PRACTICE: Lightweighting

PRACTICE

Using efficient packaging to reduce waste, energy usage, and carbon dioxide emissions

DESCRIPTION & RESULTS – Lightweight Plastic

The United Kingdom drinks industry was able to improve the resource efficiency of plastic bottles by collaborating with the WRAP (Waste & Resources Action Program) and signatories of the Courtauld Commitment, which is a voluntary agreement between WRAP and major UK grocery organizations that support less packaging and food waste ending up in household bins. Several major companies made high-profile changes to their PET (polyethylene terephthalate) packaging – boosting their environmental profile and saving on valuable raw materials. Using lightweight bottles also saves on energy and carbon emissions.

In 2007-2008, **Coca-Cola** rolled out a process to lightweight its range of 500ml plastic PET bottles by reducing the overall packaging weight from 26g to 24g, representing a material saving of 8%. The change has affected 700 million bottles annually – including Coca-Cola, Diet Coke, Fanta and Sprite – saving approximately 700 tons of PET each year.

In 2011, **Coca-Cola Amatil** (CCA) continued the $450 million group-wide rollout of blowfill technology, or PET bottle self-manufacture technology, with three additional lines commissioned in Australia. Blowfill technology enabled CCA to design new lightweight primary and secondary packaging, and has enabled the saving of thousands of tons of raw materials. CCA's Mount Franklin Easy-Crush bottle went into the market in 2011 as the lightest Australian-produced 600ml water bottle made with 35 percent less PET plastic and a carbon footprint that is 27 percent less than the previous Mount Franklin bottle. The Mount Franklin Easy-Crush Bottle is also 100 percent recyclable and easily crushed when empty, making it easier to recycle. This innovation was awarded gold in the Australian Packaging Covenant Sustainability Award category of the 2011 Australian Packaging Design Awards. Blowfill technology has enabled CCA to lightweight its entire small carbonated soft drink PET plastic bottle range, making the bottles the lightest in the global Coca-Cola system. When the rollout of the blowfill technology across the group is completed in 2015, it is estimated that more than 9,000 tons of PET resin a year will be saved.

Britvic introduced a new lighter bottle in 2008 for its one liter Robinsons squash – the UK's best-selling brand of squash. The bottle is 2g lighter than the previous container, saving over 300 tons of PET each year, and reducing the energy needed to manufacture the bottle by 5%. The changes have also enabled 25% more cases of Robinsons to be loaded onto pallets, reducing lorry loads, fuel costs and carbon emissions.

Artenius PET Packaging UK, in conjunction with Tecsor SA (France) and Artenius R&D Brecht, researched the production of super lightweight plastic packaging for 330ml and 500ml still water bottles. The trial, supported by WRAP, examined the possibility for a sub-10g container for both pack sizes. Following the production of a prototype and consumer and technical testing, the trials suggested that a monobloc form-fill-seal combination system could facilitate the production of a super-lightweight bottle for still drinks. This could potentially provide a material saving of around 30 – 40%, and an opportunity to make considerable financial savings. These super-lightweight bottles could provide an excellent opportunity in certain sectors of the market, such as children's lunchbox drinks, however it would require an initial investment in production facilities.

With WRAP's Innovation Fund, **Esterform Packaging** undertook a project investigating the commercial feasibility of reducing the weight of two PET bottles made for two UK carbonated soft drink suppliers. The aim was to reduce the weight of a 2 liter bottle from 42g to 40g; and to bring the weight of Radnor Hills' 25g 500ml bottle down to an ambitious 20g. The results confirm that thanks to advancements in blow molding, resin and preform design technology, it is possible to produce innovative lightweight PET bottles which don't compromise performance, strength or appearance.

By reducing the 500 ml bottle to 20g, Esterform Packaging set a new Best in Class standard - developing Europe's lightest 500ml PET bottle for carbonated soft drinks. The 20g bottles passed on-line tests for assessing filling, capping

and labeling performance and met all of Radnor Hills' filling and shelf-life requirements. For the 2 liter bottle, Esterform Packaging designed a lightweight 40g bottle which was subjected to burst pressure tests as well as carbon dioxide retention and creep behavioral analysis, to determine whether lightweight bottles 'creep' and lose their 'fizz' quicker than heavier bottles. The bottle passed all the tests and met line filling, capping and labeling requirements in initial on-line trials.

The project estimated that if all 500ml and 2 liter PET soft drink bottles sold in the UK switched to lighter weight preforms, 3,400 tons of packaging material could be saved every year. Massive energy savings of 2,811 million kWh could also be realized. This is equivalent to the energy required to power 703 three-bed households per year - showing that small changes can make a big difference.

To assist other companies in replicating the success of this project, WRAP recommends keeping the following points in mind when considering implementing lightweighting of PET bottles:

- New or modified moulds play an important role in delivering the lighter weigh preforms, and their cost needs to be calculated as part of the case for change;
- Change to preforms for lighter weight bottles should coincide with pre-planned mould modifications or renewal;
- Stocks of current preforms should be carefully monitored to ensure that the lighter bottles can be introduced as quickly as possible; and
- Sharing information on new Best in Class PET bottle weights within the industry will maximize commercial and environmental benefits of lightweighting.

DESCRIPTION & RESULTS – Lightweight Cartons

Lightweighting cartons and closures and sourcing paper packaging from sustainable forests continue to increase. Courtauld Commitment signatory **Innocent Drinks** reduced the amount of paper used in their 1 liter carton by 8%, saving nearly 100 tons of paper (over 2,000 trees) and around 250 tons of carbon per year. Recycling of cartons is becoming more widespread in the UK, with more than 65% of local authorities collecting liquid cartons through bring banks.

DESCRIPTION & RESULTS – Lightweight Aluminum

Research undertaken in 2007 as a result of a WRAP, **Coca-Cola**, and Beverage Can Makers Europe partnership demonstrated there is potential to lightweight aluminum carbonated cans by 5% – and potentially more. This is achieved by not only reducing the gauge of the can body and end, but also by modifying the design of the can. The widespread production of light-weighted soft drinks cans has already begun and as a result, it is anticipated that the EU can industry will save almost 15,000 tons of aluminum each year, and make significant cost savings. Lightweighting aluminium drinks cans by 5% across the EU will save 88,000 tons of
carbon dioxide – equivalent to taking 28,000 cars off the road.

DESCRIPTION & RESULTS – Lightweight Glass

It is sometimes assumed that lighter weight glass bottles will suffer higher rates of failure, as it could be perceived that they are weaker. However, technical tests on new lighter glass bottles have shown that the 'Narrow Neck Press and Blow' process for manufacturing can result in a more even glass distribution than traditional methods, which more than compensates for the weight reduction. In fact this manufacturing method often results in stronger bottles than their heavier counterparts.

One project in the UK brought together retailers, brands, producers, fillers and glass manufacturers to encourage a move to using lighter weight glass bottles for soft drinks. A number of different products were successfully light-weighted as a result of this project, saving over 10,000 tons of glass each year and 3,150 tons of carbon dioxide.

AE Chapman & Son Ltd, together with glass manufacturer O-I, successfully light-weighted eight variants of 250ml, 330ml, 500ml and 750ml mineral water bottles. They ensured the external dimensions of diameter, label panel height and neck finish were unchanged to minimize any visible difference to existing customers and to ensure that the bottles could be used on a variety of different filling lines. Following the design changes, the 250ml bottle was reduced from 210g to

190g, the 330ml by 30-40g, the 500ml by 40-60g and the 750ml by 50-70g. In total, this led to a saving of 1,790 tons of glass per year – clearly demonstrating the business benefits and adaptability of this approach.

Coca-Cola reduced the weight of its iconic 330ml contour bottle by a fifth, which led to savings of over 3,500 tons of glass and an estimated 2,200 tons of carbon dioxide each year. All 330ml glass bottles of Coca-Cola, diet Coke and Coca-Cola Zero are now made to the new specification, weighing 20% less – reduced from 263g to 210g – but retaining dimensions, quality and strength. The new lightweight 'Ultra' bottles are manufactured by Ardagh Glass using design software that helps determine the stress points and optimum weight of a glass bottle, allowing technicians to create both the strongest and lightest viable design. Ardagh also light-weighted a number of other glass bottles for Coca-Cola, including the 750ml Appletiser and 330ml Fanta and Sprite bottles, achieving over 800 tons of raw material savings.

The benefits of conversion of the glass bottle to Ultra fall into three categories:

- **Environment:** Ultra bottles are by design lighter than alternative bottles. The Ultra 330ml Contour is 30g of glass lighter than non-Ultra bottles, and this equates to 3,500 tons of glass per year. Additionally, as the production of glass is energy intensive, this would also equate to a savings of 2,200 tons of carbon dioxide being released into the atmosphere.

- **Safety & Quality:** Ultra designs have been shown to be stronger than non-Ultra designs, and so are less likely to burst during filling and use phase. CCE has seen a reduction in burst rates from 1 in 23K to 1 in 50K (estimated) during filling. Expected reduction in consumer complaints is comparable.

- **Sustainable packaging & cost savings:** The Ultra design saves 20% of glass raw material. Based on the raw material savings, an estimated £250k is saved annually. The savings on the energy is still to be confirmed, however in 2003, it was estimated at more than £100k annually.

Britvic reduced the amount of glass in bottles of its juice drink J2O. The new 275ml bottle is 20g lighter, with each bottle reduced from 200 grams to 180 grams, saving around 4,000 tons of glass per year, equivalent to 20 million bottles of J2O a year. The new design has also led to improvements in filling line efficiencies, due to the bottle being lowered in height, as well as energy savings as less glass is used during bottle blowing. There is no visible change to the J2O bottle as the volume remains the same, despite the height having been reduced by 5mm. The bottle has also maintained its durability and strength, ensuring that it can be stacked and stored as usual, which is important for Britvic's customer needs.

DESCRIPTION & RESULTS – Recycled Content

Improving the environmental benefits of drinks packaging also includes increasing the use of recycled content, which will help reduce carbon dioxide. For example, specifying 50% rPET (recycled PET) content will reduce the carbon dioxide equivalent of a bottle by approximately 25%. In addition, research has shown that consumer attitudes towards recycled plastic packaging are favorable, and that many shoppers would prefer to buy products using recycled packaging over those that did not. Therefore, businesses could benefit from responding to this demand.

Innocent Drinks is one company to have made significant progress in reducing its carbon footprint by leading the way in terms of using rPET. In September 2007, Innocent became one of the first brands in the world to put drinks on the shelf in 100% recycled plastic bottles. It started by using rPET for four of its smoothie flavors; however, the company extended this in January 2008 to produce all of its recipes in the 100% rPET bottles. In making the change, along with light-weighting the bottle, Innocent reduced the carbon impact of packaging by 55% and carbon emissions by 1,000 tons during 2008.

Since March 2008, **Sainsbury's** Taste the Difference 250ml, 500ml and 1L fresh chilled juices have been packaged in 100% recycled plastic bottles – helping to save 375 tons of virgin plastic per year.

Coca-Cola Amatil (CCA) produces the Mount Franklin Easy-Crush Bottle, which is 100 percent recyclable and easily crushed when empty, making it easier to recycle. CCA has also contributed to major recycling initiatives with customers, including Westfield and Hoyts. Other efficient recycling achievements include:

- Sustained investment in public place recycling infrastructure through the Packaging Stewardship Forum (PSF), which contributed to the installation of more than 5000 new recycling bins and the provision of free signage support to 38 councils and communities across Australia to educate the community on litter reduction and recycling
- The continued roll-out of the Coca-Cola Customer Recycling Program with in excess of 450 Coca-Cola branded wheelie bins rolled out across the country

- The ongoing funding of the Coca-Cola Foundation Community Recycling Grants to Keep Australia Beautiful which, in turn, offers financial assistance to local communities wishing to improve beverage container recycling.

RESOURCES

More detail on these WRAP projects, including a full technical report, is available from www.wrap.org.uk/retail.For more information, or technical advice, contact the retail team at WRAP on 01295 819686 or email retail@wrap.org.uk