



ENVIRONMENTAL
TECHNOLOGY
BEST PRACTICE
PROGRAMME

WATER USE IN THE SOFT DRINKS INDUSTRY



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Over 25 billion litres of water are used to produce the 10 billion litres of soft drinks that are consumed each year in the UK, according to estimates based on a survey of water use in the UK soft drinks industry carried out by the Environmental Technology Best Practice Programme. The results of this survey are presented here, divided into four categories, based on the survey respondents.



sites producing bottled waters;

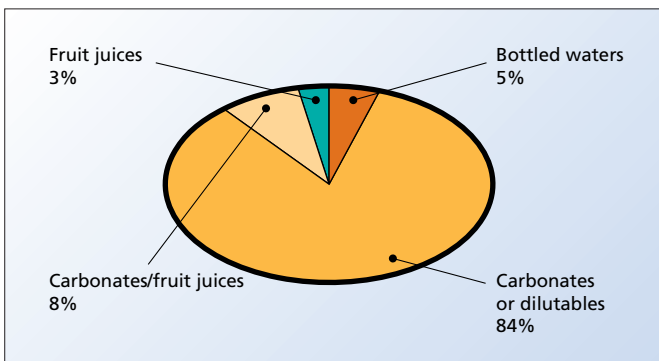


sites producing fruit juices;



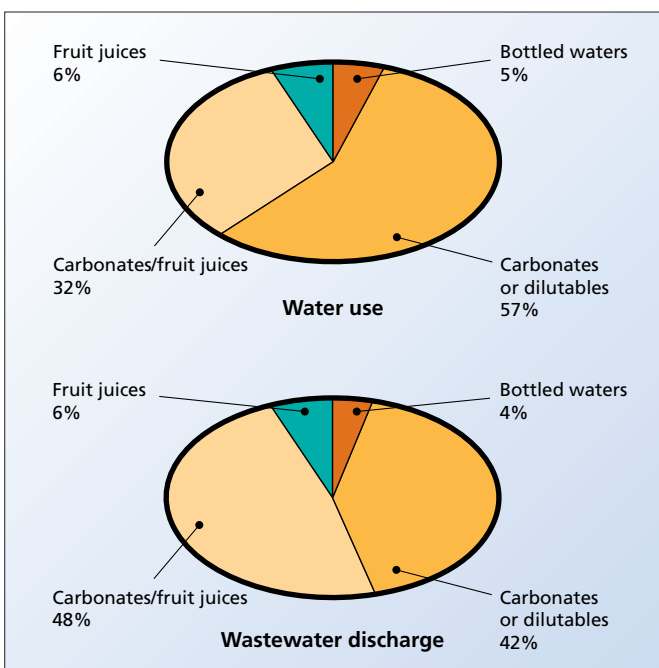
sites producing carbonates or dilutables;
sites producing both carbonates and fruit juices.

Fig 1 Soft drinks production in the UK by survey category



Relative water use and wastewater discharge by category are shown in Fig 2.

Fig 2 Water use and wastewater discharge by survey category



WHY REDUCE WATER CONSUMPTION?

The reasons for conserving water have never been greater. Water supply costs have increased significantly in recent years, and water companies and authorities predict further steep rises in the future. The survey found that costs ranged from 39 - 75 pence/m³, so water supply alone can cost many thousands of pounds a year. If other costs, eg treatment costs, are taken into account, the true cost of water is even higher.

Most companies pay for both supply and disposal of water. Disposal of wastewater often costs much more than purchasing mains water. For 60% of survey respondents, over 30% of the water supplied is discharged off site as waste. Discharge costs were found to vary between 16 pence/m³ and £1.59/m³. Water companies and authorities have indicated that discharge costs are likely to increase significantly in the future, possibly up to 15 times the cost of water supply.

HOW THIS GUIDE WILL HELP YOU

This Environmental Performance Guide provides benchmarks for water use and wastewater discharge in the soft drinks industry. The information in this Guide will help you to:

- compare your site's performance with that of other companies in your category;
- identify the savings you can achieve by reducing water use and wastewater discharge;
- make your company more competitive by reducing operating costs.

DO YOU KNOW HOW MUCH WATER YOUR COMPANY USES?

Over 38% of companies responding to the survey did not know exactly how much water was supplied to their sites, and 63% did not measure the amount of water discharged. Among the reasons given for a lack of water management were:

- a low priority compared with other issues;
- too long a payback on investment;
- the low cost of water compared with other operating costs.

However, most respondents (85%) have realised that increasing charges for water supply and wastewater disposal cannot be ignored, and a number of companies have already taken action. This Guide aims to show that water management measures have cost saving benefits whilst helping companies to reduce their impact on the environment.



REMEMBER:

If you don't measure it, you can't manage it.

USING THE WATER AND WASTEWATER CALCULATORS

Use the Water and Wastewater Calculators to find out your site's specific water consumption and specific wastewater discharge levels. Specific water consumption is the volume of water used per unit of production, measured here in m³ of product. Similarly, specific wastewater discharge is the volume of wastewater discharged per unit of production, again measured in m³ of product. Establishing these figures will allow you to compare your site's performance with that of other companies in your category, regardless of company size and variations in throughput.

To take account of seasonal variations, it is important to use data covering a whole year. Using the most recent data available will reflect your current practices. You can photocopy the form and use it to repeat the calculation after water saving measures have been introduced. You can also apply the same calculations to individual machines and processes.

Comparing your figures with the values for your category (see pages 4, 5 or 6) will tell you if your company can improve its water management and thus save money. If your site produces more than one category of soft drink, you will need to look at the pages for each category.

The Cost Savings Calculator on page 7 will help you work out your potential cost savings from improved water management.

WATER CALCULATOR		
Volume of water used in the last 12 months	..... m ³	A
Output of product during the same 12-month period	..... litres	B
Divide B by 1 000	..... m ³	C
Specific water consumption	..... m ³ water/ m ³ of product	$\frac{A}{C}$

WASTEWATER CALCULATOR		
Volume of wastewater discharged in the same 12-month period	..... m ³	D
Specific wastewater discharge	..... m ³ wastewater/ m ³ of product	$\frac{D}{C}$

HOW HAVE OTHER COMPANIES ACHIEVED SAVINGS?

Saving water means saving money. A number of companies have already implemented measures to reduce their water use and wastewater discharge. Significant cost savings and other benefits have already been achieved at sites using one or more of the following water saving measures. These measures are grouped according to **capital cost**.

No-cost/low-cost

- Immediate repair of leaks.
- Good housekeeping, eg turn off taps and report leaks.
- Fit triggers to hoses.
- Improve boiler water management.
- Give responsibility for the water reduction plan to a senior manager.
- Negotiate deals on water tariffs.
- Training.

Medium Cost

- Fit meters to measure water use for the whole site or individual high-consumption processes.
- Improve plant washing procedures.
- Control flow rates for spray, sealing and cooling water supplies.
- Development of an environmental management or water management system.

Higher Cost

- Steam trapping and condensate recovery.
- Introduce or make greater use of cleaning-in-place (CIP) technology.
- Replacement of flow-through systems with recirculation, recycling and re-use systems.
- Modifications to wastewater treatment systems to either reduce discharge costs or allow re-use/recycling.



For cost-effective water management, it is important to plan and target your actions

Underground aquifers are the main water source used by this sector, although some companies use mains water for equipment washing, container rinsing, floor washing and domestic use. Most of the water is used for equipment preparation (Fig 3). Of the water used for equipment washing, 57% is pre-treated in some way.

Survey Fact

Cleaning-in-place (CIP) equipment has been installed by 44% of soft drinks sites, and 30% control flow rates to washing/cooling processes.

Specific Wastewater Discharge

Fig 5 shows performance bands that have been derived from the survey responses in the bottled waters sector. The average specific wastewater discharge is 0.8 m³ water/m³ of product. The main source of wastewater is equipment preparation.

Fig 5 Wastewater discharge vs production in the bottled waters sector

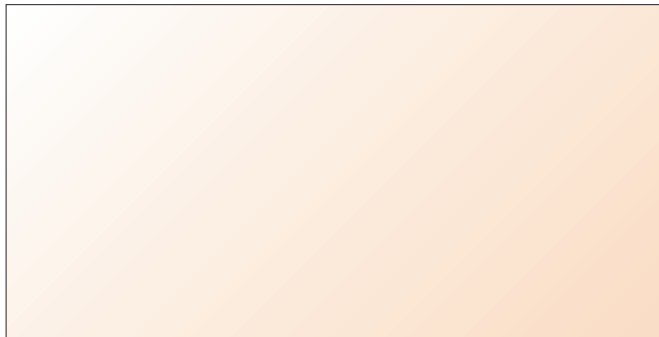


Fig 3 Water use in the bottled waters sector

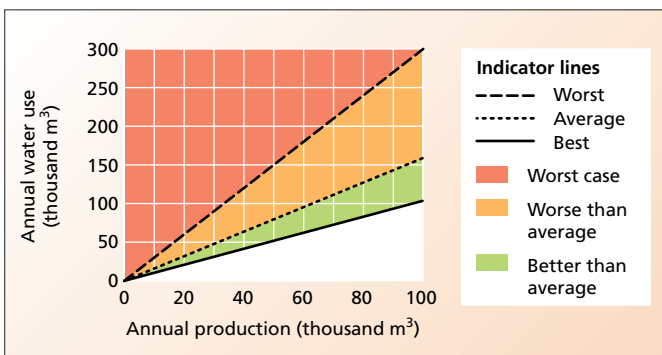


The main water-related cost for this sector is for wastewater disposal. Other costs include the abstraction licence fee, extraction costs, any mains water charges and water treatment costs.

Specific Water Consumption

The survey revealed a wide range of specific water consumption in this sector. The average value of 1.6 m³ water/m³ of product means that two-thirds of the water supplied to the site does not end up in the product. Fig 4 shows performance bands that have been derived from the survey responses.

Fig 4 Water use vs production in the bottled waters sector



Could Your Site Improve Its Performance?

You can use Figs 4 and 5 to compare your performance with that of other sites in the sector. With these graphs, you can work out what your site's water consumption should be, and how much wastewater should be discharged at your level of production.

Starting with Fig 4, mark the annual production (thousand m³) on the horizontal axis. Then draw a vertical line from this point up to the average and best indicator lines. Now draw horizontal lines from the intersection points to the vertical axis and read off the corresponding values for water use. Record your figures in the table below. Then repeat the exercise for the volume of wastewater discharged in the same 12-month period using Fig 5. Record your results below, then turn to page 7 to work out your savings potential.

Guide values for water use and wastewater discharge at your site

	Water use (m ³)	Wastewater discharge (m ³)
Average	..... AWU	..... AWWD
Best	..... BWU	..... BWWD

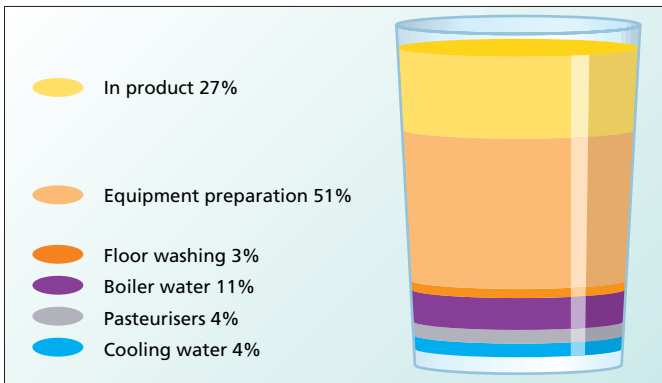
One company realised that borehole water, ie its product, is a precious resource and thus requires careful management to ensure the long-term future of the company. Mains water is now used for equipment washing and CIP. The long-term implications of losing its only raw material source far outweigh the short-term impact on profits due to the higher costs of mains water. The site has also introduced trigger hoses and improved plant-washing procedures. Leak repair is immediate, and wastewater is treated on site for re-use.



The main source of water in this sector is the mains water supply. Nearly twice as much water is used for equipment preparation (51%) than is added to the product (27%). Boilers use a further 11% (Fig 6). The main costs are associated with mains water supply and wastewater treatment and/or disposal.

Survey Fact
Immediate leak repair is a policy at 41% of soft drinks sites, and 59% have fitted trigger hoses.

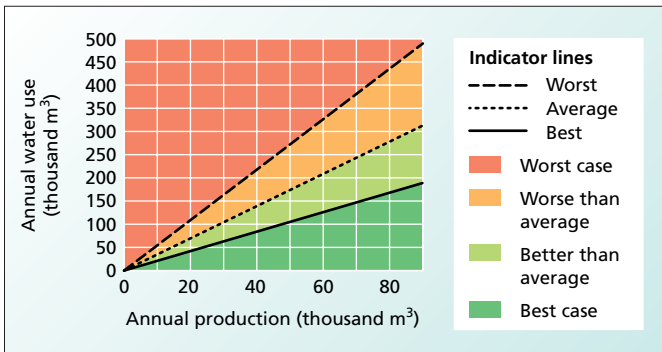
Fig 6 Water use in the fruit juices sector



Specific Water Consumption

The survey revealed a wide range of specific water consumption in this sector. More than three times more water (3.5 m³ water/m³ of product) is used during production than goes into the product. This is partly due to the nature of the juice manufacturing process, but there is still scope for considerable improvement. Fig 7 shows performance bands that have been derived from survey responses.

Fig 7 Water use vs production in the fruit juices sector

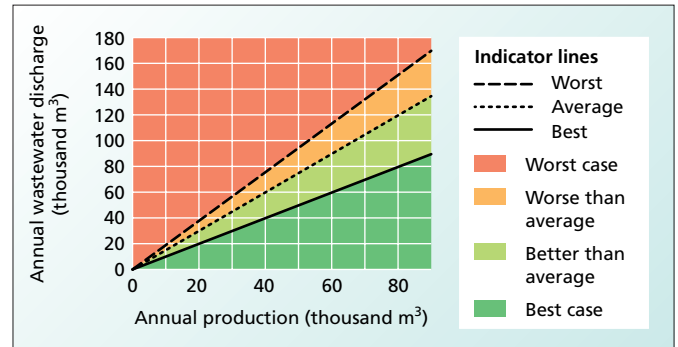


Specific Wastewater Discharge

Fig 8 shows performance bands that have been derived from survey responses in the fruit juices sector. The average specific wastewater discharge is 1.5 m³ water/m³ of product. The main source of wastewater is from equipment

preparation. At most sites, more water is discharged as waste than goes into the product, even though water from the pasteurisers and boilers is recirculated.

Fig 8 Wastewater discharge vs production in the fruit juices sector



Could Your Site Improve Its Performance?

You can use Figs 7 and 8 to compare your performance with that of other sites in the sector. With these graphs, you can work out what your site's water consumption should be, and how much wastewater should be discharged at your level of production.

Starting with Fig 7, mark the annual production (thousand m³) on the horizontal axis. Then draw a vertical line from this point up to the average and best indicator lines. Now draw horizontal lines from the intersection points to the vertical axis and read off the corresponding values for water use. Record your figures in the table below. Then repeat the exercise for the volume of wastewater discharged in the same 12-month period using Fig 8. Record your results below, then turn to page 7 to work out your savings potential.

Guide values for water use and wastewater discharge at your site

	Water use (m ³)	Wastewater discharge (m ³)
Average	..... AWU	..... AWWD
Best	..... BWU	..... BWWD

One fruit juice manufacturer in the survey has achieved significant cost savings by monitoring water use and implementing a range of water management measures. The measures include improving plant cleaning procedures and using air cleaning of packaging to replace rinsing. Annual savings of £54 000 have been achieved through a 17% reduction in water supplied and wastewater discharged.

Survey Fact
Water use is monitored at 30% of sites, and 26% have a boiler management policy.



Mains water is the principal source of water for sites producing carbonates, dilutables and carbonates plus fruit juices. For producers of carbonates or dilutables (Fig 9), water used is mainly in the product. For sites producing carbonates together with fruit juices, however, (Fig 10), more water is used for washing bottles (33%) than in the product (23%).

The main costs in these categories come from mains water supply, wastewater disposal and water treatment.

Survey Fact

Steam and condensate management are practised by 33% of soft drinks sites.

Fig 9 Water use in the carbonates or dilutables category

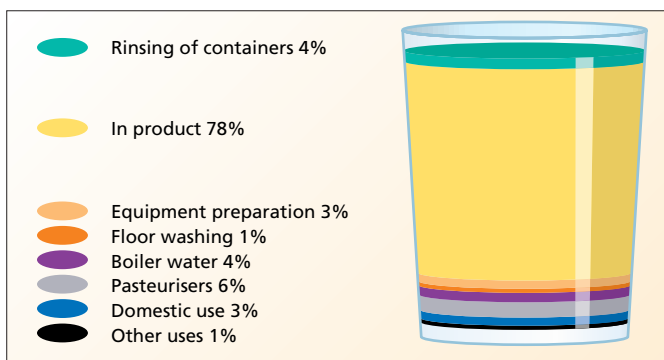
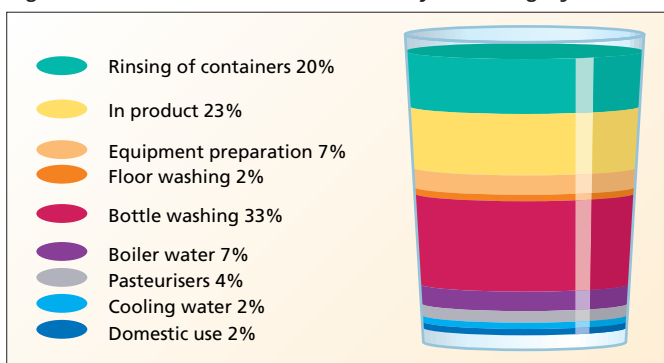


Fig 10 Water use in the carbonates/fruit juices category



Specific Water Consumption

The survey revealed a wide range of specific water consumption in these categories. The average is 2.3 m³ water/m³ of product in the carbonates or dilutables category and 6.1 m³ water/m³ of product in the carbonates/fruit juices category. These averages indicate that a major proportion of the water supplied does not end up in the product. Figs 11 and 12 show performance bands that have been derived from the survey responses. The 'best' water use indicator line is one-third of the industry average, showing that there is considerable scope for improvement in many companies.

Fig 11 Water use vs production in the carbonates or dilutables category

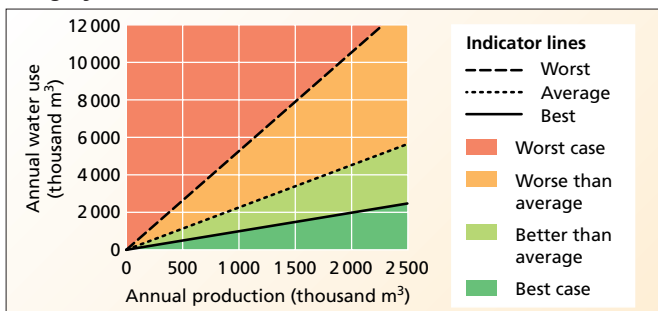
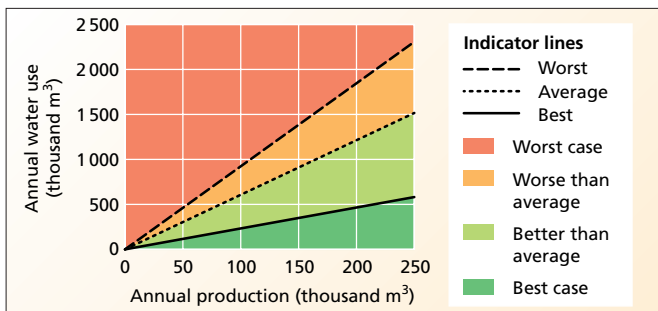


Fig 12 Water use vs production in the carbonates/fruit juices category



Specific Wastewater Discharge

Figs 13 and 14 show performance bands that have been derived from the survey responses in these two categories. The average specific wastewater discharged is 1.4 m³ water/m³ of product in the carbonates or dilutables category and 3.6 m³ water/m³ of product in the carbonates/fruit juices category.

Fig 13 Wastewater discharge vs production in the carbonates or dilutables category

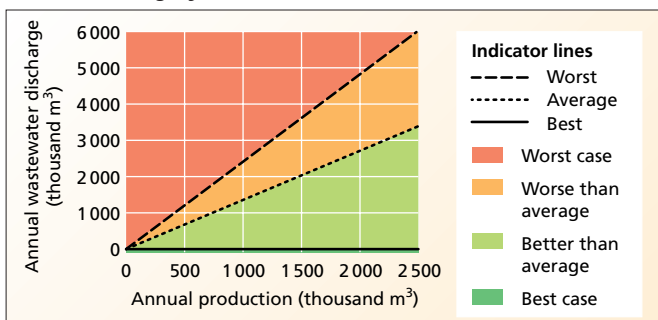
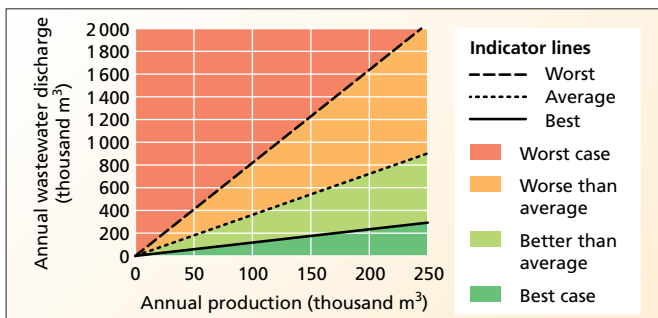


Fig 14 Wastewater discharge vs production in the carbonates/fruit juices category



A carbonates manufacturer has reduced water consumption by 10% through simple water management measures such as using trigger hoses and turning off taps. The company is now seeking to invest in wastewater recycling technology.

Most sites are wasting a much higher proportion of their total water use than necessary. There is scope for considerable improvement, particularly on carbonate-only sites, where most wastewater arises from container rinsing and equipment preparation. Although the pasteurisers produce large volumes of wastewater, this can be recirculated to reduce waste. For carbonates/fruit juices sites, the main sources of wastewater are bottle washing and container rinsing. However, water from container rinsing activities is frequently recirculated to reduce waste.

Survey Fact

A policy of raising awareness to turn off taps has been implemented at 41% of sites.

Could Your Site Improve Its Performance?

You can use Figs 11 - 14 to compare your performance with that of other sites in your category. These graphs provide an indication of what your site's water consumption should be, and how much wastewater should be discharged at your level of production.

Starting with Fig 11 or Fig 12, mark your site's annual production (thousand m³) on the horizontal axis. Then draw a vertical line from this point up to the average and best indicator lines. Now draw horizontal lines from the intersection points to the vertical axis and read off the corresponding values for water use. Record your figures in the table below. Then repeat the exercise for the volume of wastewater discharged in the same 12-month period using Fig 13 or Fig 14.

Guide values for water use and wastewater discharge at your site

	Water use (m ³)	Wastewater discharge (m ³)
Average	..... AWU	..... AWWD
Best	..... BWU	..... BWWD

Now go to the next column to see how much money your site can save through improved water management.

Water supply and wastewater disposal are controllable costs that can be reduced for the benefit of your company. Are you aware how much money your company could save through improving its water management? Find out by following steps one to three below. As well as best water use (BWU) and best wastewater discharge (BWWD) values for your site, you will also need to refer to your Water Calculator and Wastewater Calculator (see page 3). Even if your water use and wastewater discharge are better than average, you may be surprised at how much money you could save if you improved your performance even further.

Step One: Water Savings

Take the value you recorded for BWU and subtract it from the volume of water in m³ used on your site during the last 12 months (A in the Water Calculator on page 3). The answer is the volume of water you could save in m³. Now multiply this value by your unit water cost to find out how much money you could save.

Best water use	BWU	m ³
Volume of water used in the last 12 months	A	m ³
Volume of water you could save	$X = A - BWU$	m ³
Unit cost of water supply	Y	£/m ³
Cost savings from reduced water use	$S = X \times Y$	£

Step Two: Wastewater Savings

Now repeat the calculation for wastewater discharge. Take the value you recorded for BWWD and subtract this figure from the volume of wastewater in m³ discharged from your site during the same 12-month period (D in the Wastewater Calculator). The answer is the reduction in wastewater volume you could achieve in m³. Now multiply this value by your wastewater unit cost to find out how much money you could save.












Best wastewater discharge	BWWD	m ³
Volume of wastewater discharged in the last 12 months	D	m ³
Volume of wastewater you could save	$Y = D - BWWD$	m ³
Unit cost of wastewater discharge	V	£/m ³
Cost savings from reduced wastewater discharge	$W = Y \times V$	£

Step Three: Total Savings

Cost savings from reduced water use	S	£
Cost savings from reduced wastewater discharge	W	£
TOTAL COST SAVINGS	S + W	£

Now use the Action Plan on the back page as the starting point for turning your potential savings into reality.

ACTION PLAN

-  Phone the [Environmental Helpline on 0800 585794](tel:0800585794) for a free copy of *The Essentials - Food and Drink Processing*.
-  Use your calculated potential cost savings to win support from senior management for a water use reduction plan.
-  Establish management responsibility for action to reduce water use.
-  Monitor water entering and wastewater discharged from your site. If necessary, install meters.
-  Measure water use and wastewater generation for each process area.
-  Map water use across your site and determine the water mass balance.
-  Use **Good Practice Guide (GG26) *Saving Money Through Waste Minimisation: Reducing Water Use*** and **Good Practice Guide (GG67) *Cost-effective Water Saving Devices and Practices*** to help you identify possible water saving opportunities. Both Guides are available free through the [Environmental Helpline on 0800 585794](tel:0800585794).
-  Set realistic targets for improvements across the whole site and for each process.
-  Implement cost-effective water saving measures for your site.
-  Continue to monitor water use and report cost savings.
-  Review measures to control and improve water use.

This Guide was produced by the Environmental Technology Best Practice Programme.
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FOR MORE INFORMATION ABOUT THE ENVIRONMENTAL TECHNOLOGY BEST PRACTICE PROGRAMME
AND HOW ITS FREE SERVICES CAN HELP YOU, PLEASE PHONE THE

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world wide web: <http://www.etsu.com/etbpp/>

THE ENVIRONMENTAL TECHNOLOGY BEST PRACTICE PROGRAMME IS A JOINT DTI AND DETR PROGRAMME
MANAGED BY AEA TECHNOLOGY PLC THROUGH ETSU AND THE NATIONAL ENVIRONMENTAL TECHNOLOGY CENTRE

