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Getting warmer...

How breweries can cope with climate change

BY ANTHONY GLADMAN

Last year saw Extinction Rebellion protests sweep across the globe, summer temperatures in Europe break past 45°C – and massive bushfires in Australia fuelled by record-breaking temperatures and months of severe drought. The need for action on climate change has become clearer than ever, but what does this mean for brewers?

The Intergovernmental Panel on Climate Change has issued critical warnings for global warming of 2°C and more above pre-industrial levels. To keep within this all business, brewers included, must reduce their carbon emissions.

But although the need for action is clear, there's no point taking shots in the dark. Lucy Harbor, who runs environmental consultancy Cool World Consulting, says that many companies make changes to be more environmentally friendly without knowing what the impact of those actions would be.

"With some businesses that I've looked at, it can actually backfire. Something they do to be more environmentally friendly can actually end up creating a bigger carbon footprint for themselves. One example is cloth bags. Lots of companies give out cloth bags with their logo on them. Cloth bags actually have to be reused 180 times in order to be better than a plastic bag. So, they're great if people are going to reuse them a lot. But if it's a cloth bag thats not-particularly-nice that people will probably only use three times then it's actually much worse."

Carbon footprints

Carlsberg UK worked with The Carbon Trust to measure the environmental impact of its business in 2015 and did so again at the end of 2019. The work carried out produces what is called the beer-in-hand carbon footprint, which takes in all stages of the process from the farmers growing barley right up to the pint held by the drinker. Quantifying the impact of the various parts of its business informs its work to reduce emissions and allows the company to measure its

Banning hoses and a dry floor policy make for a very noticeable point of difference at the Small Beer Company

progress against specific targets.

This process is not limited to the multinationals, however. Lucy Harbor worked with The Kernel Brewery in London to assess its carbon footprint in 2014, when the brewery was contemplating a switch from KeyKegs to reusable steel kegs, and again in 2016.

You might think that reusable steel kegs are obviously better than one-way KeyKegs, but it's not as simple as that. Ben Landsberry from The Kernel explains: "That stainless keg, it's still better for the environment to send the stainless keg to Scotland full, and then get it shipped back to us empty, than it is to send a one-way keg. But once it leaves the UK, it's better to send a KeyKeg. We would have to be getting them shipped back empty, which is just a big waste."

Sustainability isn't a single issue. It is a tangled web of cause and effect spread over many different arenas. This means that when you want to make your brewery more sustainable you can't just wave a magic wand and do it all at once. You have to pick and choose where to spend your effort, your time and your money. So where to start?

Water-intensive production

Within the sustainability sector there is growing recognition that water has implications for other areas such as energy and food security. If you were to put all the separate issues contained within the big green bag that is 'sustainability' into some sort of hierarchy then water would come out at or pretty near the top.

Water scarcity already affects every continent. Figures from the United Nations show that there are 700 million people in 43 countries already suffering from water scarcity. By 2025 that figure is expected to more than double to 1.8 billion people.

By that time, it is thought that two-thirds of the world's population will live under water-stressed conditions. Even in the UK, where water seems abundant, the government has warned that demand could outstrip supply within 25 years due to population growth and climate change.

Brewing is the most water-intensive production process in the beverage sector, around one and a half to two times more water-intensive than soft drinks production – while there is also huge water usage in the production of beer's principal agricultural raw materials. Given these facts, it makes sense to look at these water-intensive areas closely.

Carlsberg has made water-use one of the pillars of its Together Towards ZERO initiative, which aims to reduce the company's environmental impact across four key areas between 2015 and 2030. In the UK Carlsberg used 2.9 hectolitres of water for every hectolitre of beer produced in 2015. This ratio of 2.9:1 was already good compared to the industry average, but the company's target for 2030 is an ambitious 1.7:1.

"Basically we should be making the most of every drop we get out of the tap," says Peter Statham, Sustainability Manager at Carlsberg UK. "That's major and would be very difficult for small breweries to achieve."

By 2018 the company had already seen a 22% reduction in its water use thanks to increased efficiency. "Last year we took the water that we use for the rinse on the bottles and it is now used in the pasteuriser," says Statham. This saved 45,000hL of water during 2018 – enough to fill an Olympic-sized swimming pool 18 times.

Moreover, by improving the software

Snap Pack, the product of three year's collaboration with NMP Systems, will reduce Carlsberg's global plastic use by 76%, saving 1,200 tonnes of plastic annually

which controls the pasteuriser, the company was able to improve temperature control and changeover times. This led to a further saving of 12,000hL and almost 300,000kwh of heat energy.

Small companies working hard

Carlsberg also found efficiency savings with its centrifuge. The company uses a large amount of water to keep this equipment cool, which would once have been treated as waste but is now stored and reused for cleaning and further cooling elsewhere in the brewery. This saves around 300,000 litres per year.

So when it comes to water use, Carlsberg is performing well compared to other brewers. In 2017 the average water-use ratio for the UK's brewing industry was 3.5:1, according to figures from the British Beer and Pub Association. You would expect large multinational brewers, with their big budgets and benefits of scale, to be at or below this figure.

The average is this low precisely because it includes these large, efficient breweries. And you would be right to expect most smaller breweries to have a ratio somewhat higher than this figure. But here too you can find companies working hard to reduce their water use.

Small Beer Brew Co, a 50hL brewery in south-east London, has already achieved eye-opening results with its water use. "It's a little under 1.5:1 and we're always looking to shave off more where we can," says co-founder Felix James. "This includes all water on site, including toilet flushing, washing up etc. When we include offsite packaging, this does creep up towards the 2:1 mark."

"Every brewer worth his or her salt knows that a good brewery starts with a draining floor, but we decided there was a better alternative," says James. "In a traditional brewing environment, brewers drain waste products to the brewery floor and use hoses to wash down into a drain.

"Hoses aren't particularly suited to this purpose and many brewers will relate to the frustration of wasting time and water washing down floors. We have successfully engineered a brewery with a dry floor which saves hundreds of litres of water every day."

While banning hoses and keeping a dry floor make for a very noticeable point of difference from other breweries, it was the other measures that Small Beer Co undertook that had the most impact. "The biggest saving at Small Beer comes from using electrical energy to recover the majority of heat from our wort. Much of the 'lost' water (i.e. the half pint that doesn't end up in the pint of beer) actually ends up in our spent grain which goes to cattle feed."

This has a knock-on effect that saves even more water. "The farmer tells me that the cows drink significantly less from their trough when they eat the grain versus alternative feed stocks."

Once the beer is brewed, there's packaging to consider. For most in the industry, this will be the largest component of their brewery's carbon footprint. At Carlsberg it accounted for 41% of all emissions in 2015, a figure that the company has been working hard to reduce since then.

Plastic and paper

In March 2019 Carlsberg launched its Snap Pack packaging for six and eight packs of its Pilsner, which replaced the familiar plastic hi-cone rings. Instead, blobs of glue attach the cans to each other, with a thin strip of plastic serving as a handle. "We're not swapping out the plastic for something else, we're trying to design it out completely," says Statham.

Snap Pack is the product of three year's collaboration with NMP Systems during which time the company tested over 4,000 different types of glue looking for the right one. Carlsberg says that adopting this new format across the whole group will reduce its global plastic use by 76%, saving 1,200 tonnes of plastic annually.

This is equivalent to removing 60 million plastic bags from the environment. "The next step is to look at sharing it with our partner brands, such as San Miguel, during 2020. I think there is a big role for it in leading the industry," says Statham.

"Sustainability has always been a compromise and a worse version of what was already there, but this is much better. We've seen our customers react really well. We've got lots more listings off having Snap Pack and now some customers are saying they don't want hi-cones at all."

Not content with that, the company revealed in October that it was developing the world's first 'paper' beer bottles, made from sustainably-sourced wood fibres. The bottles are both 100% bio-based and fully recyclable – and feature an inner barrier to allow the bottles to contain beer.

At the moment Carlsberg has two prototypes of the bottles, one of which uses a thin recycled PET polymer film barrier, while the other has a 100% bio-based PEF polymer film barrier. These prototypes will be used to test

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the barrier technology as the company seeks a solution to achieve its ultimate ambition of a 100% bio- based bottle without polymers.

Bottles to cans

Many smaller brewers have switched from glass bottles to cans over recent years and these can certainly represent major emissions savings. Cans are lightweight and stack well, which leads to more efficient transport, plus they are highly recyclable. But still brewers must be careful.

"You need to be sure about the environmental credentials of the can. Cans have the potential to make a really big difference, but that's only if it's in a very efficient facility. The emission factor can vary between one and twenty, depending on whether you're using a factory that's powered by coal, or a factory that's powered by renewable energy," Lucy Harbor explains.

Another important point to consider is the amount of recycled material used in the packaging. Harbor says that of all the steps open to brewers, this may represent the easiest win.

"Recycled material has a very big impact with cans and with bottles. If you want to reduce the impact of your bottle, you could go and ask different glass bottle manufacturers what the recycled content of their glass bottle is. And the higher the content, the lower the footprint.

"That makes a substantial difference. It's the same for the cans as well, because there's just lots more emissions involved in producing it from raw materials compared to from recycled material. You tend to need higher temperatures and there's still the emissions from the extraction and the refining of all the materials."

Another place to look for improvements is the power used in the brewery. Here again the larger multinationals, with their size and increased purchasing power, are at an advantage.

Renewable energy

Budweiser Brewing Group UK&I, for example, announced at the end of 2018 that it was entering into a 15-year power purchasing agreement with Europe's largest solar energy company, Lightsource BP, to secure 100% renewable electricity for its UK operations.

Under the deal, Lightsource BP will build and operate solar panels capable of producing 100 megawatts of electricity for AB InBev's Budweiser breweries at Magor in South Wales and Samlesbury in Lancashire. Together these produce over 17 million bottles and cans of Budweiser each week. Once Lightsource BP's solar energy is connected, these will all feature a new symbol to encourage consumers to choose a beer brewed with 100% renewable electricity. This is expected to be completed by the end of next year.

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Carlsberg too is working on improving its energy supply. At present the Carlsberg Group offsets the electricity it uses globally through buying renewable energy certificates. "That's a midground," says Statham. "It's definitely not the end point but it's better than doing nothing." The challenge Carlsberg faces is that the supply of renewable energy in the UK is not yet large or stable enough to meet its needs. "That's maybe something that's more difficult on our scale," Statham says.

If the company were simply to switch to source renewable energy from the UK grid, it would simply consume the UK's renewable energy capacity without contributing anything. So instead the company is looking at other sources of clean power.

"We are developing a system which will recover and store the heat energy lost during the brewing process. This stored energy can be used again in the brewing process and possibly other areas of production."

Of course, not all of this need be done at scale. With thoughtful design any brewery can capture and reuse at least some of the heat it produces during brewing. And beyond that, some of the best things to do are also the simplest: "One of the challenges we have is getting people to turn off kit they're not using. That's a big efficiency saving. If you've got a pasteuriser running and there's nothing going through it, that's major in water and energy use," says Statham.

And at the consumer level, there's an even simpler move that will help keep emissions low: drink local. "If you're going to buy a beer from the West Coast of America then that's going to have a lot of emissions [once it reaches the UK]," says Harbor.

"So, I think brewers that do make an effort to make sure their own emissions are low from their brewing, if they're promoting and selling their beer locally, maybe that's something that they could be saying to their customers. You buy local and you save all the transport emissions, and hopefully get better beer, because I think it's going to be better if it's not transported so far."

Back at the Kernel in south-east London, Ben Landsberry agrees: "The most sustainable thing would be to have beer in serving tanks, and everybody comes to drink it at the brewery."