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a world without waste

Resource review: UK Drinks sector

Drinks Resource Maps – Summary and overview

Developing waste and water resource maps for UK retail (off-trade) and, where applicable, on-trade drinks supply chain

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Purpose

The aim of this project is to develop a series of 'resource maps' for 12 key product groups within the UK drinks sector, detailing product and packaging waste and water consumption and losses arising in the UK. The resource maps focus on the retail and manufacturing stages of the supply chain and thereby exclude agriculture, household and non-UK arisings. The resource maps build on previous research on supply chain waste and highlight opportunities for resource efficiency, thereby providing drinks companies with environmental and economic benefits.

The 12 product groups investigated in this study are:

- soft drinks - carbonates (on-trade);
- soft drinks - carbonates (off-trade);
- soft drinks - still and juice drinks;
- soft drinks - fruit juice;
- cider;
- beer (micro);
- beer (draught);
- beer (packaged);
- gin/vodka;
- whisky malt;
- whisky grain; and
- wine.

The results from this study are grouped together into six sector-based 'resource reviews' covering soft drinks, cider, brewing (beer), gin/vodka, whisky, cider and wine. Each sector review highlights key opportunities for waste prevention and includes the individual product resource maps.

Eight cross-sector themes have also been identified and these represent some of the most significant opportunities for resource efficiency; namely product losses, overproduction, reducing fill losses, clean-in-place, effluent separation, water, packaging and organic arisings. These themes are designed to help the industry improve its resource use by sharing good practice. Each theme describes key improvement opportunities.

This review has identified £12 million of potential savings in water and packaging with some no or low cost 'easy wins'. Further and more significant savings potential exist, for example, in tackling product loss which can be as high as 7% and by recovering value from effluent

streams both of which could also be no or low cost. Beyond these, the wider and deeper application of lean production techniques could deliver major resource efficiency impacts, particularly in medium sized businesses.

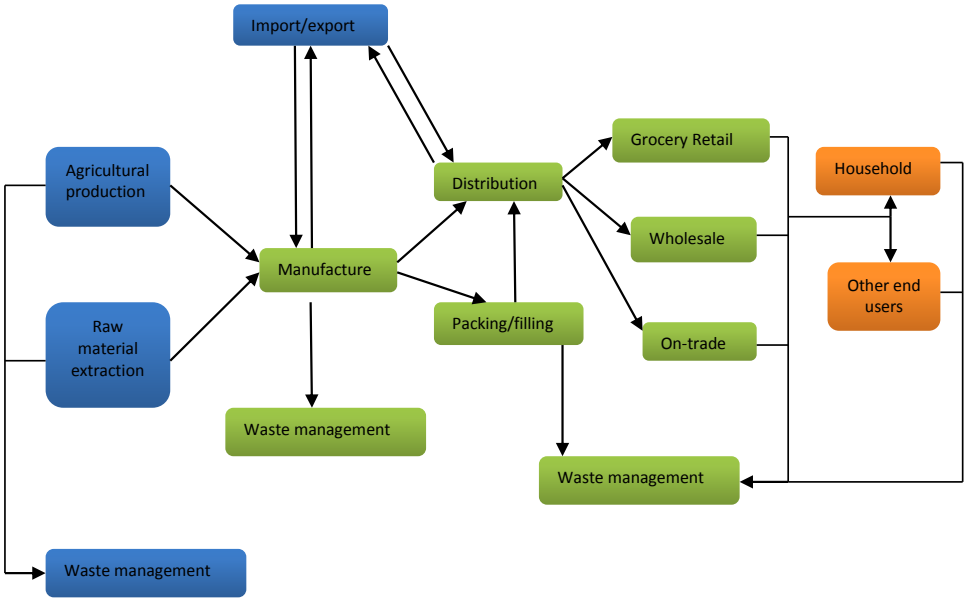
This summary of the research methodology is explained and the top line results presented. More details are included in the sector resource reviews and cross-cutting themes, which should be read in conjunction with this summary of the study.

Background

Previous WRAP research has shown that 6.6 million tonnes of waste are generated by the grocery retail supply chain at a cost of £5bn per year. The same study also drew attention to several data gaps and as a result WRAP commissioned a series of resource mapping projects for fruit and vegetables, fresh meat, fish, pre-prepared foods and this research which covers the drinks sector.

Combined beverage sales represent 21% of total food and drink value added. The industry is dominated by very small enterprises with some 80% of sites having fewer than 20 employees. By contrast 4% of sites employ over 250 staff and produce by far the largest production volumes. Supply chains are long and complicated and can involve considerable time periods between production and consumption. A very simplified overview is shown in Figure 1 below.

Figure 1 shows a schematic summary of the drinks supply chain.



Source: Oakdene Hollins

This study focuses on the stages shown within the green dashed box, though the waste in parts of the supply chain not in scope can be strongly influenced by the practices of those shown within the boundary, for example the impact of light-weighting primary packaging on household waste.

The drinks sector is covered by several trade associations including the Wine and Spirits Trade Association (WSTA), British Beer and Pub Association (BBPA), British Soft Drinks Association (BSDA), Scotch Whisky Association (SWA) and the National Association of Cider Makers (NACM). The trade associations have developed sustainability strategies to drive improvement and showcase the achievements of their respective members. An example is the BSDA's strategy which focuses on four key areas: climate change, waste and packaging, water and transport. Member companies have set targets which include zero waste to landfill by 2015 and a reduction in water use of 20% by 2020. Another example is the BBPA which runs a benchmarking service for its members on water use.

WRAP manage two major responsibility deals covering waste and water respectively:

- The Courtauld Commitment; and
- The Federation House Commitment

The Courtauld Commitment is now in its second phase. The voluntary agreement has three targets covering household food, packaging and supply chain waste. It currently has 53 signatories[1] comprising grocery retailers, suppliers and brand owners. Signatories from the drinks sector include: AB InBev UK, A.G. Barr plc, Accolade Wines UK Ltd, Britvic Soft Drinks, Carlsberg UK, Coca-Cola Enterprises, Cott Beverages, Dairy Crest, Danone Waters (UK and Ireland), Heineken UK, Innocent Drinks, Miller Brands (UK), Molson Coors Brewing Company (UK), Nestle Waters UK and Vimto Soft Drinks (Nichols). The supply chain target, to reduce product and packaging waste in the supply chain by 5% by 2012, is of particular relevance to this study. Recent evidence shows that there has been a pronounced diversion of waste away from landfill and other disposal methods towards recovery and recycling routes. While this is extremely encouraging, it does not directly contribute to the Courtauld target which aims to drive waste prevention behaviour.

The Federation House Commitment is a WRAP and Food and Drink Federation (FDF) joint initiative that targets water use in the food and drink industry. Signatories include: Britvic plc, Coca-Cola UK, Cott Beverages, GlaxoSmithKline plc, Nestle UK, and PepsiCo UK from the drinks sector[2].

These initiatives are leading to improvements in resource efficiency across the drinks sector but further opportunities are being targeted by the industry. For example, the soft drinks sector is embarking on the production of a 'road map' which will include long term sustainability goals.

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[1] *http://www.wrap.org.uk/category/initiatives/courtauld-commitment*
[2] *http://www.wrap.org.uk/content/federation-house-commitment-1*

Many individual companies from the drinks sector have developed and published their own sustainability plans.

Method

This study was undertaken in four key steps.

Literature review - The initial data were gathered from corporate reports and market research/data publications (such as Mintel Reports, AC Nielsen's Drink Pocket Book, Britvic plc's annual report and the BBPA's Annual Statistical Handbook). These reports enabled top-level packaging, raw material and water consumption and losses across the drinks sector to be determined.

Interviews with trade associations - This second phase of data-gathering involved a series of interviews with relevant trade associations. These included the Food and Drink Federation (FDF), Wine and Spirits Trade Association (WSTA), British Beer and Pub Association (BBPA), British Soft Drinks Association (BSDA), Scotch Whisky Association (SWA), Metal Packaging Manufacturers Association (MPMA), National Association of Cider Makers (NACM), British Glass and the British Retail Consortium (BRC).

The drinks trade association representatives were invited to suggest suitable companies for site visits and questioned on where knowledge gaps pose a barrier to robust understanding of the situation. At this stage of data-gathering a review of any evident gaps was undertaken. Trade association interviews gave a clearer understanding of the likelihood of data weaknesses and the means of addressing the gaps was developed. This included site audits undertaken to gather primary data.

Company interviews and site visits - The data-gathering process involved some 10 in-depth interviews and 20 site visits with members of the drinks supply chain, with the objective of breaking down top level consumption and loss tonnages determined in the literature review to

specific points in the chain. At each stage, the quantity and quality of water used, the quantity and quality of wastewater produced and the composition of the waste were identified, where possible. This enabled the water consumption and waste generation per unit volume of product to be calculated.

Development of resource maps - Individual resource maps were created for the twelve product groups. The inputs and outputs at each stage of the supply chain were evaluated and the CO_2 and water impacts at each of these stages were determined. Both solid and liquid waste, together with packaging inputs and losses, were analysed and converted to carbon equivalent impact. The hotspots of consumption and waste were determined, considering both the avoidable and the non-avoidable wastes. Where possible, reasons for loss were attributed to practices carried out and the processes were evaluated to determine opportunities for improvement.

Recommendations were given to reduce consumption and improve efficiency, but where this was not possible, waste management techniques were considered with regards to moving up the waste hierarchy.

The resource maps are included in each of the six sector based resource reviews that accompany this summary.

Results

About 11,900 million litres of product are produced each year within the 12 drinks sectors examined in this study. Table 1 provides an estimate of the resource streams involved within the supply chain.

Table 1: Summary of the major resource streams for the 12 drinks sectors

Product category	Product sub category	Total production	Total in-process raw material losses	Total water consumed	Total waste water discharged	Total organic arisings from extraction	Total packaging waste
		Mlitres	Mlitres	Mlitres	Mlitres	Tonnes	Tonnes
Soft drinks	Carbonates (on-trade)	4,846	309	7,816	2,970		61,417
	Carbonates (off-trade)						
	Still and juice drinks		31				4,000
	Fruit juice	811	57	2,839	2,028		3,438
Cider		960	19	3,226	2,286	36,000	10,303
Beer	Micro	210	4	19,935	15,282	47,950	87
	Draught	2,190	44			344,890	
	Packaged	2,100	42			337,090	50,421
Gin/vodka		196	5	12,184	11,612	3,000	34,504
Whisky	Malt	376	19			424,000	
	Grain					315,000	
Wine		214	9	704	490	2,000	5,018
	Total	**11,903**	**539**	**46,704**	**34,668**	**1,509,930**	**169,188**

Source: Oakdene Hollins estimates from the 12 resource maps

Please note, most raw materials for soft drinks (fruit juice, etc) and gin / vodka (neutral alcohol) are imported, and hence there is minimal "total organic arisings from extraction".

The table highlights the significance of water as a major input resource. It shows that, on average, 4.2 litres of water are used and 3.2 litres of waste water are generated per litre of product. Total organic arisings amount to around 1.5 million tonnes, though the majority of this is classed as a by-product rather than a waste stream. The majority of organic material has a long standing use as animal feed. In terms of solid waste, it is estimated that the industry generates around 169,000 tonnes of packaging, much of which is recycled, and around 300,000 tonnes from the extraction processes (though it did not prove possible to break this down by industry sector or cause). The study did not quantify the amount of waste that is sent to landfill (previous work by the Environment Agency indicates that beverage manufacturers sent 25,000 tonnes of waste to landfill in 2008).

Water management, product loss and packaging are the three main 'hotspots' with each offering significant opportunities for resource efficiency gains across each of the six sectors.

Water management

Table 2 shows an analysis of annual water consumption in the UK drinks sector by category for 2010.

Table 2: Analysis of annual water consumption in the UK drinks sector, 2010

Drinks sectors	Specific water consumption (water:product ratios)		Total volume of product (Mlitres)	Total volume of water used (Mlitres)		Difference between average and best practice (Mlitres)
	Average	Minimum		Average	Best practice	
Beer	4.43	2.96	4,500	19,935	13,320	6,615
Wine	3.29	1.46	214	704	312	392
Fruit juice	3.5	0.5	811	2,839	406	2,433
Carbonates	1.53	1.36	4,410	6,730	5,998	732
Juice drinks	1.53	1.36	436	1,086	593	493
Distilleries	21.3	7.72	572	12,184	4,416	7,768
Cider	3.36	2.38	960	3,226	2,285	941
Total			**11,903**	**46,704**	**27,329**	**19,374**

Sources:
BBPA confidential member data
The Beverage Industry Environmental Roundtable. Water use benchmarking in the beverage industry. Trends and observations, 2010
WRAP. Delivering processed water efficiency. IGD. Richard Barnard Ashact Consulting. October 2010
Primary data gathered during this study.
http://www.cokecorporateresponsibility.co.uk/big-themes/water-use/reducing-water-use.aspx

A further analysis shows that a 10% move in average practice towards the minimum or best practice would result in an estimated annual saving of 1.9 billion litres of water with an associated economic potential saving of up to £6 million and an environmental saving of 2.0 million tonnes of carbon dioxide equivalent (see Water Efficiency Review). The main opportunities arise in distilleries and in brewing.

Water efficiencies can be realised by:

- Measuring water use, determination of water intensity (specific water use or water:product ratio) at site level and subsequent setting of water reduction targets;
- Installation of sub meters to quantify and monitor water usage on key water-using operations; and
- Calculating a water balance which is a numerical account of where water enters and leaves the site and where it is used within the site operations, listing the amounts of water used by each main process.

Because of the importance of water as an input to the industry, a cross sector theme (Water Efficiency Review) outlines in more detail savings opportunities. The review defines the targets set on water use by many of the larger companies and how reduction in water use for cleaning, cooling and steam generation, for example, can be achieved.

Two further cross sector themes have also been identified, namely 'clean-in-place' and effluent separation. Additional details are contained in the separate reviews that accompany this summary.

Cleaning down can account for as much as 70% of the overall water use. All the companies visited within the study operated clean-in-place (CIP) systems for cleaning down, with a volumetric or a timed process being the standard practices. In such cases, cycle times or volumes are often based on the worst-case scenario, often with an additional safety

buffer to "make sure" the equipment is truly clean. Five key improvement opportunities are:

- Process design: ensuring that cleaning requirements are considered at the design stage;
- Optimising the CIP programme: to ensure the appropriate programme is used;
- Real time cleaning verification: to minimise product loss, water usage and changeover time;
- Novel technologies: to increase the take up of new technologies; and
- Low temperature detergents: to reduce the energy use during CIP.

These developments are considered further in the separate review on CIP.

Some 34 billion litres of water are discharged annually by the drinks sector. The treatment methods widely in use focus on compliance with regulations rather than on actively decreasing the materials entering the waste water stream or on segregating wastewater streams that have potential for recovery. Treating waste water for recycling can often be advantageous because it can contain high levels of easily biodegradable chemical oxygen demand (COD). Anaerobic digestion (AD) is one possible method that produces methane for use as a renewable energy.

In-plant control measures should always precede end-of-pipe treatment options. Water re-use from wastewater streams that have low to medium levels of pollutants is feasible in most plants and can offer quick payback due to the reduction in mains water consumption costs and in effluent disposal. Other recovery options are set out in the cross sector review together with case studies on good practice.

Product loss

Yield losses within bottling and processing vary between 2% and 7% depending on the type of drink and the sector. For alcoholic drinks yield losses were nearer 2% while for soft drinks losses were closer to 7%. Figure 2 shows an analysis of the main causes of yield loss.

Figure 2: An analysis of yield losses within the soft drinks sector

The factors contributing to yield loss also vary by drinks type although product 'giveaway' is relatively common. These losses are compounded by the sourcing of material like neutral alcohol and fruit juices (apart from apples) outside the UK where additional yield losses will arise but are outside the scope of this study. Ingredients like these and bulk wine shipped for bottling in the UK are delivered in bulk tankers or flexitanks which have a capacity of 25,000 litres. Other ingredients typically for branded products are supplied in ready-made batch quantities or 'compounds' which can result in large volumes being supplied in small volume units.

This study identified a high level of variability in the filling operations within the soft drinks, cider and beer sectors, accounting for product losses of as much as 1.3%. In the case of under-fills many are not reworked because it is not considered cost effective. Overfilling ('giveaways') are often accepted as assurance that nominal filling levels

have been met in compliance with 'weights and measures'. The solution is to tackle process variability either through staff training or by improving the performance of the equipment. The high product cost and duty implications associated with spirits result in a much higher level of control.

Differentiation has led to an increasing number of stock keeping units (SKU's) running on each production line. It is common for lines to produce over 60 SKU's varying in terms of both product type and packaging format/size. This often leads to:

- High levels of product waste at changeover;
- High levels of clean-down which is the most significant water use; and
- High set up losses.

Over-production results when product is produced in excess of customer demand. Even in a made to order sector like soft drinks over-production can be as high as 1.5%. Three generic causes can be identified namely, poor communications with customers, inherent variability in production processes and the need to forecast orders for raw materials like juice concentrate from Brazil, neutral alcohol from the USA and bulk new world wine for bottling in the UK all of which have long lead times.

The production processes result in around 1.5 million tonnes of organic material, mostly spent grains. From 2006 this material has been classed as a by-product so is not regarded as a waste stream. The majority, some 1.2 million tonnes, are sent to animal feed which is a long-standing use that has evolved between, in particular, the Scotch Whisky industry and local farmers.

A more detailed review of each of the four topics can be found in separate reports on:

- Product losses;
- Reducing filling losses;
- Over-production; and
- Organic arisings.

Packaging

Results from the first year of the Courtauld Commitment (second phase) shows that signatories, including drinks companies from the sectors examined in this study, are decreasing the material used in packaging. The majority of the reported decrease is associated with paper and card and plastic split almost equally. The amount of recycled content is also reported to be increasing.

This review shows there is further scope for light-weighting all forms of packaging and that particular opportunities arise to prevent some of the 169,000 tonnes packaging waste that arises annually in the supply chain. While much of this material is recycled, prevention can offer both economic and environmental benefits.

Apart from further light-weighting there are five areas in which packaging reductions can also be made within the supply chain, namely:

- Stretchwrap;
- Layerpads;
- Slipsheets;
- Preforms; and
- Innovation.

Stretchwrap is used widely across the sector to secure product loaded onto pallets for transportation. It is one of the most recovered and recycled plastics in the UK because a keen price can be obtained. However, the savings opportunity from waste prevention is higher. It is estimated that savings of £5.78m are achievable across the sector by reducing the weight of wrap per pallet.

Further details of this and the other four areas are included in the cross-sector review on reducing packaging waste.

Conclusions

This study has made a contribution to improved resource efficiency within the drinks sector. It demonstrates there is much that individual sectors can do at no or low cost to realise environmental improvements and provides a platform from which longer term sustainability goals can be identified and achieved.

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