

SUPERMARKET BUSINESS GUIDE

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1. Introduction

The Target Sustainability Supermarket Business Guide has been developed to help your business improve the efficiency of its resource use and improve profitability.

This Guide focuses on how your organisation can implement an on-going resource efficiency system that will reduce waste and lead to energy efficiency and water efficiency gains. Using these resources more efficiently will also lead to financial benefits, bought about directly from reduced landfill costs, reduced energy bills and in some cases reduced water costs. Consumers also look favourably on businesses which are seen to be doing their part for the environment.

This Guide will be more effective for your organisation if read in conjunction with Target Sustainability The Path to Sustainability Business Guide which outlines the basics of how to go about implementing the kinds of changes necessary to make significant and lasting improvements within an organisation. The Target Waste Business Guide, Target Energy Business Guide and Target Water Business Guide are also useful to read in conjunction with this Guide. These can be downloaded from www.target sustainability.co.nz.

2. How to use this Guide

Each section of this Guide (Waste, Energy and Water) is separated according to the main areas of a typical supermarket, i.e. the different departments (deli, bakery, butchery, produce etc.), the shop floor, store room, administrative offices and staff facilities. This means that you can pick and choose areas that are relevant to your supermarket. It also ensures that the Guide can be used by a wide variety of supermarkets, big or small.

3. Waste, Energy and Water – An Overview

Solid material resources, energy and clean water are the three main inputs into a business. Unfortunately, these resources are exhaustible. If we do not manage them wisely, they may become less available and more costly to obtain in the future.

In New Zealand, energy costs are increasing rapidly and for a supermarket that uses a significant amount of electricity in its day-to-day running, these increasing costs are limiting your supermarket's profitability. Add to the energy bill the costs associated with your supermarket's waste and water and you are looking at a substantial amount of money, some of which could be saved.

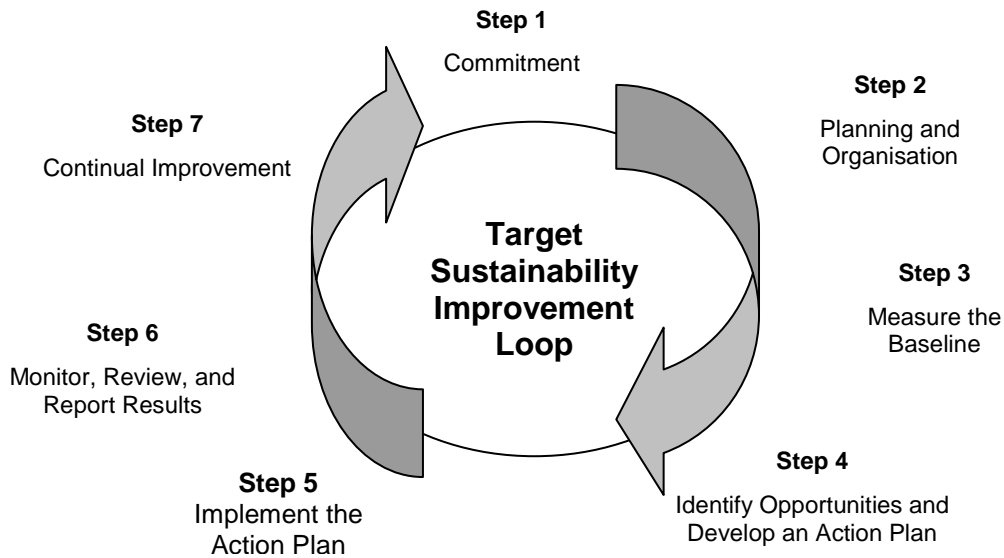
Becoming efficient is as much about saving you and your business money as it is about reducing environmental impact. The benefits of energy efficiency and conservation practices are two-fold; they provide you with an excellent opportunity to save money and increase your business's profitability, while at the same time minimising the effect your business has on the wider environment.

3.1. Key Steps in Undertaking a Resource Efficiency Programme

The key steps in undertaking a resource efficiency programme are shown in the Target Sustainability Improvement Loop, in Figure 1. The Improvement Loop represents the journey that is ahead of you and your business. Many new programmes face obstacles, remember this when carrying out your resource efficiency programme. Persevere and be patient and try not to get discouraged. In general pick the low hanging fruit first. That is, implement opportunities that will offer the largest savings and are simple to undertake before tackling other opportunities.

The main focus of this Target Sustainability Supermarket Business Guide is on Steps 3 and 4 of the Improvement Loop. Further explanation of these steps and on the other key steps can be obtained from the Target Sustainability The Path to Sustainability Business Guide. Worksheet 1 in The Path to Sustainability Business Guide will help you to keep on track with these key steps and hence your resource efficiency programme.

Figure 1: Target Sustainability Improvement Loop



3.2. The Waste Hierarchy

The waste hierarchy (Figure 2) shows that when given the choice, the best option is to prevent the amount of waste that is generated in the first place. While recycling is an important component of the overall waste management hierarchy, it is preferable if waste is prevented before it has to be recycled. Preventing waste reduces the demand on resources and reduces the costs associated with waste (whether it is the energy cost to produce it and recycle it, or the cost to send it to landfill). Reuse is also a more preferable option to recycling, as it extends the life of the resource, without having to add additional energy to make it useful again, i.e. melting plastic down to re-create another product.

After you have determined the main waste streams in your business, it is important to refer to the Waste Hierarchy (Figure 2) when exploring options on where, and in what areas within your supermarket, you can improve. The flow diagram featured in Figure 3, shows the steps of the waste hierarchy using packaging as an example of waste in a supermarket.

Figure 2: The Waste Hierarchy

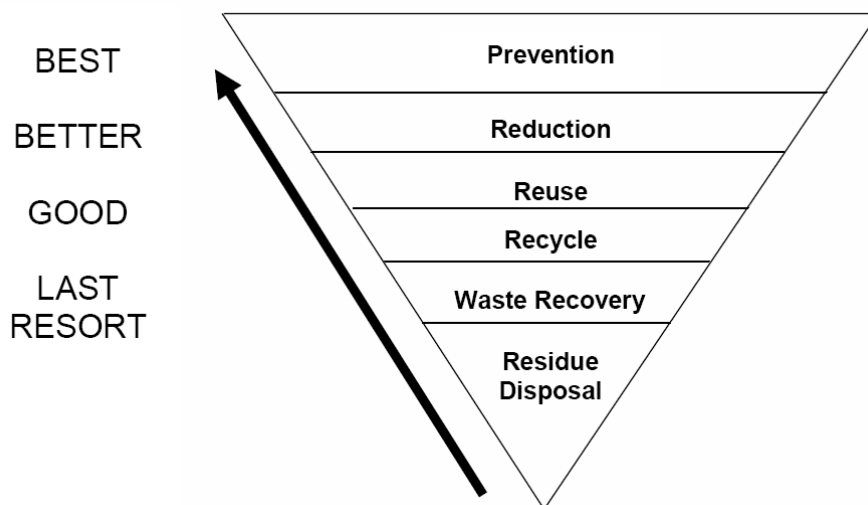
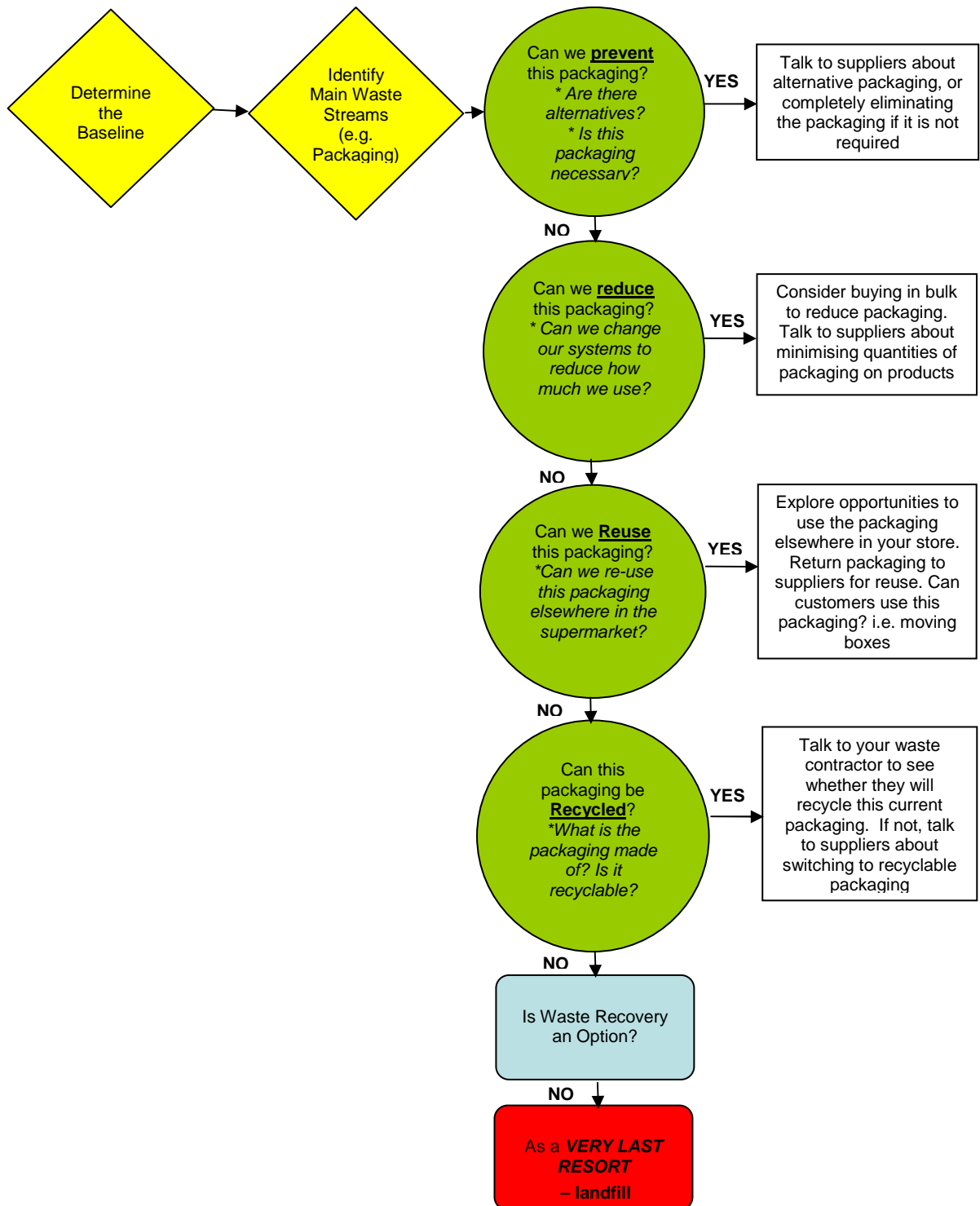


Figure 3: Resource Efficiency Process Diagram (Packaging Example)



4. Waste

Diversion systems for the major waste streams (e.g. cardboard cartons, meat by-products from butcheries, and vegetable trimmings and wastage from fresh produce departments) are generally well-established throughout the industry. Other waste materials, such as plastic film pallet wrap and office paper, are less commonly separated for recycling, so there is opportunity for improved waste recycling in many stores.

Remember, reducing your waste is as much about looking at what you receive into your supermarket, as what your supermarket throws away

A good first step in reducing waste in supermarkets is to conduct a review of existing waste management practices. This could involve talking to all department managers about the wastes they generate and how they are managed. Talking with shop floor staff is useful to find any problems with the existing systems and to help generate ideas for improving the systems. The next step is to undertake a waste audit, providing you with an indication of the types and volumes of waste produced from each area of your supermarket. Remember the importance of making baseline measurements before implementing any waste reduction initiatives so that improvements can be quantified.

4.1. Measure Baseline Waste

A waste audit is as simple as sorting through your rubbish and organising the different types of rubbish into categories to determine what you are actually throwing away. It can be an enlightening experience, and often people are genuinely surprised about what their peers and colleagues throw away. Waste audits are generally carried out on one week's worth of waste, however, for most supermarkets, this would constitute a considerable amount of waste. Therefore it is probably best to do a waste audit for waste generated over two or three representative days of supermarket operation to obtain a fair representation of your supermarket's waste stream.

The specifics of carrying out a waste audit are provided in Section 5.0 of the Target Waste Business Guide. The waste audit will provide you with a snapshot baseline of waste that is currently sent to landfill or is being recycled from your supermarket. This information will help you prioritise what areas and activities within your store require attention to minimise waste.

The remainder of this waste section outlines typical wastes and opportunities to reduce waste in specific areas of your supermarket. You will notice throughout this Guide references to the Christchurch Recycling Directory (www.target sustainability.co.nz/RecyclingDirectory). This is a simple and easy-to-use online directory that allows you to search for local service providers who can recycle your different types of waste.

4.2. Waste in the Produce Department

Produce departments receive produce in bulk, either palletised, in sacks or boxes or in crates. Some types of vegetables, such as lettuce, are trimmed at the store to remove outer leaves, generating substantial volumes of organic waste.

Example of packaging waste at a supermarket

4.2.1. Typical Waste

- Pallets
- Waxed cardboard cartons
- Wooden and plastic crates
- Moulded pulp trays
- Plastic fruit trays
- Plastic film pallet wrap
- Labelling waste
- Hygienic supplies (gloves, hairnets, paper towels, rubber gloves)
- Unsold, damaged, and spoilt product
- Vegetable trimmings



4.2.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential produce packaging

Reduce

- Talk with your suppliers about changing the type of produce packaging to increase its ability to be reused or recycled
- Ensure you are purchasing your stock in bulk to minimise the number of glass jars and steel cans that you use
- Carefully monitor and control ordering to reduce scope for produce spoilage
- Consider ordering pre-trimmed vegetables from suppliers to reduce staff time spent trimming produce and reduce the amount of waste produced. Some vegetables, however, may be prone to transit damage if pre-trimmed
- Consider reducing the price of produce that is nearing the end of its shelf life
- Minimise the number of produce items packaged in non-recyclable trays
- Discourage wrapping produce in plastic that is unnecessary i.e. bananas
- Provide your customers with reusable or recyclable bags for their produce

Reuse

- Return pallets, crates, and cartons to the supplier wherever possible
- Ensure staff know which packaging is returnable
- Put in place procedures to reduce damage to returnable packaging
- Negotiate with suppliers to provide returnable packaging

Recycle

- Cardboard and plastic pallet wrap are widely accepted for recycling. Find a local recycler who will collect these materials, and install recycling collection containers
- Ensure the cardboard and plastic film recycling systems work efficiently, with easy access to recycling collection containers, good signage, and regular staff training
- Separate all organic produce waste and set up an organic collection system

Divert your organic waste from the landfill through an organic waste collector

4.3. Waste in the Bakery

The amount and types of waste produced by in-store bakeries varies according to whether or not the bakery produces dough from raw ingredients or uses frozen dough. The amount of product wastage can also vary between stores, as some stores prefer to keep shelves fully stocked during all trading hours, whereas other stores reduce product prices at the end of the day to sell off unsold stock.

4.3.1. Typical Waste

- Pallets and pallet wrap
- Multi-wall paper flour sacks
- Steel cans
- Glass jars
- Plastic bags
- Plastic pails
- Un-used dough
- Dough off-cuts and scraps
- Labelling waste from the packaging of goods
- Hygienic supplies (gloves, hairnets, paper towels, rubber gloves)
- Unsold product

4.3.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

Talk with your suppliers about the possibility of eliminating non-essential packaging on products used in the bakery e.g. is there excess plastic on any of the delivered products that is not necessary?

Reduce

- Talk with your suppliers about reducing the quantity or changing the type of packaging on products used in the bakery to increase its ability to be reused or recycled. For example, could the packaging be changed from plastic to paper or cardboard packaging? Or could some products be delivered in reusable sturdy plastic containers?
- Carefully monitor and control production to reduce wastage
- Consider reducing the price of unsold stock at the end of the day
- Unsold product could be given to a local charity, or possibly included in the fruit and vegetable waste collected by an organic waste collector
- Consider selling bakery products to your customer wrapped in paper rather than plastic to minimise the amount of non-recyclable waste that your customers take away from your store

Reuse

- Return pallets to the supplier wherever possible
- Ensure staff know which packaging is returnable
- Reuse plastic pails for storage or find a market for empty plastic pails through a local waste exchange (e.g. www.terrano.org.nz) or on an online auction site

Recycle

- Cardboard and plastic pallet wrap are widely accepted for recycling. Find a local recycler who will collect these materials, and install recycling collection containers
- Ensure the cardboard and plastic film recycling systems work efficiently, with easy access to recycling collection containers, good signage, and regular staff training
- A co-mingled recycling collection container could be provided for glass jars and steel cans
- Check if the paper recycler will accept multi-wall paper flour sacks

4.4. Waste in the Deli

Delis handle small quantities of a wide range of products, and deli operations often incorporate preparation of various types of ready-to-eat food. Small quantities of a wide range of waste materials are generated.

4.4.1. Typical Waste

- Cardboard cartons
- Steel cans
- Glass jars
- Plastic pails
- Plastic film
- Meat and vegetable trimmings
- Labelling waste from the packaging of goods
- Hygienic supplies (gloves, hairnets, paper towels, rubber gloves)
- Unsold product such as cut meats and salads

4.4.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential packaging that arrives with your deli supplies

Reduce

- Talk with your suppliers about reducing the quantity or changing the type of packaging on products used in the deli to increase its ability to be reused or recycled
- Ensure you are purchasing your stock in bulk to minimise the number of glass jars and steel cans that you use
- Consider selling deli meats to your customer wrapped in paper rather than plastic to minimise the amount of non-recyclable waste that your customers take away from your store
- Explore the option of providing your customers with recyclable/reusable containers for their deli purchases i.e. for coleslaw and salads

Reuse

- Reuse plastic pails for storage or find a market for empty plastic pails through a local waste exchange (e.g. www.terranoval.org.nz/) or on an online auction site
- Encourage suppliers to use returnable packaging
- Ensure staff know which packaging is returnable

Recycle

- A co-mingled recycling collection container could be provided for glass jars and steel cans
- Ensure the cardboard and plastic film recycling systems work efficiently, with easy access to recycling collection containers, good signage, and regular staff training
- Dispose of meat scraps into the butchery meat by-product collection and the food scraps into the organic waste collection

Use signage and regular staff training to ensure your recycling system works successfully

4.5. Waste in the Butchery/Seafood Department

The types and amount of waste generated by butcheries varies considerably, depending on the proportion of the meat sales that are from carcass meat and the proportion from boxed meat. The use of boxed meat and carcass meat varies between stores and can also vary within each store over time, meaning the waste streams may not be constant. Disposal of meat by-products for rendering through the local “bone man” is an established, widespread practice in the butchery trade.

Fresh seafood is usually delivered to supermarkets in a processed state in expanded polystyrene boxes (polyboxes) packed with ice that provide thermal insulation for the chilled product. A small number of stores process their own fish.

4.5.1. Typical Waste

- Meat by-products such as fat and bone
- Cardboard cartons
- Contaminated plastic carton liners
- Plastic pallet wrap
- Plastic strapping
- Labelling waste from packaging of meat and seafood
- Hygienic supplies (gloves, hairnets, paper towels, rubber gloves)
- Unsold meat and fish
- Seafood polyboxes
- Ice pouches

4.5.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential packaging that arrives with your butchery and seafood supplies

Reduce

- Talk with your meat and seafood suppliers about reducing the quantity or changing the type of packaging on products to increase its ability to be reused or recycled
- Reduce the price on meat and seafood as it approaches expiry
- Explore the prospect of selling meat on recyclable trays thereby reducing the amount of waste you pass on to your customers

Reuse

- Request meat and seafood suppliers to use returnable packaging
- Polyboxes can be given or sold to customers, or supplied to nurseries for seed propagation
- Return pallets to the supplier wherever possible
- Ensure staff know which packaging is returnable

Give your polyboxes to nurseries for growing seeds

Recycle

- Ensure the cardboard and plastic film recycling systems work efficiently, with easy access to recycling collection containers, good signage, and regular staff training
- Ask whether the “bone man” will accept un-packaged waste seafood with the meat by-products
- If there is not a local “bone man” who collects meat by-products for rendering, investigate local pet food manufacturers, or an organic waste collector

4.6. Waste in the Inward Goods/Grocery/Frozen Food/Liquor /Dairy Departments

All supermarkets have an inward goods department that receive incoming products and either warehouses the product, or stocks it immediately to the store’s shelves. Many types of products (such as bread) are delivered directly by the suppliers’ representatives, who are responsible for keeping shelves stocked and removing product that has reached its expiry date. These representatives are often responsible for removing unsold product and damaged goods from the site and disposing of secondary packaging at the store.

For products not handled by the suppliers’ representatives, store-staff transfer the product from the warehouse area, remove it from the secondary packaging, and stock the shelves. Each staff member stocking shelves is responsible for disposing of packaging waste materials generated by the process.

4.6.1. Typical Waste

- Pallets
- Plastic film pallet wrap
- Plastic strapping
- Cardboard cartons
- Plastic shrink wrap
- Unsold stock including newspapers and magazines
- Damaged goods

4.6.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential packaging that arrives with products

Reduce

- Talk with your suppliers about reducing the quantity or changing the type of packaging on products to increase its ability to be reused or recycled
- Avoid over ordering which can lead to unsold stock and associated packaging
- Sell damaged goods and goods nearing their expiry date at reduced prices
- Donate unsold and damaged goods to charities such as food banks

Reuse

- Return pallets to suppliers wherever possible
- Encourage all suppliers to use returnable pallets
- Ensure staff know which packaging is returnable
- Train your staff on how to open packaging correctly to permit its reuse
- Give away cardboard cartons to the public

Recycle

- Ensure the cardboard and plastic film recycling systems work efficiently, with easy access to recycling collection containers, good signage, and regular staff training
- Dispose of newspapers and magazines with the cardboard recycling collection, or establish a separate paper recycling collection in conjunction with the office recycling system
- Arrange with suppliers to return unsold magazines and newspapers for recycling
- Find an appropriate market for non-returnable and damaged pallets through the online recycling directory

4.7. Waste in the Floral Department

4.7.1. Typical Waste

- Cardboard boxes that flowers are delivered in
- Flower stems and flower off cuts
- Unsold and expired stock
- Decorative items, ribbons, bows and cellophane
- Twist ties and rubber bands
- Price labelling and plastic backing of price tags

4.7.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential packaging that arrives with products

Reduce

- Talk with your suppliers about reducing the quantity or changing the type of packaging on products to increase its ability to be reused or recycled. For example, could some products be delivered in reusable sturdy plastic containers?
- Reduce prices on stock near expiry date or give away expiring/unsold stock (e.g. give to retirement homes, hospice etc.)
- Enquire if there are recyclable alternatives to cellophane to minimise the amount of non-recyclable waste that your customers take away from your store

Reuse

- Ensure staff know which packaging is returnable
- Train your staff on how to open packaging correctly to permit its reuse
- Request that the suppliers collect the cardboard boxes for reuse
- Give away cardboard cartons to the public

Recycle

- Dispose of organic off cuts with the organic waste collection from other departments

4.8. Waste in the Administrative Offices

4.8.1. Typical Waste

- Office paper
- Newspapers, magazines, junk mail, envelopes
- Paper ream wrap
- Packaging such as cardboard cartons and plastic film
- Toner and printer cartridges
- Electronic waste (computers, printers, photocopiers, mobile phones, batteries)
- Food waste
- Tissue and napkins
- Drink bottles and cans
- Disposable coffee cups
- Till receipts
- Redundant furniture
- Excess business cards
- Excess promotional items/brochures

4.8.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential packaging that arrives with products
- Use your computer to send paperless faxes
- Do not use cover sheets for your faxes
- If possible ask whether your suppliers could send electronic invoices
- Provide reusable cups and cutlery rather than disposable kitchen materials

Reduce

- Encourage emailing and discourage printing of emails
- Set photocopiers and printers to print double-sided and reduce copies to fit two pages into one where possible
- Use draft mode when printing a draft document to save on toner
- Purchase in bulk to reduce packaging
- Buy refillable toner cartridges
- If you must use window envelopes, then ask your supplier for envelopes that use glassine, a wood fibre product, as these can be recycled

Reuse

- Place a reuse tray beside the printer/photocopier and on desks to collect and encourage reuse of paper that has been used on one side only (lids from paper containers make good trays)
- Purchase reuse address labels for envelopes
- Use two-way envelopes
- Reuse paper folders

Recycle

- See the Target Waste Business Guide about setting up a paper, cardboard, co-mingled material,, food waste, printer cartridge and fluorescent light recycling system in the office
- Return equipment to suppliers for recycling

Several methods of reducing solid waste in the office are outlined in the Target Waste Business Guide on the Target Sustainability website www.targetustainability.co.nz

4.9. Waste in the Staff Facilities

4.9.1. Typical Waste

- Food scraps
- Food packaging
- Plastic and glass drink bottles and metal cans
- Disposable cutlery and cups
- Wooden stirrers
- Paper towels and napkins
- Newspapers and magazines
- Empty cleaning containers
- Toilet paper and paper towel packaging

Ask staff for their input on how they think waste could be minimised. This can lift staff morale and pride in their work by including them in decision making

4.9.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential packaging that arrives with products
- Provide reusable cups and cutlery rather than disposable kitchen materials, e.g. supply teaspoons instead of wooden stirrers

Reduce

- Suggest ideas to your staff about minimising waste in their lunches, e.g. buy a large container of yogurt in bulk, and bring only what you need in a small reusable container. Suggest to staff to buy products with packaging that can be recycled
- Purchase toilet paper, hand soap and cleaning liquids in bulk to reduce packaging
- If you use paper towels purchase types that have a recycled content and are unbleached
- Consider using air hand driers and/or cloth towel dispensers in bathrooms (ensure you meet your organisation's Health and Safety requirements)

Reuse

- Provide reusable ceramic mugs or recyclable cups rather than disposable coffee cups

Recycle

- Dispose of organic food waste with the organic waste collection from other departments
- Provide a co-mingled recycling system for recyclable plastic and glass bottles and metal cans and a recycling system for paper

Several methods of reducing solid waste in the office staff facilities are outlined in the Target Waste Business Guide on the Target Sustainability website www.targetustainability.co.nz

4.10. Waste in the Shop Floor/Check-Out/Lobby

4.10.1. Typical Waste

- Packaging – plastics, paper and cardboard
- Display shelving
- Sale signage
- Price labels
- Plastic checkout bags
- EFTPOS paper
- Waste generated at check-out counters
- Drink bottles and cans
- Disposable coffee cups
- Food packaging
- Tissues
- Paper, newspapers, and magazines
- Food scraps

4.10.2. Opportunities to Prevent, Reduce, Reuse and Recycle

Prevent

- Talk with your suppliers about the possibility of eliminating non-essential packaging that arrives with products
- Provide reusable cups rather than disposable cups
- Ask whether your customer requires a bag when they purchase only a small number of items

Reduce

- Have a minimum number of items per bag policy to reduce the number of bags used
- Ensure that any supplier representative doing an in store taste test promotion minimises the waste they produce e.g. use recyclable tasting containers which are rinsed before being recycled

Reuse

- Encourage your customers to bring reusable bags. Provide them for sale near the checkout
- Consider offering your customer a small incentive for bringing a reusable bag
- Offer customers cardboard boxes for packing their purchased products
- Reuse display shelving and sale signage where possible

Recycle

- Provide a collection container for the return of supermarket plastic bags, if these can be included with the plastic film recycling
- Provide for the public in store co-mingled recycling collection containers for glass and plastic bottles and steel cans in key locations next to rubbish bins. Provide separate collection containers for organic waste e.g. for produce trimmings made by customers
- Print your promotional material on recyclable paper

Put up signs at prominent points around your store to inform your customers about your Resource Efficiency Programme

4.11. Further Waste Reduction Suggestions

Further information on waste and opportunities to reduce waste streams can be obtained from the Target Waste Business Guide on the Target Sustainability website www.target sustainability.co.nz. The Target Waste Business Guide also provides a number of useful worksheets and information on plastic identification codes.

5. Energy

Due to the nature of the operation, which is in some cases around the clock for 365 days per year, energy consumption at supermarkets can be costly. There are however a large number of ways in which improvements can be made, provided adequate time is spent identifying and implementing these opportunities.

With the cost of energy increasing, as well as the growing public awareness of the associated environmental issues, management of energy consumption is becoming an increasingly important area. The benefits of energy efficiency for supermarkets extend beyond a reduction in energy bills, and can act as an effective marketing tool also.

Example of Supermarket Space



5.1. Measure the Baseline Energy Use

Before energy use can be managed and before introducing any new energy efficiency initiatives, energy use should first be measured by undertaking an energy audit. The energy audit will provide you with the baseline of current energy use in your supermarket (Step 3 in Figure 1). It is important to measure the baseline as you can compare future energy use against it and so help you quantify your progress and associated savings.

More information on improving energy efficiency is provided in the Target Energy Business Guide on the Target Sustainability website www.target sustainability.co.nz

5.1.1. Evaluate energy bills

Overall energy use can be evaluated by reviewing the invoices for electricity and other energy sources. Use a table similar to Table 1 to help to identify and document this information. Useful conversion factors are shown in Table 2.

Table 1: Summary of Energy Bills

Energy Source	Start Date	Finish Date	Quantity (kWh, GJ etc)	Cost (\$)
Electricity				
Gas				
Transport fuel				
Other (Specify)				

Table 1 needs to be compared to the same time last year to review whether your monthly consumption has increased or decreased. If consumption has increased since the same time last year, then look for reasons why this has occurred.

Table 2: Useful Conversion Factors

Fuel Type	Conversion Factor¹
LPG	1 litre ² = 7.4 kWh
	1 kg = 13.9 kWh
Diesel	1 litre = 10.6 kWh

5.1.2. Conduct a basic energy 'split'

Compare the billed amount with the amount you calculate or predict that you are using. This will identify any areas of concern and can be done by conducting a basic 'energy split' of the site.

Using tables similar to the examples in Tables 3 and 4, record all items in the building that consume energy (all forms). Doing this on a room by room basis often helps keep things clear. Also record the rating of each item in watts (W) and how many hours per day the item is used for. This then allows total energy consumption to be calculated. For items where wattage ratings cannot be found, assumptions may have to be made. Remember that 1 kilowatt (kW) is equal to 1,000 watts (W). 1 kW is also equivalent to the rating of a 1 bar electric heater, or 10 light bulbs at 100 watts each.

For items such as refrigeration units it can be difficult to calculate total consumption. You can estimate consumption however by observing the proportion of time the compressor operates by listening to when it turns on and off, and multiply this by the compressor rating shown on the outside unit. For example, if you observe the outside unit operates for 5 minutes out of the 10 minutes for which you were listening on a typical day, then it is fair to assume that the refrigeration unit will operate for 50 % of the time it is turned on.

To calculate the running cost of the equipment in Table 3, simply multiply the power use (kWh/yr) by the price you pay for electricity, which can be found on your electricity bill. For example, for the incandescent lights in Table 3, if the rate for electricity is say \$0.18 per kWh, then the running cost for the year will be 14,600 kWh/year x \$0.18/kWh = \$2,628 per year.

¹ Gross calorific value (GCV)

² Liquid volume

Table 3: Example Electricity Split

Equipment	Number of Items	Power Rating kW	Hours/day of Operation	Days/yr of Operation	Power Use (kWh/yr) = rating x hrs x days
Incandescent Lights	50	0.1	8	365	14,600 kWh/yr
Compact fluorescent lights	45	0.023	24	240	5,962 kWh/yr
Tubular fluorescent lights	280	0.058 ³	16	365	94,842 kWh/yr
Halogen lights	30	0.05	3	240	1,080 kWh/yr
Direct electric heaters	10	2.0	6	150	18,000 kWh/yr
Heat pumps	4	1.0 (input)	3 ⁴	300	3,600 kWh/yr
Computer (flat screen)	12	0.085	9	240	2,203 kWh/yr
Standard Fridges	10	0.3 (input)	12 ⁴	365	13,140 kWh/yr
Open cover chest freezer	12	1.5	12 ⁴	365	78,840 kWh/yr
Extract hood in kitchen	2	0.3	6	365	1,314 kWh/yr
Hot water cylinder	2	3.0	6	365	13,140 kWh/yr
Refrigeration compressor	12	8	8 ⁵	150	115,200 kWh/yr
				Total:	289,920 kWh/yr

³ Older tubular fluorescents also have ballasts (an electrical device for starting and regulating fluorescent and discharge lamps) which consume approximately 10-20 % extra in addition to the lamp rating (standard wound ballasts use approximately 20 % and low loss wound ballasts use approximately 10 %. Electronic ballasts use power which is typically offset by the increased efficiency of the lamp; so a 58W fluorescent tube with electronic ballast will use approximately 58W). The example for tubular fluorescents in the table assumes electronic ballasts.

⁴ This time shown in the table is the actual time that the compressor for the item is operating. For example, if the heat pump is turned on for 6 hours per day, and the compressor operates for approximately half of this time, then use 3 hours for the calculation.

⁵ For a refrigeration compressor this is very rough only. Ideally the consumption should be measured using an energy meter, or by more involved calculation methods.

Table 4: Example LPG/Diesel Split

Equipment ⁶	Number of Items	Power Rating (kW)	Efficiency (%)	Hours/day of Operation	Days/yr of Operation	Energy Use ⁷ (kWh/yr) = rating x hrs x days
	A	B	C	D	E	F
Diesel boiler	1	115	82%	2	365	102,378 kWh/yr
LPG radiant heaters	4	10	80%	6	150	45,000 kWh/yr
					Total:	147,378 kWh/yr

While the above section offers a basic guide to measuring and managing energy consumption in supermarkets, the need to involve professionals for more complex items is sometimes necessary. This is also recommended if staff do not have time to spend on the above. A list of EMANZ accredited energy consultants in New Zealand can be found on the EMANZ website, www.ema.org.nz.




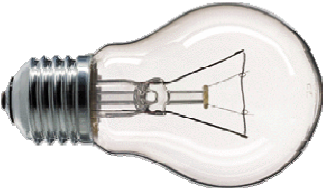


5.2. Lighting Guide

A lighting calculator is provided at www.target sustainability.co.nz that you can download to help you assess different lighting options. Table 5 lists some of the more common types of lighting found in supermarkets.

⁶ See Table 6 for examples.

⁷ To calculate total Energy Use (column F), multiply column A, B, D and E and then divide through by the efficiency (column C).

Table 5: Lighting Guide

Image	Lighting Type	Notes
	Tubular Fluorescent (T8)	T8 refers to diameter (8/8 inches). Typically between 36-58 watts and approximately 75-90 lumens/watt ⁸
	Tubular Fluorescent (T5)	T5 refers to diameter (5/8 inches). Typically between 14-35 watts and approximately 80-95 lumens/watt ⁶
	Compact Fluorescent	Typically between 8-32 watts and approximately 65 lumens/watt ⁶
	Incandescent	Typically between 40-150 watts and approximately 15 lumens/watt ⁶
	Halogen (Incandescent)	Typically around 50 watts and approximately 15 lumens/watt ⁶
	HID (High Intensity Discharge) – Metal Halide	Typically between 70-400 watts and approximately 75 lumens/watt ⁶

⁸ Lumens are a measure of light output, therefore the higher the light output per watt of electrical input (lumens per watt – lm/W), the more efficient.

5.3. HVAC (Heating, Ventilation and Air-Conditioning) Guide

Table 6 lists some of the more common types of HVAC found in supermarkets.

Table 6: HVAC Guide



Image	HVAC Type	Notes
	Direct electric	Low efficiency (1 unit of energy in = 1 unit of heat out)
 <p style="text-align: center;">Indoor unit Outdoor unit</p>	Heat pump	High efficiency (1 unit of energy in = approximately 3 units of heat out)
	Gas fired heaters	Many types available. Potential issues with fumes if not flued. (1 unit of energy in = 0.8 units of heat out)
	AHU (Air Handling Unit)	Larger ducted systems. Can be coupled to either boiler with heating hot water, direct electric, heat pump, or gas fired heaters. Chillers typically used for cooling
	Boiler	Image shown is a gas fired boiler which can supply heated water to air handling units or domestic hot water. Possible fuels include electricity, gas, LPG, coal, diesel, wood pellets. Efficiency will vary with fuel type

Image	HVAC Type	Notes
	Chiller	<p>Image shown is an air cooled chiller which supplies chilled water to air handling units. Can also be water cooled. Powered by electricity (1 unit of elec. in = 3 to 8 units of cooling out)</p>

5.4. Refrigeration Guide

A calculator is provided at www.target sustainability.co.nz that you can download to help you assess the impact of door opening on refrigeration energy consumption. Table 7 lists some of the more common types of refrigeration units found in supermarkets.

Table 7: Refrigeration Guide





Image	Refrigeration Type	Notes
	Remote cabinet	<p>Compressor and condenser are located remotely from the unit. One compressor can serve several cabinets, improving overall efficiency. Image shown is a multi-deck cabinet</p>
	Self-sufficient cabinet	<p>Compressor and condenser are located as part of the unit. The image shown has the compressor located at the bottom of the unit</p>
	Freezer	<p>Compressor can be located either with freezer (self-sufficient) or remotely. Image shown is an open top chest freezer</p>

Image	Refrigeration Type	Notes
	Walk-in cool room	Compressor and condenser are typically located outside the building. Opportunity for heat recovery from condenser coils

5.5. Energy Use in the Shop Floor/Lobby

In terms of floor area the shop floor and lobby is likely to take up the majority of a typical supermarket. It is also the section of the business open to public scrutiny, and therefore represents an opportunity for effective marketing. Customer comfort in terms of both lighting and heating/cooling are important factors for a successful supermarket. For this reason improving energy efficiency for lighting and heating cannot be done at the expense of product marketing and customer appeal.

5.5.1. Typical Energy Use

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC), including:
 - Roof or ceiling mounted air handling units (AHU) with ducted systems. These typically use boilers and heating hot water, heat pumps or direct electric elements to provide heating, and chillers to provide cooling
 - Heat pumps. These can be used for both heating and cooling
 - Direct electric heaters
 - Gas fired heaters
 - Extract fans
- Refrigeration
- Other equipment including audio equipment and computers

Due to its size, even small improvements to the shop floor and lobby area can have large savings. It is often found that lighting and equipment is left on in these spaces unnecessarily both after-hours and over-night.

The shop floor and lobby area can sometimes be found to be over-lit, consuming more energy than required. A lux meter as shown in the following picture can be used to measure light levels in units of lux. AS/NZS 1680.1:2006 states that for areas requiring ordinary or moderately easy tasks, such as shop floors and lobby's, a lighting level of 240 lux is recommended.

A Lux Meter



5.5.2. Opportunities to Prevent and Reduce Energy Use

Prevent

- If any new building works or renovations are planned, the design phase is the ideal time to incorporate energy efficiency into the building. Engage the services of a professional energy consultant for technical advice

Reduce

- Ensure the area is not over-lit. As previously discussed the recommended illuminance is 240 lux for areas such as supermarket floors
- Turn off lights during the daytime in areas which are adequately lit by natural light. This can be achieved automatically by using lux sensors which dim the lights, or turn off banks of lights, according to the amount of natural light available. Fluorescent lights with electronic ballasts allow this form of control – talk to your electrician about this opportunity
- Use efficient lighting methods such as fluorescent lighting. Avoid use of incandescent or halogen lighting
- Clean lamp diffusers and reflectors regularly to maximise light output. This should be part of your cleaning and maintenance programme
- Replace fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Use a lux sensor to operate outside lighting
- Make sure that lighting is not being used unnecessarily outside normal business hours. Cleaning staff may not need all lighting on while they are working
- Ensure HVAC is turned off after hours by using time clocks
- Ensure that the cooling (air conditioning and/or fans) and heating (heaters, heat pumps) do not 'fight' each other by operating at the same time
- For larger sites it may be feasible to invest in a Building Management System (BMS). This is a PC based system which controls lighting, HVAC and any other equipment from one central point
- If a BMS is not used, ensure that the control of the air conditioning or heating system is assigned to one person and that staff agree on the temperature required
- If large air handling units (AHUs) are used, ensure the outside air flow being brought into the building is at minimum flow, unless the AHU has an economiser and is in economiser mode. An economiser allows a certain amount of return air from the space to pass through the AHU, reducing energy consumption. If large systems such as this are used it is often worthwhile to employ a professional energy consultant for advice
- If LPG or diesel boilers are used, have a flue gas analysis performed to ensure your boiler is operating at optimum efficiency
- Replace any direct electric heaters with heat pumps. Heat pumps are typically around three times more efficient than direct heating
- Use auto-closing doors on the main lobby entrance to avoid excessive air infiltration. Ideally two sets of doors (air-lock) and a wind buffing wall on the outside of the entrance would be used to further minimise infiltration
- Investigate double glazing for windows and doors, and use these for any new areas or renovations. This also helps to minimise noise from the outside
- Reduce the Control Period Demand (CPD) and Anytime Maximum Demand (AMD) charges by load shedding. While this opportunity does not directly reduce energy consumption, it will reduce cost. This will only apply to supermarkets that are charged by their electricity retailer as a Major Customer

*Install
fluorescent
lighting instead
of incandescent
or halogen
lighting*

5.6. Energy Use in the Produce, Dairy and Frozen Food Departments

5.6.1. Typical Energy Use

While each supermarket will be different, typical energy consuming equipment found in the produce, dairy and frozen food departments can include but is not limited to:

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC)
- Refrigeration, including:
 - Cold rooms
 - Freezers
 - Open cover chilled or frozen food cabinets. Two main types:
 - Remote cabinets – these use a remote chiller plant located a distance from the cabinets which often serves multiple cabinets
 - Self-contained cabinets – these have individual chiller units built into each cabinet
- Domestic hot water (DHW)

Depending on the size of the supermarket, the energy consumption of the refrigeration equipment can represent between 35-50 % of the total energy consumption of the store (IPCC, 2005). In 2002 the total energy consumed by refrigerated cabinets in New Zealand was estimated at 780 GWh per annum (EECA, 2003). Refrigeration equipment therefore presents itself as a prime candidate for energy efficiency. There are a number of possibilities for reducing refrigeration energy consumption, as described below. Note that for refrigeration, the *condenser* is the unit outside the cooled space which rejects heat to the environment (or for use elsewhere), and the *evaporator* is the unit inside the cooled space which absorbs heat and provides cooling.

Typical open cover remote chiller cabinets used for holding frozen food, with self-contained drinks fridge adjacent (EECA, 2003)



Lighting and HVAC in the produce, dairy and frozen food departments can also be large consumers of energy if uncontrolled or poorly managed.

5.6.2. Opportunities to Prevent, Reduce and Reuse Energy

Prevent

- Avoid the use of stand-alone or self-contained chillers to boost store capacity. Instead use centralised plant whenever possible (remote cabinets) as these will have a higher overall efficiency

Reduce

- Ensure display lights are turned off after hours, including those incorporated into cabinets
- Ensure fridge and freezer doors are closed whenever possible
- Inspect fridges and freezers for damaged door seals and replace these with new ones
- If possible install clear plastic doors over open-top freezers and cabinets. This is a decision which will need to involve the marketing team, as these covers are typically not used to encourage customers to purchase items
- Install removable polystyrene freezer covers at night for open-top freezers and cabinets
- Do not set chilled cabinet/freezer temperatures lower than they need to be. Even one °C can make a large difference. If the supermarket is heated during winter, colder cabinet/freezer temperatures will also increase heating consumption
- Ensure fridges and freezers have adequate ventilation around them to dissipate heat generated by the compressor
- Ensure fan inlets and outlets are not obstructed or blocked in any way
- Do not stack product directly in front of evaporators
- Reduce the condensing temperature at the compressor to about 25°C - check with your refrigeration maintenance company first. Significant electricity savings will result from operation at a lower condensing temperature
- Check refrigerant sight glass for bubbles indicating gas leakage. An undercharged system may not maintain a consistent temperature and will consume more energy when operating
- Check evaporator defrost elements are working properly. Use an on-demand defrost operation, rather than a timed cycle
- Remove ice build-up on freezers
- Consider variable speed drives (VSDs) on larger compressors
- Minimise the use of lights in chilled rooms, as these produce heat which in turn forces the compressor to consume more electricity
- Minimise over use of refrigerated cabinets, especially for produce which does not require essential refrigeration
- Consider using a dedicated walk-in chilled room for produce and dairy
- Ensure all new chillers meet with New Zealand MEPS (Minimum Energy Performance Standards). This is now compulsory for new equipment. For more information on MEPS see www.eeca.govt.nz/labelling-and-standards/meps.html
- Implement a chiller plant maintenance plan if you do not have one in place already. If chillers become problematic replace with new higher energy efficiency units
- Use efficient lighting methods such as fluorescent lighting. Avoid use of incandescent or halogen lighting
- If light levels for a particular task need to be increased, use individual task lighting in preference to increasing illumination over a wide area
- Replace fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Turn off lights during the daytime in areas which are adequately lit by natural light
- Avoid use of air conditioning at times where natural ventilation from doors or windows can be used
- Fix dripping hot water taps as soon as possible

Replace any damaged door seals on your fridges and freezers

Set your chilled cabinet/freezer temperature appropriately. One degree can make a difference to your energy bill

Reuse (heat recovery)

- Recover heat rejected from compressors and use this elsewhere. This is applicable to larger equipment such as walk-in freezers which reject heat to the environment. This heat can be recovered and used elsewhere, such as for space heating in the main shop floor area, or administration. This has a double benefit of reducing compressor consumption also. We recommend involving an energy consultant for this opportunity due to its complexity

5.7. Energy Use in the Bakery

5.7.1. Typical Energy Use

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC)
- Ovens and provers (warming ovens used to assist bread rising)
- Refrigeration
- Air compressors
- Bread mixers and slicers
- Domestic hot water (DHW)

Bakeries are typically warm environments, with cooling and ventilation required to maintain a workable environment. Minimising the heat output of ovens and provers is therefore a key element of managing energy use in bakeries, with the added benefit of a reduction in cooling and ventilation.

Example of a Multi-Deck Bakery Oven



As previously discussed, energy must first be measured before it can be managed. Key performance indicators (KPIs) are a useful tool for bakeries to measure and benchmark their energy consumption. A useful KPI for bakeries is energy consumption (kWh) per kilogram of dough produced. This can be determined provided the bakery output is known, and an electricity check meter is installed in the bakery department. Like cakes themselves, this value will vary depending on the size and shape of the bakery, with proportionally higher KPIs for smaller sized bakeries. As an indication, a previous study conducted by Industry, Science and Resources Australia (ISR, 2000) showed that for bakeries with an annual output of around 10,000 tonnes of dough per year, the KPI which should be aimed for was 0.75 kWh/kg-dough. The KPI of your bakery should be determined now, and compared again on a monthly and annual basis to identify areas of concern and validate any improvements made.

5.7.2. Opportunities to Prevent, Reduce and Reuse Energy

Prevent

- Do not place fridges next to ovens
- Size air compressors correctly

Reduce

- Specify double glazing on all new oven doors
- Ensure oven elements and radiant surfaces remain clean. This will improve the radiant output of the oven and therefore it's overall efficiency. This build up occurs slowly and cleaning once a month should be sufficient
- Maintain oven seals and replace damaged ones
- Optimise equipment run time by planning of bread batches so that as few ovens as possible can be used for the shortest possible time. Ovens and provers should also not be turned on earlier than necessary, so ensure operation schedules are planned well
- Turn off ovens and provers when not in use, including individual oven decks when not used
- Minimise over production of bakery product. While some over production is necessary for marketing reasons, this should be kept at a minimum to reduce operational and energy costs. An accounting system should be implemented, if this has not already been done, and overproduction monitored on a regular basis
- Connect oven light to door switch so that the light only operates when the door is open
- Avoid excessive use of extract fans which remove conditioned air from the room
- Install variable speed drives on extract fans with switches linked to room temperature sensors or oven doors, so that the fan speed increases as the room temperature warms
- Ensure fridge and freezer doors are closed whenever possible
- Inspect fridges and freezers for damaged door seals and replace these with new ones
- Do not set fridge/freezer temperatures lower than they need to be
- Ensure fridges and freezers have adequate ventilation around them to dissipate heat generated by the compressor
- Investigate use of instantaneous hot water heaters to replace standard hot water storage cylinders
- If standard hot water cylinders are used, ensure these are modern A-Grade cylinders, and install cylinder wraps to boost insulation levels
- Ensure you are using tempered water systems. Tempered water systems mix in cold water near the hot water source so losses of heat in the pipe work are minimised. This also means you are putting less cold water into your heating water unit
- Ensure display lights are turned off after hours, including those incorporated into cabinets
- Use efficient lighting methods such as fluorescent lighting. Avoid use of incandescent or halogen lighting
- Check lighting levels with a lux meter to ensure the space is not over lit. AS/NZS 1680.2.4:1997 states that for general working areas in a bakery, a lighting level of 160 lux is recommended
- If light levels for a particular task need to be increased, use individual task lighting in preference to increasing illumination over a wide area
- Replace fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Turn off lights during the daytime in areas which are adequately lit by natural light
- Ensure lighting and all HVAC equipment and fume hoods are turned off after bakery hours. A time clock can be a simple automated way to do this
- Turn off equipment when it is not needed by educating staff and installing labels and reminders on equipment and switches
- Avoid use of air conditioning at times where natural ventilation from doors or windows can be used
- If air compressors are used, ensure these are located outside the bakery where it will typically be cooler in temperature. This will reduce compressor load, reduce heat output in the bakery, and also reduce noise levels
- Turn off air compressors at after hours
- Fix dripping hot water taps as soon as possible
- Implement an equipment maintenance plan if you do not have one in place already. If equipment becomes problematic replace with new higher energy efficiency units
- Implement a chiller plant maintenance plan if you do not have one in place already. If chillers become problematic replace with new higher energy efficiency units

To improve the efficiency of your oven, ensure oven elements and radiant surfaces are kept clean

Reuse (heat recovery)

- Recover heat rejected from compressors and use this elsewhere. This is applicable to larger equipment such as walk-in freezers which reject heat to the environment. This heat can be recovered and used elsewhere, such as for domestic hot water or space heating. This has a double benefit of reducing compressor consumption also. We recommend involving an energy consultant for this opportunity due to its complexity

5.8. Energy Use in the Deli

5.8.1. Typical Energy Use

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC)
- Refrigerated cabinets
- Heated cabinets
- Domestic hot water (DHW)

While these areas are not typically as energy intensive as say the bakery department, it is often found that lighting and equipment are left on unnecessarily and as always, there is room for energy efficiency measures to be taken.

5.8.2. Opportunities to Prevent and Reduce Energy Use

Prevent

- Avoid the use of stand-alone or self-contained chillers to boost store capacity. Instead use centralised plant whenever possible (remote cabinets) as these will have a higher overall efficiency

Reduce

- Ensure display lights are turned off after hours, including those incorporated into cabinets
- Use efficient lighting methods such as fluorescent lighting. Avoid use of incandescent or halogen lighting
- If light levels for a particular task need to be increased, use individual task lighting in preference to increasing illumination over a wide area
- Replace fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Turn off lights during the daytime in areas which are adequately lit by natural light
- Ensure fridge and freezer doors are closed whenever possible
- Inspect fridges and freezers for damaged door seals and replace these with new ones
- Do not set chilled cabinet/freezer temperatures lower than they need to be. Even one °C can make a large difference. If the supermarket is heated during winter, colder cabinet/freezer temperatures will also increase heating consumption
- Ensure fridges and freezers have adequate ventilation around them to dissipate heat generated by the compressor
- Ensure fan inlets and outlets are not obstructed or blocked in any way
- Do not stack product directly in front of evaporators
- Reduce the condensing temperature at the compressor to about 25°C - check with your refrigeration maintenance company first. Significant electricity savings will result from operation at a lower condensing temperature
- Check refrigerant sight glass for bubbles indicating gas leakage. An undercharged system may not maintain a consistent temperature and will consume more energy when operating
- Check evaporator defrost elements are working properly. Use an on-demand defrost operation, rather than a timed cycle
- Remove ice build-up on freezers
- Consider variable speed drives (VSDs) on larger compressors
- Minimise overuse of refrigerated cabinets, especially for product which does not require essential refrigeration
- Ensure all new chillers meet with New Zealand MEPS (Minimum Energy Performance Standards). This is now compulsory for new equipment. For more information on MEPS see www.eeca.govt.nz/labelling-and-standards/meps.html

**Implement a
chiller plant
maintenance plan**

- Check if heated product can be air cooled before entering a fridge or freezer
- Where possible use doors and windows on heated cabinets with low-transmission glass and double glazing to reduce radiant heat loss
- Ensure lighting and all HVAC equipment are turned off after hours. A time clock can be a simple automated way to do this
- Turn off equipment when it is not needed by educating staff and installing labels and reminders on equipment and switches
- Avoid use of air conditioning at times where natural ventilation from doors or windows can be used
- Fix dripping hot water taps as soon as possible
- Implement an equipment maintenance plan if you do not have one in place already. If equipment becomes problematic replace with new higher energy efficiency units
- Implement a chiller plant maintenance plan if you do not have one in place already. If chillers become problematic replace with new higher energy efficiency units

5.9. Energy Use in the Seafood/Meat Department

5.9.1. Typical Energy Use

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC)
- Refrigeration
- Butchery and meat processing equipment, including fillers, grinders (mincers), tyers etc
- Domestic hot water (DHW)

Example of mixing machine in a butchery used for producing sausages



Aside from some equipment specific to seafood and meat processing, these departments contain equipment similar to that described in the section titled Energy Use in the Produce, Dairy and Frozen Food Departments due to the need for refrigeration to keep product cool.

5.9.2. Opportunities to Prevent, Reduce and Reuse Energy

Prevent

- Avoid the use of stand-alone or self-contained chillers to boost store capacity. Instead use centralised plant whenever possible (remote cabinets) as these will have a higher overall efficiency

Reduce

- Ensure display lights are turned off after hours, including those incorporated into cabinets
- Use efficient lighting methods such as fluorescent lighting. Avoid use of incandescent or halogen lighting
- Check lighting levels with a lux meter to ensure the space is not over lit. AS/NZS 1680.2.4:1997 states that for general food processing areas such as a butchery, a lighting level of 240 lux is recommended
- If light levels for a particular task need to be increased, use individual task lighting in preference to increasing illumination over a wide area
- Replace fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Ensure fridge and freezer doors are closed whenever possible
- Inspect fridges and freezers for damaged door seals and replace these with new ones
- Do not set chilled cabinet/freezer temperatures lower than they need to be. Even one °C can make a large difference. If the supermarket is heated during winter, colder cabinet/freezer temperatures will also increase heating consumption
- Ensure fridges and freezers have adequate ventilation around them to dissipate heat generated by the compressor
- Ensure fan inlets and outlets are not obstructed or blocked in any way
- Do not stack product directly in front of evaporators
- Reduce the condensing temperature at the compressor to about 25°C - check with your refrigeration maintenance company first. Significant electricity savings will result from operation at a lower condensing temperature
- Check refrigerant sight glass for bubbles indicating gas leakage. An undercharged system may not maintain a consistent temperature and will consume more energy when operating
- Check evaporator defrost elements are working properly. Use an on-demand defrost operation, rather than a timed cycle
- Remove ice build-up on freezers
- Consider variable speed drives (VSDs) on larger compressors
- Minimise overuse of refrigerated cabinets, especially for product which does not require essential refrigeration
- Ensure all new chillers meet with New Zealand MEPS (Minimum Energy Performance Standards). This is now compulsory for new equipment. For more information on MEPS see www.eeca.govt.nz/labelling-and-standards/meps.html
- Ensure lighting and all HVAC equipment are turned off after hours. A time clock can be a simple automated way to do this
- Turn off equipment when it is not needed by educating staff and installing labels and reminders on equipment and switches
- Avoid use of air conditioning at times where natural ventilation from doors or windows can be used
- Fix dripping hot water taps as soon as possible
- Implement an equipment maintenance plan if you do not have one in place already. If equipment becomes problematic replace with new higher efficiency units
- Implement a chiller plant maintenance plan if you do not have one in place already. If chillers become problematic replace with new higher efficiency units

Ensure fridges and freezers have adequate ventilation around them to dissipate heat generated from the compressor

Reuse (heat recovery)

- Recover heat rejected from compressors and use this elsewhere. This is applicable to larger equipment such as walk-in freezers which reject heat to the environment. This heat can be recovered and used elsewhere, such as for space heating in the main shop floor area, or administration. This has a double benefit of reducing compressor consumption also. We recommend involving an energy consultant for this opportunity due to its complexity

5.10. Energy Use in the Storeroom

5.10.1. Typical Energy Use

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC)
- Other equipment including computers

These spaces are typically simple in operation, with minimal heating and cooling, and simple lighting layouts. However, there are still opportunities for reducing energy consumption.

5.10.2. Opportunities to Prevent and Reduce Energy Use

Prevent

- Allow the roof to consist of about 15 % transparent panels. Use a daylight (lux) sensor to switch off lights when natural lighting is adequate. Daylight sensors work better with fluorescent lamps than high intensity discharge (HID) lamps such as high pressure sodium

Reduce

- Use efficient lighting methods such as high pressure sodium (HPS), metal halide (MH), fluorescent lighting or compact fluorescents. Avoid use of incandescent or halogen lighting or mercury vapour (MV) lamps
- Check lighting levels with a lux meter to ensure the space is not over lit. AS/NZS 1680.2.4:1997 states that for warehouses, a lighting level of 160 lux is recommended
- If light levels for a particular task need to be increased, use individual task lighting in preference to increasing illumination over a wide area
- Replace HID and/or fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Turn off lights during the daytime in areas which are adequately lit by natural light. Daylight (lux) sensors can be used to automatically control this
- Use occupancy sensors to turn lighting and equipment off automatically when the space is left unoccupied
- Ensure that doors including any vehicle entrances are not left open unnecessarily which can cause excessive heating or cooling
- Use plastic drop-down curtains or rapid opening doors to reduce air flow through entrances, whilst still allowing forklifts and staff through
- Ensure computer hard-drives and screens are turned off after hours
- Ensure lighting and all HVAC equipment are turned off after hours. A time clock can be a simple automated way to do this
- Turn off equipment when it is not needed by educating staff and installing labels and reminders on equipment and switches
- Use radiant heating rather than air heating
- Encourage staff to dress appropriately so that supplemental heating, such as portable oil column and fan heaters, are not used

5.11. Energy Use in the Administrative Offices/Check-Out

5.11.1. Typical Energy Use

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC)
- Cash registers and computers

Depending on the size of the supermarket, administrative areas are often transient places where staff often pass in and out. For this reason it is important to pay particular attention to opportunities involving turning lighting and equipment off in spaces which are left unoccupied.

5.11.2. Opportunities to Reduce Energy Use

Reduce

- Turn off lights during the daytime in areas which are adequately lit by natural light
- Use a daylight (lux) sensor to switch off lights when natural lighting is adequate
- Use efficient lighting methods such as fluorescent lighting. Avoid use of incandescent or halogen lighting
- Check lighting levels with a lux meter to ensure the space is not over lit. AS/NZS 1680.2.4:1997 states that for office work, a lighting level of 320 lux is recommended
- If light levels for a particular task need to be increased, use individual task lighting in preference to increasing illumination over a wide area
- Replace fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Ensure lighting and HVAC is turned off when a space such as an office is left unoccupied. Automatic occupancy sensors are a good way to do this - see your electrician. Remind staff using labels on light switches
- Use time clocks to turn lighting and HVAC equipment off after hours
- Ensure that HVAC is switched off when external temperatures are such that opening a window would be more effective
- Ensure computer hard-drives and screens are turned off after hours, including cash registers
- Replace direct electric heaters with heat pumps. Heat pumps are typically around three times more efficient than direct heating
- Encourage staff to dress appropriately so that supplemental heating, such as portable oil column and fan heaters, are not used
- Ensure that air conditioning and heating is switched off in offices when external temperatures are such that opening a window would be more effective
- Ensure that the control of the air conditioning or heating system is assigned to one person and that staff agree on the temperature required

Replace direct electric heaters with heat pumps

5.12. Energy Use in the Staff Facilities and Restrooms

5.12.1. Typical Energy Use

- Lighting
- Heating, Ventilation and Air Conditioning (HVAC)
- Other equipment including audio equipment and computers
- Domestic hot water (DHW)

While these spaces typically use a small amount of floor area in comparison to the shop floor and warehouse area, lighting and equipment is frequently left on in these spaces unnecessarily. HVAC in these spaces is usually simplistic, with extract fans used in restrooms.

5.12.2. Opportunities to Reduce Energy Use

Reduce

- Turn off lights during the daytime in areas which are adequately lit by natural light
- Use a daylight (lux) sensor to switch off lights when natural lighting is adequate
- Use efficient lighting methods such as fluorescent lighting. Avoid use of incandescent or halogen lighting
- Check lighting levels with a lux meter to ensure the space is not over lit. AS/NZS 1680.2.4:1997 states that for passageways and toilet blocks, a lighting level of 80 lux is recommended
- If light levels for a particular task need to be increased, use individual task lighting in preference to increasing illumination over a wide area
- Replace fluorescent tubes which are beginning to dull and near the end of their life. This can save energy since staff are less likely to use additional lighting to supplement the lower light levels
- Ensure lighting and HVAC is turned off in unoccupied spaces. Automatic occupancy sensors are a good way to do this - see your electrician. Remind staff using labels on light switches
- Use time clocks to turn lighting and HVAC equipment off after hours
- Use an occupancy sensor to control the operation of extract fans in restrooms. It must be remembered that these fans remove air which has undergone heating or cooling. Replacing this air with outside air will result in additional energy consumption
- Ensure that HVAC is switched off when external temperatures are such that opening a window would be more effective
- Investigate using instant water heaters rather than hot water cylinders
- Ensure you are using tempered water systems. Tempered water systems mix in cold water near the hot water source so losses of heat in the pipe work are minimised. This also means you are putting less cold water into your heating water unit
- If showers are provided for staff, use low-flow shower heads. To determine your existing shower flow a bucket and a stopwatch can be used. Low-flow shower heads control the flow to around 7 litres per minute. Replace shower heads which discharge above 10 litres per minute
- Fix dripping hot water taps as soon as possible
- Ensure computer hard-drives and screens are turned off after hours, including cash registers
- Replace direct electric heaters with heat pumps. Heat pumps are typically around three times more efficient than direct heating
- Encourage staff to dress appropriately so that supplemental heating, such as portable oil column and fan heaters, are not used

Use an occupancy sensor to control the operation of extract fans in restrooms

5.13. Further Energy Efficiency Suggestions

Further information on energy efficiency can be obtained from the Target Energy Business Guide on the Target Sustainability website www.target sustainability.co.nz The Target Energy Business Guide also provides a number of useful worksheets and calculators.

6. Water

The main areas for water consumption in supermarkets are the produce, butchery/seafood, bakery and deli departments, the staff room and amenities (toilets). Another large user of water may be the landscaping areas outside the store (if your store is large enough). This section will deal with these individual areas.

6.1. Measure Baseline Water Use

There are a lot of different things you can do to be water efficient in your supermarket, ranging from educating your staff on water saving practices to installing water efficient fixtures.

Before water use can be managed and before introducing any new water efficiency initiatives, water use should first be measured by undertaking a water audit. The water audit will provide you with the baseline of current water use in your supermarket (Step 3 in Figure 1). It is important to measure the baseline as you can compare future water use against it and so help you quantify your progress and associated savings.

More information on improving water efficiency are provided in the Target Water Business Guide on the Target Sustainability website www.target sustainability.co.nz

In your water audit you should:

- Identify the types and quantities of water using fixtures and fittings. It is probably a good idea to do an inventory of fixtures and fittings in each area of your supermarket
- Evaluate how much water is used in certain processes in each area e.g. cleaning down the butchery - ask such questions as what is the pressure of the hose? How long is the hose turned on for? How often is this cleaning down undertaken?
- Check water pressure in taps and hoses
- Check for leaking taps/cisterns/urinals/hoses (this should be done on a regular basis)
- Identify the number of toilets you have and whether they are single or dual flush
- Identify the number urinals you have and whether they are flush type, or automatic
- Check the water efficiency of urinals
- Establish how much water your dishwasher(s) use
- Establish how much water is used in the bakery's prover
- Establish how much water is used for irrigation

To find out actual water use within your store you can contact the Christchurch City Council.

Further details on carrying out a water audit are provided in the Target Water Business Guide.

6.2. Common Water Use in Supermarket Departments

Although they prepare and sell different products, the produce, butchery/seafood, bakery and deli departments can all be treated similarly when it comes to water efficiency. Each department is likely to contain a number of sinks, hand basins, dishwashers, and operate similar cleaning protocols. Benches in the preparation areas are generally sanitised frequently, usually every hour, with the use of spray bottles. Display areas are also cleaned as required.

6.2.1. Opportunities to Reduce Water Use

Reduce

- Put up signs at the sinks, reminding your staff to minimise water use, and also to ensure taps are turned off correctly
- Consider installing flow restrictors/low flow nozzles and possibly sensor activators on your taps. Sensor activated taps will eliminate continually running taps
- Where possible, only use dishwashers when they are fully loaded, and use the economy cycle
- Scrape the items before you put them into the dishwasher instead of rinsing them, which uses additional water
- If there is no dishwasher, wash items in sinks full of water rather than running the tap
- Ensure any dripping taps and water leaks are fixed promptly. Ensure the organisation has an effective water leak reporting procedure available and communicated to all staff so staff will report water leaks so they can be fixed quickly

Place signs near taps to remind your staff to minimise their water use

- When purchasing new appliances and fittings ensure they have a high water efficiency Star rating through the Water Efficiency Labelling Scheme (WELS)

6.3. Specific Water Use in Supermarket Departments

6.3.1. Opportunities to Prevent Water Use – Produce Department

Some produce that arrives requires washing prior to it being displayed. This is carried out in sinks in the produce preparation area.

- Talk to your suppliers about receiving pre-washed produce, this will minimise the washing that needs to be done at your store, saving water and labour

6.3.2. Opportunities to Reduce Water Use – Bakery Department

The amount of water used in the bakery will also depend on whether your supermarket orders in frozen dough, or whether you make bread from scratch, the latter of which uses more water. Water is also used in your prover.

- Ensure your prover is making efficient use of the water that it uses. Make sure there are no water leaks in the system

6.3.3. Opportunities to Reduce Water Use – Butchery/Seafood Department

The amount of water that is used in the butchery/seafood department depends on whether the meat and seafood gets delivered pre-packaged, or whether it requires further preparation. If the latter is the case in your supermarket, then there would be more cleaning requirements. Hot water hoses are often a feature in a butchery department, which are used to wash the preparation areas down.

- Ensure hot water is not wasted during the wash down. Make sure that your staff are aware of water saving practices
- Use trigger nozzles to control the use of water during wash down

6.4. Water Use in the Staff Facilities

Staff facilities in supermarkets include staff rooms and amenities.

6.4.1. Opportunities to Reduce and Reuse Water

Reduce

- Install dual flush toilets, or put a ‘toilet dam’ (bag of water or brick) in the cistern to reduce the cistern water capacity/flush
- Install flush urinals
- Place signs above sinks and hand basins to remind staff to minimise water use and turn taps off properly
- If showers are provided for staff, use low-flow shower heads
- Talk to your cleaning staff and discuss whether they can see options for reducing water use (e.g. turning off taps while cleaning sinks)
- Encourage cleaning staff to use dry cleaning methods around the store before hosing and mopping
- Ensure the organisation has an effective water leak reporting procedure available and communicated to all staff so staff will report water leaks so they can be fixed quickly

Reuse

- Explore possibilities to collect and store water for use (e.g. use rainwater to flush toilets)

6.5. Water Use for Landscaping

6.5.1. Opportunities to Reduce and Reuse Water

Reduce

- Schedule irrigation to occur in the cool of the evening or early morning. This will minimise the water loss caused by evaporation
- Install automatic watering devices so irrigation can be programmed to run at a certain time of day
- Try not to over water your grass/plant beds. Moisture meters can be used to ensure that you only water plants when it is needed
- Ensure the watering devices are switched off when it is raining
- Water only what needs watering (i.e. not the footpaths)
- Ensure the organisation has an effective water leak reporting procedure available and communicated to all staff so staff will report water leaks so they can be fixed quickly

Reuse

- Explore possibilities to collect and store water for use (e.g. use rainwater for landscaping irrigation)

Explore the possibility of using rainwater collected off your roof to flush toilets and irrigate your gardens

6.6. Further Water Efficiency Suggestions

Further information on water efficiency can be obtained from the Target Water Business Guide on the Target Sustainability website www.target sustainability.co.nz The Target Water Business Guide also provides a number of useful worksheets.

7. Completing the Target Sustainability Improvement Loop

So now you have undertaken waste, energy, and water audits at your supermarket, identified your main waste streams, and hopefully made some changes to improve your business' resource efficiency. You have now completed Steps 1 to 5 of the Target Sustainability Improvement Loop introduced in Section 3.1. The remaining steps are Step 6: Monitoring, Reviewing and Reporting Results and Step 7: Continual Improvement. These steps and the importance of staff education are briefly described below; however, a more detailed description is given in the Target Sustainability The Path to Sustainability Business Guide.

7.1. Staff Education

Staff education is often a key area to focus on to achieve greater resource efficiency. All personnel within the organisation need to take ownership of resource efficiency from senior management down to the office workers. Those with responsibility for others need to model, emphasise and reinforce resource efficiency as a regular part of every day business. Staff training combined with good system housekeeping generally does not cost the organisation very much money but can result in significant resource efficiency gains. It could be well worthwhile giving consideration to developing a staff training module on resource efficiency. This would help to reinforce the message that reducing resource usage is important to the business bottom line. Such training also helps to change and reinforce the organisation culture in terms of resource efficiency. See the Target Sustainability The Path to Sustainability Business Guide at www.target sustainability.co.nz for other suggestions on how to engage staff.

7.2. Monitoring, Reviewing and Reporting

In order to ensure that your resource efficiency programme keeps moving forward, your progress needs to be monitored, reviewed and reported on. Monitoring and reviewing your programme will entail the use of Key Performance Indicators (KPIs). KPIs are introduced in the individual Target Sustainability Target Waste/Energy/Water Business Guides and are a good tool to monitor and review your progress.

Some examples of KPIs include:

- Office Paper Use - Office ream paper used (kg/month per FTE)
- Office Paper Recycling - Quantity of paper collected by service providers (kg/month per FTE)
- Office Cardboard Recycling - Quantity of cardboard collected by service providers (kg/month per FTE)
- Office Organic Kitchen Waste - Quantity of organic kitchen waste collected by service providers (kg/month per FTE)
- Office Waste Sent to Landfill - Waste collected by service providers (kg/month per FTE)
- Office Related Energy Use - kWh/FTE or m²
- Office Related Water Use - litres/ FTE or m²
- Production Related Waste - kg/production unit
- Production Related Energy Use - kWh/production unit
- Production Related Water Use - litres/production unit

Evaluating how these KPIs compare to baseline KPIs (i.e. before you made any changes), will give you an indication of how well your resource efficiency programme is performing.

To keep momentum, and motivation, you should report the results of your resource efficiency programme on staff notice boards/newsletters. You should also inform your customers of your successes by putting up notices in your supermarket where customers can see them, i.e. at the checkout counter. More and more, consumers are becoming aware of businesses environmental responsibility. Telling your customers about your resource efficiency programme is a great marketing strategy.

Feedback from staff is also very important to the success of the programme. Listen to what they have to say, and make changes where applicable. Keeping the staff involved and engaged with the resource efficiency programme is more likely to keep the programme moving forward.

7.3. Continual Improvement

The final step is to ensure that there is no final step and the resource efficiency programme continues to exist in your store, and continues to improve. The likelihood of your programme continuing successfully in the future is dependant on various factors including continual training of staff, communication of successes and integration of the programme into your stores day to day activities and structure. These factors are expanded on in Section 7 of the Target Sustainability The Path to Sustainability Business Guide.

The Target Sustainability Supermarket Business Guide has outlined some of the opportunities for reducing waste and being energy and water efficient. The opportunities are not limited to those that have been described, so be creative and think outside the square for identifying other opportunities in your business.

Use Worksheet 1 in the Target Sustainability The Path to Sustainability Business Guide to assess your progress with the 7 Steps in the Target Sustainability Improvement Loop.

8. Useful Websites

www.target sustainability.co.nz

Christchurch City Council website where you can download the Target Sustainability resource efficiency toolkits and access the online recycling directory

www.enviro-choice.org.nz/

Environmental Choice New Zealand. Environmental Choice is an environmental product labelling programme in New Zealand. This website lists products that already carry the Environmental Choice Label, and the specifications that must be met for products to carry the label

9. References

- EECA, 2003. *Minimum Energy Performance Standards for Commercial Refrigeration Cabinets*, Mark Ellis and Associates for EECA, June 2003
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- ISR, 2000. *Energy Efficiency in the bread baking industry (In-store supermarket bakeries)*, Industry Science and Resources, Energy Efficiency Best Practice Program, June 2000