<td>Could one-trip packaging be reinforced for re-use?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is used packaging segregated at source to allow re-use where appropriate?</td>
<td></td>
<td></td>
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<tr>
<td>Is any aspect of the packaging design (own or supplier) inhibiting re-use?</td>
<td></td>
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<tr>
<td>Could contamination be reduced to facilitate re-use?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could used packaging (e.g., boxes, drums etc) be purchased?</td>
<td></td>
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</tr>
<tr>
<td>Could re-usable packaging be leased (e.g., layer pads, pallets)?</td>
<td></td>
<td></td>
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<tr>
<td>Could used packaging be utilised elsewhere on-site or by staff?</td>
<td></td>
<td></td>
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<tr>
<td>Could used packaging be sold/given away for re-use (rather than recycling)?</td>
<td></td>
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<tr>
<td>Could a cleaning system be used to help re-use (e.g., IBC or drum cleaning)?</td>
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</tr>
<tr>
<td><strong>Recycling packaging and reducing the cost of disposal</strong></td>
<td></td>
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<tr>
<td>Could more recycled materials be used?</td>
<td></td>
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<tr>
<td>Is the packaging designed to facilitate recycling (e.g., single material designs)?</td>
<td></td>
<td></td>
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<tr>
<td>Is it correctly and clearly marked?</td>
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<td></td>
</tr>
<tr>
<td>Is used packaging segregated at source?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could waste materials be kept unmixed and uncontaminated?</td>
<td></td>
<td></td>
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<tr>
<td>Could materials be disposed of more cheaply (e.g., given to other companies)?</td>
<td></td>
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</tr>
<tr>
<td>Are the most appropriate skips being used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you getting the most out of them?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Would you benefit from having a compactor, baler, shredder or drum crusher?</td>
<td></td>
<td></td>
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<tr>
<td>Could you get a better waste disposal deal?</td>
<td></td>
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<tr>
<td>Could you purchase/operate high-value equipment jointly with other companies?</td>
<td></td>
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<tr>
<td>Is an energy-from-waste incinerator or a CHP plant a possibility?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Cost savings worksheet

**Area/department:** ....................................................................................................................

<table>
<thead>
<tr>
<th>Measure</th>
<th>Capital cost* (£)</th>
<th>Amount of packaging affected (units, kg, etc)</th>
<th>Net annual saving per unit* (£)</th>
<th>Total net annual saving for measure (£)</th>
<th>Payback period (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>B × C = D</td>
<td>12 × A/D</td>
</tr>
</tbody>
</table>

* Approximate.
## Re-usable packaging: cost benefit worksheet

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Staff days</th>
<th>Day rate</th>
<th>Staff costs</th>
<th>Other costs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>One-off costs</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Container design</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Container selection</td>
<td></td>
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<tr>
<td>In-house consultation</td>
<td></td>
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<tr>
<td>External consultation</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Container purchase</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Warehouse modifications</td>
<td></td>
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<tr>
<td>Transport modifications</td>
<td></td>
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<tr>
<td>Process modifications</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Scheme set-up (staff)</td>
<td></td>
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<tr>
<td>Tracking system set-up</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total one-off costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Annual costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Container rental</td>
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<td>In-house management</td>
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<td>External management</td>
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<td>Container inspection</td>
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<td>Container cleaning</td>
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<td>Container refurbishment</td>
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<td>Container replacement</td>
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<td>Container disposal</td>
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<td>Compliance costs</td>
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<td>Damaged returns</td>
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<td>Additional transport costs</td>
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<td><strong>Annual benefits</strong></td>
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<td>Reduced handling effort</td>
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<td>Reduced warehousing</td>
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<td>Reduced product damage</td>
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<td>Improved transport use</td>
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<td>Improved market share</td>
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<td><strong>Total net annual costs/benefits</strong></td>
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*Enter savings as a negative cost, e.g. −£2 500.*
Envirowise - Practical Environmental Advice for Business - is a Government programme that offers free, independent and practical advice to UK businesses to reduce waste at source and increase profits. It is managed by Momenta, an operating division of AEA Technology plc, and Technology Transfer and Innovation Ltd.

Envirowise offers a range of free services including:

- Free advice from Envirowise experts through the Environment and Energy Helpline.
- A variety of publications that provide up-to-date information on waste minimisation issues, methods and successes.
- Free, on-site waste reviews from Envirowise advisors, called FastTrack visits, that help businesses identify and realise savings.
- Guidance on waste minimisation clubs across the UK that provide a chance for local companies to meet regularly and share best practices in waste minimisation.
- Best practice seminars and practical workshops that offer an ideal way to examine waste minimisation issues and discuss opportunities and methodologies.