

Best Practice Guide NO. BPGCS003

RESOURCE LOSS MAPPING

To reduce the loss of resources in any business it is necessary to understand where and how it occurs, and how much it is really costing. Resource Loss Mapping encompasses all losses that impact on company's profits and it is a visual and practical tool to analyse and manage environmental performances, particularly in small companies.

By using simple mapping techniques it will be possible to 'map out' how the company is using resources. From this it will be possible to build up a picture of the processes and see more clearly where resources are being wasted.

Resource Loss Maps:

Draw a map of the facility including interior spaces, car parks, etc. The drawing should show the real situation.

Develop symbols to indicate the different types of losses arising on site e.g. general waste, cardboard/paper, metal, plastic, timber, water, solvents, gaseous, hazardous wastes, effluent, energy, etc.

Two examples of resource loss maps are presented. The first company, Printers Inc, has produced a simple map of its site (Figure 1). The second company, First Fuses Ltd, has mapped its losses in greater detail (Figure 2).

The example maps are similar to those that will be produced for your company.

How to make a Map:

To make a map, walk around the site and as you go, look for areas where resource losses are occurring. Any resources used (inputs) are a potential source of loss. Look particularly for wasteful processes such as a bin for offcuts or for discarded packaging or water may be running down the drain. Other potential losses may be steam rising from an open treatment bath or the waste collection skip outside the building.

Some losses are easy to identify, e.g. a hose left running. Other sources may be less obvious, e.g. a heating thermostat that is set a few degrees higher than necessary. Start with the obvious and, as these are dealt with, the others can be investigated.

It is not essential to have everything laid out in exact detail at the beginning. The first step is to establish where losses are occurring.

The first stage of marking the symbols on the map should be fairly simple. At this stage, just enough information to take the first few steps to cutting down on losses is all that is required. Later, you may wish to make maps of individual departments or processes to enable you to look at these areas in far greater detail. Extra information can be added as more detailed activities of resource loss minimisation are planned.

Key for Figures 1 and 2

□ Packaging	⊙ Labour	● Solvent
⚠ Timber	⚠ Energy	△ Gaseous
◇ Plastic	△ Water	⚠ Hazardous
⊘ Raw Materials	○ Liquid	△ Product

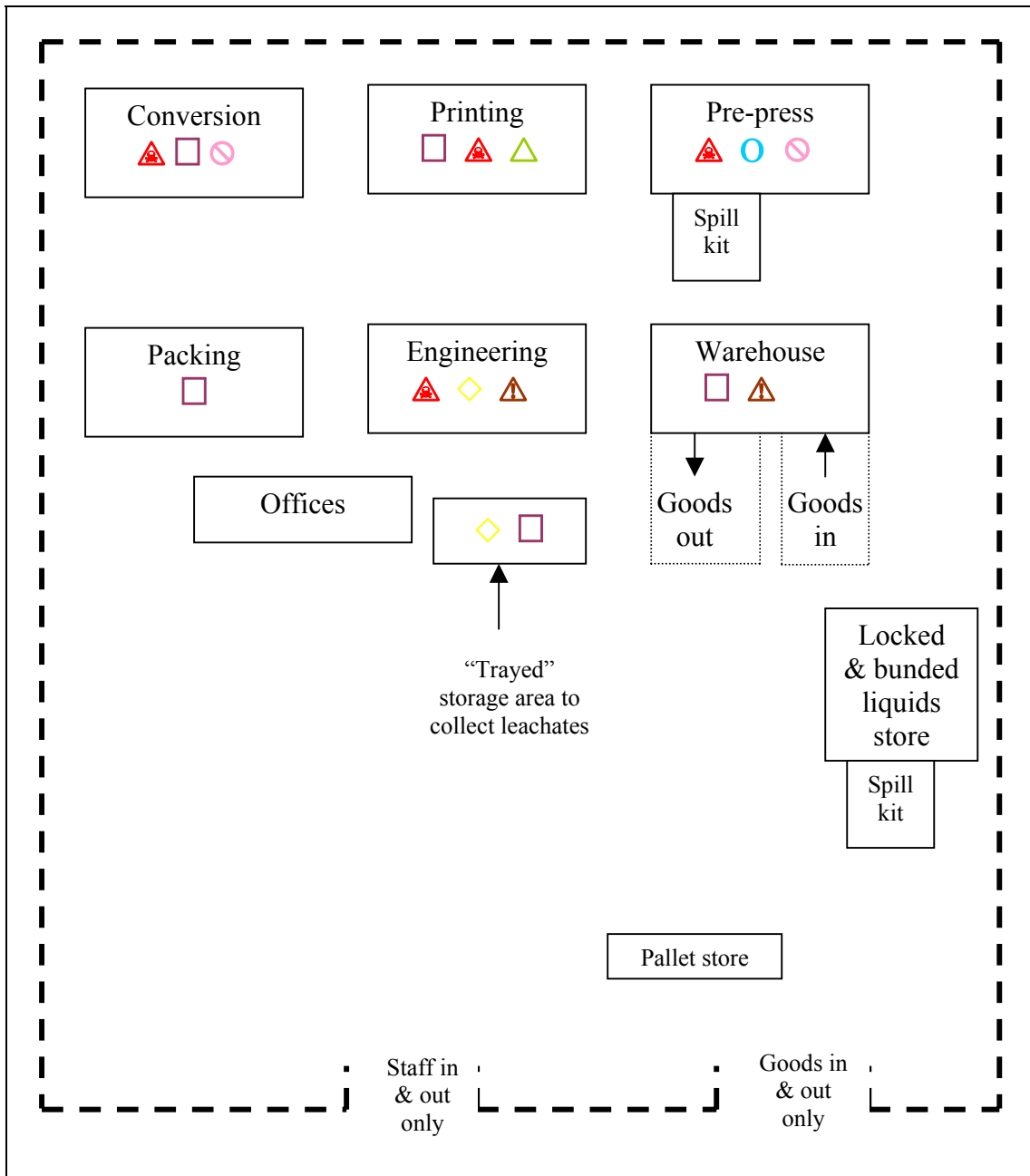


Figure 1. Resource loss map for Printers Inc

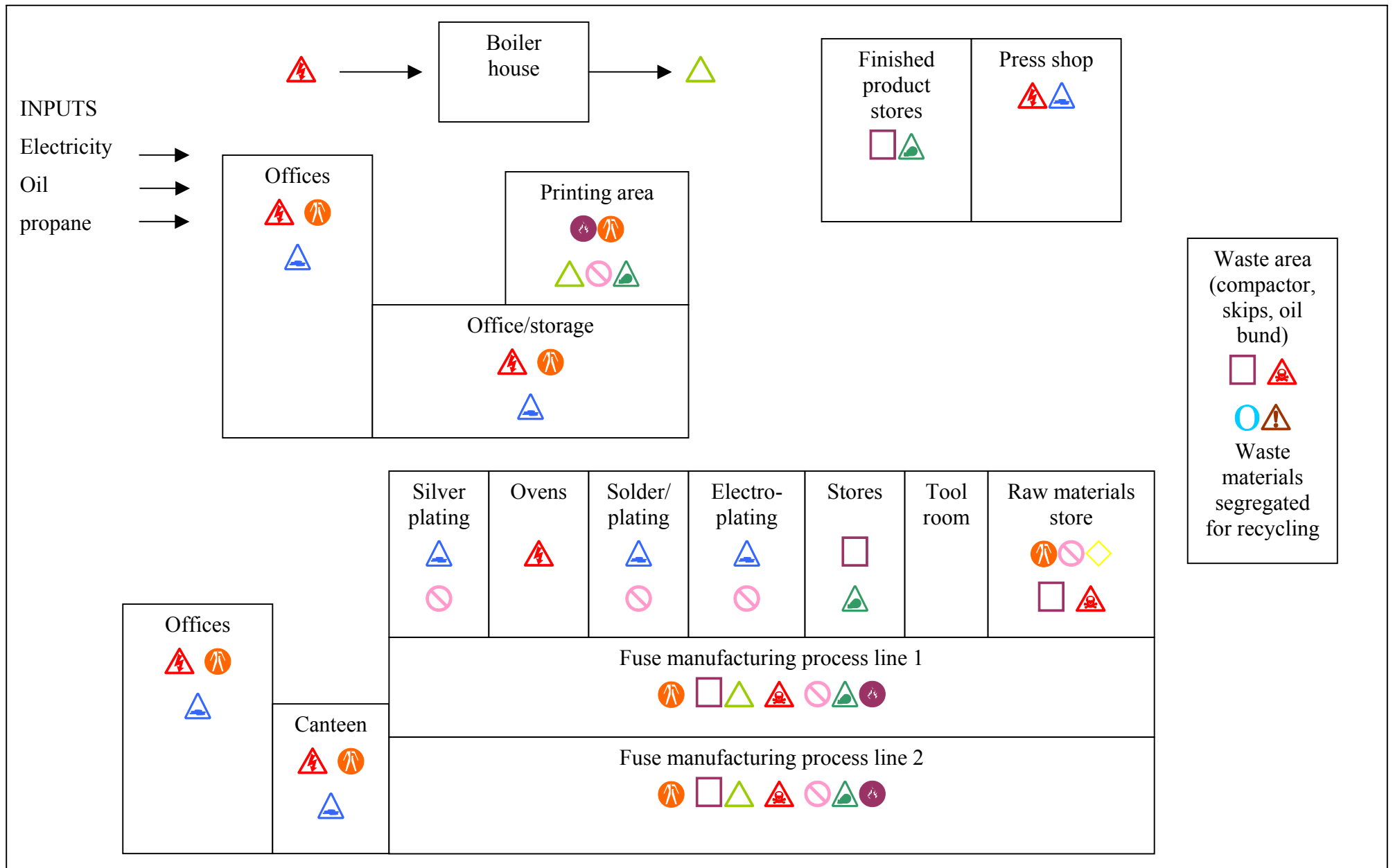


Figure 2. First Fuses Ltd

Start Thinking About Resource Loss:

The maps for Printers Inc and First Fuses Ltd were produced by someone walking around with a blank map of the site looking for areas of potential losses. Don't worry about putting in any figures at this stage, just start thinking about resource losses. You could begin where your production process starts, e.g. the delivery area or goods inwards. Think about the potential losses that may occur here. Ask yourself some questions - these are typical ones you may ask about your delivery area.

- Is there a good system of stock rotation to ensure out-of-date goods are not left on shelves?
- Are goods stacked properly to minimise damage?
- What happens to damaged goods?
- What happens to goods that are 'off-spec'?
- Are you taking advantage of bulk buying?
- What happens to the packaging?
- Is space heating effective?
- Are doors left open unnecessarily?

Discover Your Inputs and Outputs:

Once areas of loss have been identified and marked on the map using one of the symbols, you may be able to put in the quantity e.g. tonnes arising. At this stage, it only needs to be an estimate. Detailed figures can be obtained later to allow calculation of actual costs.

To find out the actual cost of your losses you need to look first not at all the wastes, but at your bills and purchase orders.

Many input costs are listed in delivery notes and invoices that will give some indication of the amount that is being lost. Put these figures onto the map as inputs. ***Don't forget utility bills.***

There are three types of figures you will require. You need to know all your inputs (e.g., raw materials purchased (cost and quantity), electricity consumed), outputs (e.g., units of production), and your levels of waste (e.g. how much is recycled, waste disposal charges). You should have historical records of these and, with some effort, could put together your figures for last year.

As you put figures to inputs and losses, you will begin to get a picture of where it is occurring - and how much it is costing. Steps can then be taken to reduce that cost to the business.

Counting The Cost:

The golden rule for all work processes and the starting point for resource loss minimisation is that everything that you put in comes out somewhere. In other words, total inputs are equal to total outputs. The raw materials are used to create finished products: the proportion that is not utilised is waste and represents a financial loss.

In any production process, from baked bean production lines to businesses selling services to customers, there are a number of inputs and outputs associated with the process (see Figure 3).

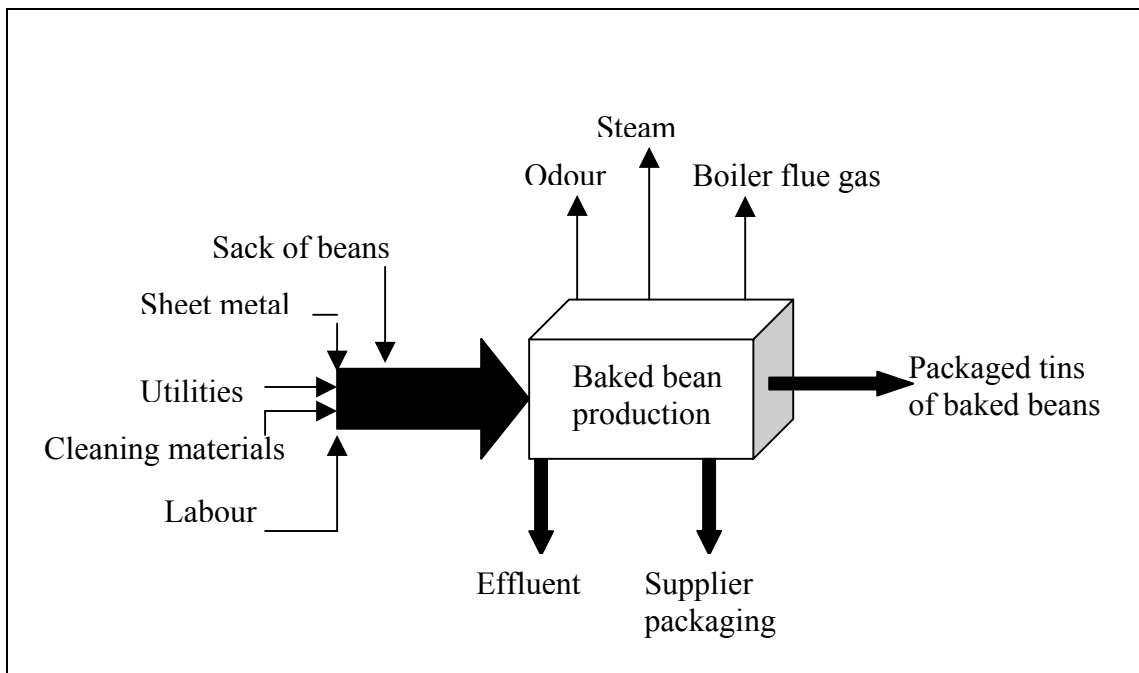


Figure 3. Inputs and outputs from a baked bean production line

Successful businesses are those that can maximise the proportion of raw materials going into finished products and services. Or, to put it another way, they are the businesses that can reduce to a minimum the amount of money represented by resource loss.

By knowing the total cost of a raw material, be it a tonne of metal, a ream of paper or a cubic metre (m³) of water, and the amount of final product, the proportion of loss can be calculated - as well as the actual cost to the business. Don't forget that raw materials are not just those used directly in a process. They also include the cost of 'consumables', such as office paper or cleaning rags. This is why you need figures for your inputs and outputs. It will help you to calculate the true cost. Many companies count only the cost of waste disposal, but this overlooks many sources, e.g. water or energy use that are higher than they should be, the solvent that evaporates, or where more chemicals or cleaners than necessary are used.

As you mark up your map, think about the hidden costs as well.

Involve Others

Much of the information needed will come from colleagues. Any resource loss minimisation programme relies on everyone being involved, so now is a good time to start getting everyone to think about it.

You will have to talk to colleagues to obtain the detailed information you need to help you quantify the loss. For example, is it one skip or two of waste cardboard - is that

per week or per month? How many wastepaper bins are emptied every day from the office? How often are the lights left on overnight after everyone has gone home? How long has the tap in the kitchen been leaking? Is it necessary to have clean, treated water in each of the rinsing baths?

As you use your map, you will probably have many ideas that need investigating about how and why losses occur and how to prevent them. Write everything down as it occurs to you. Once you can start to see how losses could be reduced, you are ready to move on to the next step and set about reducing it in a systematic way.

The Options For Minimisation

When you have completed your map it should be a comprehensive overview of losses in your company that will form a blueprint for reducing it.

Factors to consider in prioritising resource loss minimisation activities are:

- the ease with which action can be taken;
- the cost of the particular type of waste - for example, precious metals cost more to buy than steel plate, plastic document folders more than plastic cups;
- the proportion being lost (the percentage of the raw material that is not profitably used).

You should be able to identify some of these priority areas by looking at the figures you have on the map.

Taking Action

There are many ways to minimise resource losses. Listed in the appendix are a few of the most inexpensive ways. These are only a small selection of the many measures that you could take.

Updating And Reviewing

As losses are tackled and reduced, the map will change - particularly the numbers. Some streams may disappear completely, others may become less important. A regular review of the map will help you to see where improvements have been made and where the next target for action may be.

Alterations required by process or product development may remove some of the loss streams altogether and - just as likely - they may create others. Losses may be 'moved' to other parts of the site. Such changes may mean that sections of the map will have to be redrawn to cope with new practices and equipment.

A regular review of the map will enable you to see where progress is being made and where further action needs to be taken. The review process will also enable you to see and record the genuine achievements made.

Action Plan

If you would like to reduce the cost of resource loss to your business:

- Walk around your site and identify sources of potential wastage.
- Get senior management commitment by telling them about the cost of wastage and potential savings available.
- Talk to other employees about their ideas for reducing wastage.
- Talk to relevant departments and people and draw up a list of inputs, outputs and known wastes from your company's processes.
- Measure wastages, even if this provides only rough estimates initially.
- Put as many figures on the map as possible.
- Write down ideas for reducing wastages.
- Calculate the real cost of waste.
- Prioritise areas for action.

APPENDIX

Water

Item	Loss	Action
Leaks	All water coming onto a site is paid for twice: for both supply and disposal. Any that is leaking away is literally “money down the drain”.	Visually inspect taps and hoses for leaks. Mend where appropriate. If possible, switch off all the equipment that uses water and then check the meter. If it is still registering throughput, then there are leaks that are unaccounted for.
Water use in toilets and urinals	A great deal of water, and money, is literally flushed away in washrooms. Uncontrolled urinal cisterns will flush, regardless of whether they need to. Toilet cisterns should only flush seven litres of water, but many older types use more than this.	Fit electronic urinal flush controllers with occupancy sensors, so they flush only if necessary. Fit water dams or volume reducers in cisterns (but not in dual flush cisterns or if there is a history of drain blockage).
Water for hand washing	Only a fraction of the water delivered by a tap actually cleans the hands. Reducing the flow rate and switching off the tap automatically will cut down on wastage.	Fit flow restrictors or percussion taps.
Water hoses	Hoses left running needlessly can lose hundreds of litres of water.	Fit spring-loaded pistol grips to washing hose. These will shut off the supply automatically as soon as the task is completed.
Hot water	Where hot water has to go through long pipe runs to reach the point of use, a lot of cold water will have to be run off first. This can result in considerable water wastage.	Consider heating the water close to the point of use. For small hand basins, wall-mounted electric heaters will be sufficient. For large quantities, such as in kitchens or for process water, use free-standing, gas-fired heaters. In buildings and factories where the layout has changed over the years, it may be that pipe work could be altered to shorten the pipe runs.

Solid Waste

Item	Loss	Action
Steel drums	Non-returnable storage drums are included in the supply price. By re-using them for other purposes, businesses can save the costs of buying items for these other uses.	Identify uses for steel drums. Are there any areas of the production process where they could be used for temporary storage of materials? Any unused drums can be crushed and sold as scrap.
Scrap metal	Scrap metal merchants will often collect scrap free of charge. However, this fails to realise any commercial value that these materials may have.	Optimising the cutting out of components from sheet metal may reduce the amount of scrap created in the first place. Buying the sheet or coils in the right dimensions may help. Separating the different metals will help realise their different market values (e.g. copper and aluminium are worth more than mild steel).
Packaging	Excess packaging results in higher initial costs in producing these materials in the first place and higher disposal costs as well.	Choose reusable returnable bulk packaging where feasible. Even “one-trip” packaging has often been found durable enough to survive several trips, provided it is inspected each time to ensure that it is undamaged. And, when these options are exhausted, there is still the opportunity to recycle many types of packaging.
Paper	Minimising the use of office and computer paper can save money.	Prevent/minimise waste paper by using electronic means of communication, e.g. e-mails and on-screen editing and publishing of reports. Using both sides of each sheet of paper can significantly reduce use as well. Separating out paper from other office waste will allow it to be recycled. Equally, cardboard, newspapers, brochures and magazines are recyclable.

Liquid Waste

Item	Loss	Action
Bulk storage	Storage of waste in drums can be expensive, in terms of both disposal costs and space.	Consider switching from drum to bulk storage. This may lead to lower disposal costs, through using tankers, as well as saving the cost of a continual supply of drums.
Identifying and separating waste	If different wastes become mixed in the same storage containers, it may be difficult to recover individual constituents. In addition, it may lead to some waste incurring a higher than necessary disposal charge.	Segregate waste using clear labelling or drum/tank colour. This will help to avoid cross-contamination. Use waterproof labels to record a description of the contents and the date.
Spills	Spills of waste liquids can constitute breaches of environmental legislation and result in expensive clean-up operations.	Ensure that any tanks or drums are stored in bunded areas where leakage cannot escape and pollute surface or ground waters. This area should provide an emergency storage capacity equal to 110% of the volume of the largest bulk tank or 25% of the total product in the bunded area, whichever is the greater. Regularly check the containers are well sealed and in good condition, with no sign of corrosion or leaks. Arrange for regular removal from site to further diminish risks of leaks and spills.
Solvent cleaners	Cleaning operations often use unnecessarily large quantities of solvent. In some cases, their use can be avoided altogether.	For cleaning general surfaces and floors, detergent and warm water may be just as effective as a solvent-based solution. Regular cleaning will prevent the build-up of stubborn deposits that may need the use of solvents for their removal.
Cleaning and purging	Regular changes of product in batch production may require frequent ingredient changes. If this involves cleaning of vessels, pipelines and other equipment, wastage is likely to occur through cleaning out. The ingredients may not be recoverable if contaminated by cleaning solvents.	Consider the installation of dedicated process tanks, which will cut down the amount of cleaning, and wastage resulting. Schedule production runs to minimise product changes.

Gaseous

Item	Loss	Action
Evaporation of solvents	Volatile chemicals and solvents can be lost from storage tanks through day/night breathing. This can result in losses for some chemicals of several hundred litres per year.	Consider the installation of conservation valves for tanks containing volatile solvents to prevent vapour loss. These allow tanks to pressurise and depressurise without losing vapour.
Substitution of materials	Solvents are used in many industrial processes. The volatile organic compound (VOC) based solvents commonly used have environmental, fire and occupational exposure issues associated with their use. The emissions from these are subject to increasingly stringent regulation.	For some applications, non-VOC-based solvents can be used to replace volatile petroleum-based fluids. Non-volatile solvents, e.g., citrus-based cleaners, have improved over recent years and a review of solvents used on-site may highlight opportunities to eliminate potentially harmful VOCs from the workplace.
Boiler house emissions	Boilers generating steam or hot water for process or building use will generate quantities of soot and other substances such as oxides of nitrogen (NO _x) and oxides of sulphur (SO _x), as well as carbon dioxide (CO ₂). Such emissions will be worse if the combustion process is not efficient.	Ensure that the boiler is serviced regularly for combustion efficiency. Check the suitability of different fuel grades as a way to lower emissions. Consider whether smaller units closer to the point of use would be more efficient than a single, central boiler.
Compressed air losses	It costs money to compress air.	Fitting pistol grip shut-offs to compressed air lines will ensure that they are not left in the “on” position. Lines should also be checked for leaks and repairs made as appropriate.

Energy

Item	Loss	Action
Temperature	Where space or process heating levels are set too high, or cooling (including refrigeration) temperatures are set too low, excess energy has to be used to maintain the required conditions.	Ensure thermostats and controllers are set at appropriate temperature, e.g., central heating thermostats should be set between 16-19°C; air conditioning should not operate at ambient temperatures less than 24°C; and hot water thermostats should be set as low as reasonable (not less than 60°C because of the risk of Legionnaires' Disease).
Check heating and air conditioning	In many buildings, particularly during the spring and autumn, air conditioning and heating systems can be operating at the same time. In this case, they are merely working against each other.	Ensure that the two systems do not operate at the same time.
Using energy only where it is needed	Leaving on lights, heating systems and equipment when no-one is using them.	Ensure that lights are turned off at night and at weekends. Turn down, or turn off, the heating and lighting in storage areas when they are not required. Check whether items of equipment need to be running all the time and switch off if they do not. Consider installing simple time switches or sensors on lighting
Adequate insulation	Inadequate or ageing insulation and draught-proofing can allow energy to escape	Make a visual check of pipe and structural insulation. Old insulation may not comply with latest recommendations. Replace or upgrade where necessary.
Lighting	The energy used in lighting can account for up to 50% of the electricity bill for an office.	Consider replacing lamps with low-energy fittings such as compact fluorescents and slimline fluorescent tubes. Although they have a higher initial cost, they will more than repay the outlay in terms of reduced maintenance, longer life and lower energy bills. Also, ensure that all fluorescent lighting fixtures have reflectors (this alone can dramatically improve lighting levels and reduce the need for extra light fittings).