



Outside the box

Novel reuse of brewery waste streams

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When it comes to brewery waste, reduction is key. Be it packaging, spent grain or anything else, producing less waste is the easiest way to deal with it. Still, waste cannot be eliminated altogether. There comes a point beyond which it is no longer possible to reduce it, and so brewers must move on to the next step of the ladder: Reusing it.

This is nothing new; for example, plenty of brewers send their spent grain to farmers for animal feed, or their spent yeast to Marmite for feeding those somewhat closer to home. The brewing industry has consistently reached high levels of waste recovery.

According to Environment Agency figures, brewing produced 37,243 tonnes of waste in the UK during 2017 of which 36,642 tonnes was recovered. That's a recovery rate of 98%, but this doesn't mean the sector can't do better.

In 2019 brewery waste streams were a hotbed of unexpected innovation. In the past few months companies have arisen which see the waste produced by breweries as an opportunity to create something new, focusing on circular economies and positive feedback loops.

New materials

One such is Luna Lab, a young start-up company run by Nanna Guldbaek (better known in the industry as Artistic Director for Norwegian brewers Lervig), along with Poppy Pippin and Oksana Bondar. The three met while studying industrial and product design at university, and since graduating have been busy turning spent grain, yeast and trub into brand new materials.

“We’re trying to keep the processes to a minimum. There’s not going to be a brute force, like there usually is in manufacturing,” says Guldbaek. Indeed, Luna Lab says its processes are so clean that you can even eat off the same surface where the material is made.

The method involves dehydrating the brewery waste before mixing it with fixatives and using a heat press to form it into sheets of new material. By adjusting the mixture or the amount of heat applied, the resulting materials can vary in thickness, texture and strength.

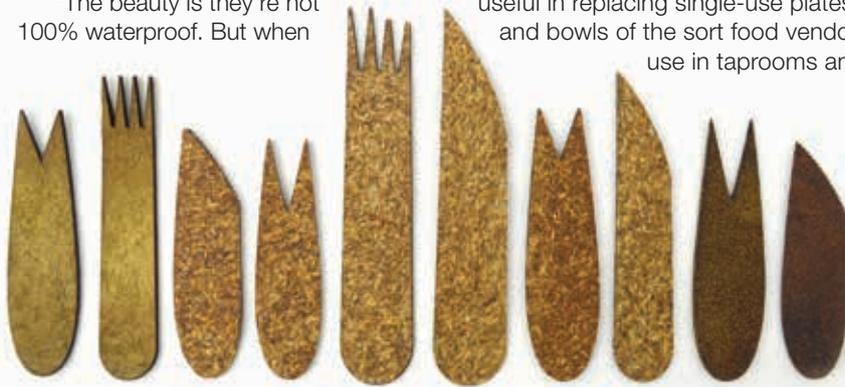
Luna Lab hopes to move beyond prototypes and begin manufacturing products by early 2020, starting with cutlery to replace the disposable plastic knives, forks and spoons commonly seen in brewery taprooms today.

“The beauty is they’re not 100% waterproof. But when

it comes to cutlery, we don’t want it to be forever. We want it to last for as long as I’m eating my sandwich, and then we want it to disappear and be part of a natural circle again,” says Guldbaek. Luna Lab’s cutlery will decompose within a matter of weeks and can even be composted after use.

The trio have also developed a material made from trub, spent hops and other sediments dug out from the mash tun – materials for which they believe no one else has yet found a use beyond animal feed.

Luna Lab transformed leftover gunk from a blackcurrant sour beer made by Wild Card brewery into a strangely beautiful sheet of soft, pliable material that they say could be used to wrap foods. This would be particularly useful in replacing single-use plates and bowls of the sort food vendors use in taprooms and



Cutlery designed to last as long as eating a sandwich



Oksana Bondar, Poppy Pippin and Nanna Guldbaek, aka Luna Lab

at festivals. Again, the material has a short life and will decompose quickly after being used.

Vegetarian products

Marmite has been making use of brewers’ spent yeast in Burton on Trent for over 100 years. But now a new company, FUMI Ingredients from the Netherlands, has found a use for the stuff that could become even more valuable.

The company extracts protein from spent yeast and turns it into a vegan egg-white replacement – a process for which FUMI won Rabobank’s Sustainable Innovation Award in 2019.

FUMI’s co-founders, Corjan van den Berg and Edgar Suarez Garcia, first began working on the process at the University of Wageningen, where Van den Berg was an Assistant Professor in Biorefineries and Garcia a PhD student.

The response to this new product has been extremely positive. Food producers, in particular those already making vegetarian products, have been quick to see its potential. “They ditch their egg-whites ingredient, replace it with ours, and instead of just having a vegetarian product they can now become vegan,” says van den Berg.

This new egg-white replacement also represents a significant environmental benefit. Producing 1kg of egg-whites releases 40kg of CO₂ equivalent into the environment. “It’s really a huge environmental burden,” says van den Berg. By comparison, FUMI

produces just 2kg of CO₂ equivalent for each kilogram of egg-white replacer. “That means a 95% reduction of CO₂ equivalent. So it’s a huge, huge step.”

Van den Berg says he hopes to begin collaborating with some major international brewers to produce the egg-white replacer at scale. FUMI has already been approached by many brewers hoping to make more from their byproducts.

“There are so many beautiful things coming together here where you get the opportunity to go for a vegan product which is made from what you could otherwise consider a waste stream. That is the beauty for me. This is what I’m really excited about.”

Green energy

Another waste ingredient brewers have to deal with – and one you might not immediately expect – is alcohol. In the last 12 months there has been a surge in the production of and demand for lighter beers with lower levels of alcohol.

The moving annual total of low- and no-ABV products has risen by 24.4% in volume and by 29.6% in value in two years, and by 22.7% and 24.3% respectively in the past year, according to CGA. This growth in demand for low and no beers means more waste alcohol for brewers to dispose of.

Before the boom in alcohol-free drinks, this was simply thought of



Yeast protein in powder and heat set gel form, vegan substitutes for egg-whites

as wastage, but with an increased production volume, brewers are looking for ways to make the process more efficient. AB InBev turns waste alcohol produced at its European HQ into biofuel.

Each week the company transports 75,000 litres – enough to fill three tanker trucks – from its brewery in Leuven to Alcogroup, a Belgian biofuel

producer and one of the largest plants of its kind on the continent.

“We want to reuse as much as we can in the circular economy,” David De Schutter, Research and Development Director for AB InBev in Europe said in an interview with *The Drinks Business* magazine.

Alcohol from 85 cans of beer is enough to generate 1 litre of biofuel, according to the brewer. For every 100 litres of residual alcohol, this generates 18 litres of biofuel.

Beyond this, AB InBev has found a further use for its waste alcohol. In September last year a new washing-up liquid from Ecover was launched with waste ingredients from the beer-brewing process making up at least 25% of each bottle. Tom Domen, Long Term Innovation Manager at Ecover, said: “We’ve challenged ourselves to think about how we could use ingredients that already exist and are currently wasted – viewing waste as an opportunity, not just a problem.”

Using brewery waste and byproducts in new and imaginative ways can create value where before there was none. It can also benefit the environment, while reducing the familiar headache of having to pay to have these materials removed and disposed of properly. It probably won’t make digging out the mash tun any less onerous though. Some aspects of brewery waste will never change.

LOVE IT OR HATE IT?

For those that don’t know about Marmite...it is a by-product of beer brewing and is produced by Dutch-British company Unilever, and an early ‘vegan’ food product from brewery waste streams.

Marmite is a paste made from yeast extract and originally made in the United Kingdom. The product is notable as a vegan source of B vitamins, including folic acid. Its invention was made possible by the work of German scientist Justus von Liebig – he of Liebig condenser fame – who discovered that yeast can be concentrated and turned into a nutritious food supplement.

The Marmite Food Extract Company was formed in 1902 in Burton on Trent with the by-product yeast being supplied by Bass Brewery.

Marmite is traditionally eaten as a savoury spread on hot buttered toast, but in recent years has been seen as flavour additive to foods as varied as crisps, rice cakes or even peanut butter. Other similar products include the Australian Vegemite, the Swiss Cenovis, and the German Vitam-R. Vegex, an autolyzed yeast product, has been available in the United States since 1913.

The image on the front of the jar shows a marmite, a French term for a large, covered earthenware or metal cooking pot.

