

# CONTINUOUS IMPROVEMENT?

As reported recently in *Brewers' Guardian*, the Brewery of the Future may well be creating products via continuous brewing. And this, cautions UC Davis professor *Charlie Bamforth*, may not be for the best, as we drift ever further from our traditional understanding of what constitutes beer



Image supplied courtesy of the Norit Group.

Norit's Beer Membrane Filtration system - an integral part of 'The Brewery of the Future', Martens Brewery in Bocholt (Belgium)

The things I do for my art. I found myself teaching a November 2009 course in Wuxi, China with such delightful industry diehards as Pat Ting, Xiang Yin, Rebecca Newman and Evan Evans. Each evening there was a truly excellent banquet, characterised of course by the inevitable gan bei in which, as guest of honour, one is expected to drain glass after glass with the delegates.

One of these banquets featured particularly (should we say) authentic food that was at once delicious, yet provocative. And thus I am to be witnessed drinking Martens 1758, from a plastic bottle.

We were, of course, the invitees of a most welcoming group of men from the company in Wuxi that have brewed this beer since 2008 – the Far Eastern Group. This is a product that owes its name to the company that brewed its first beer in Belgium in, as the brand suggests, 1758.

Let us dwell for a little while on Far Eastern. Take a moment and go to their web site (<http://www.feg.com.tw/en/business/>) to find that the group's core business is textiles. And so one infers that their route into beer was from the packaging end and those plastic bottles.

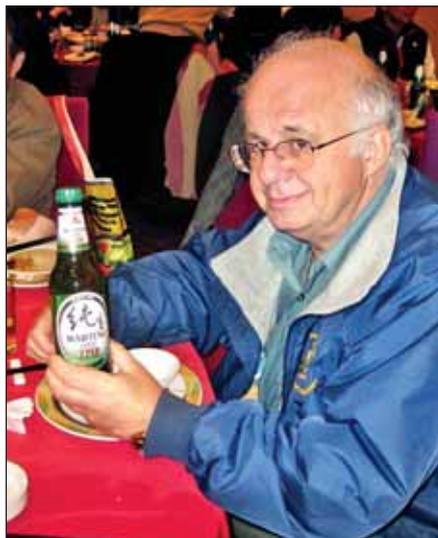
It was an eye-opener spending time at their plant, which I will confess to finding sterile, almost clinical. Yet there is no questioning their efficiency or their industry. They are a group of Taiwanese, living in apartments far from home, who literally live, eat and breathe the brewery 24/7 save for their occasional return to their loved ones at home. They live together, dine together, as well as of course work together, single-mindedly focused on the success of their business.

And perhaps this illustrates the future of brewing. For until relatively recently these engineers had no comprehension whatsoever of what goes into making beer. The company identified brewing as a legitimate extension to their business portfolio, honed in on it as (just?) another product for filling into their plastic bottles and plugged in the brewery as the vehicle by which to furnish the liquid stream for filling.

Is this the norm in our crystal ball? Beer centred on a packaging fulcrum with filling at the heart, as opposed to the current scenario where packaging is merely the final stage in a journey whose heart is, where? The fermenter?

### The mother ship

We need only look back to the originator of the 1758 brand, Brouwerij Martens from Bocholt in Belgium, to find the spirit of challenging the status quo. For here is the latter-day home of continuous brewing (*Brewers Guardian*, November/December 2009). Brewers have spoken of, even embraced, continuous fermentation for many years. And yet the notion of continuous wort production is far less frequently spoken of. The reasons are obvious: it



**Bamforth in China; unimpressed with beer in a plastic bottle**

is far more challenging than “perpetual” fermentation. So challenging, in fact, that I question whether the Martens group truly brew continuously. Is it not, rather, “intense brewing”?

The reality is that few and far between are the descriptions of systems that can in any respect be described as continuous wort production. One of the rare numbers is the continuous mashing approach patented by the APV company (see textbox). It comprised a mash moving in plug flow through stainless steel tubes that were regulated to the required temperature. The mash moved thence to a ring of eight small buckets, each resembling a small mash tun and which rotated through a series of 15 minute stages comprising filling, wort recycling, wort collection, sparging, spent grain discharge and cleaning.

The invention never “took off”. Perhaps there is no shock in this, for to convert solvation, enzymolysis, solid-liquid separation, wort boiling and trub removal into one or even a very few unbroken stages is truly almost beyond comprehension.

So what of Martens? A 20°P brew is started

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every 45 minutes with a flow rate of 200hl/h. There are four successive vessels comprising 1.5 hours' worth of mashing, with 45°C, 63°C, 72°C and 78°C stages, the heat supplied by direct steam injection.

Next stop is one of three Meura 2001 mash filters. At any given time one is in fill mode, one in sparge stage and the other being stripped of its contents.

The wort then is dispatched through a series of vessels that represent the boiling phase: a first tank that received the hop extract, a second that constitutes boiling per se, a third for settling and then a wort stripping stage.

The wort is cooled via one of two wort coolers, with one used and the other in cleaning mode. And thence to the fermenters, certainly not continuous, but featuring a <10 day residence time for fermentation and maturation. Cross flow filtration, and thence to those plastic bottles.

As *BG* editor Larry Nelson noted when writing about the Belgian brewery last year, Jan Martens is proudly an engineer. Some would contend, then, that his embracing of the Meurabrew system speaks indeed to a mindset of stony-cold process efficiency rather than inherent passion for beer. Plastic bottles surely shout this out loud.

And yet in this environment of global greenness can one contradict the statistics, namely the huge savings in energy, steam, water, electricity and cooling demand?

### Is continuous wort production silly?

Let us return, though, to this mystical word ‘continuous’. Of course we might conceive of a process whereby grain is fed at the appropriate rate to a mill that in turn sends a stream of grist to a tubular mashing system in which it is hydrated, allowing for enzyme action “on the run” as the mixture heads to a filter. Naturally we can envisage the emerging wort treated in some way (not necessarily boiling) to effect the key changes currently achieved in a kettle, namely volatile stripping, inactivation of organisms and enzymes and removal of colloiddally-sensitive material. (Isomerisation is not an issue in the era of hop extracts.)

And yet the question surely is this: in a world of isomerised hop extracts, hop aroma products, malt-derived colour and flavour preparations and a diversity of syrups with all conceivable degrees of fermentability, is it not bizarre to try to design ever more convoluted means for

converting a time-honoured batch process (viz wort production) into one with even a cursory semblance of continuousness? I cannot believe that even the most remarkable of processes such as is described above can have any cost-, environmental- or quality-based superiority to one based on the fundamental furnishing of the fermenter with a simple carbohydrate-based feedstock, supplemented with a source of nitro-



A glimpse of the future of brewing: mash tuns and cold cellar at Martens Brewery in Bocholt, Belgium



Image supplied courtesy of the Norit Group.

gen and with the product diversity established as the product runs to package.

Of course there is more than one engineer I know who would say, “Why even bother with the fermentation stage in the brewery? Buy ethanol and add the flavour, colour and foam to that.” Perhaps the ethanol could come from hydrating ethylene, out of the petroleum industry. Or how about using the bacterium *Clostridium ljungdahlii*, discovered in chicken waste, which produces ethanol from mixtures of carbon monoxide and hydrogen?

**It is that old paradigm thing again?**

Lest the reader think I have gone to the dark side, have lost my marbles, or am simply trying to be facetious, let me reassure you by admitting to none of these things. I merely seek to reinforce a point that I have (perhaps) made too many times, namely that the tradi-

tional way of making beer is charming but not necessarily the best.

For sure, the purist and passionate me says that I would always prefer my beer made in time-honored processes. And within the current portfolio of flavour ingredients of the extract variety, the ONLY way to make the finest beers is to my mind on a platform of tradition.

However, if we are going to embrace radical approaches, for goodness sake let us not contort ourselves with ever more bizarre procedures that attempt to take us from traditional raw materials to traditional worts. To step away from mashing vessels, lauter tuns/mash filters and kettles is surely to move to entirely novel procedures for producing a fermentation feedstock.

This of course takes us to New Zealand and the much heralded last bastion of continuous fermentation, Dominion Breweries.

I was honoured to meet Morton Coutts (1904–2004) who first experimented with continuous fermentation in 1930 (see *textbox*). Coutts supposedly said:

*“... yeast can be properly controlled if you look on it as a human being with a brain. It has so many enzyme mechanisms to call upon to react to whatever is necessary for its survival. Instead of looking on the final product I always took notice of the yeast as an organism that produced whatever you ended up with...”*

Eighty years on, and Dominion Breweries are still fermenting continuously, an approach staunchly and eloquently championed by Doug Banks. It has served them well and I personally have stepped in for them to collect awards for their beers when they were unable to travel to UK in person.

It works for them. For a diversity of reasons it did not succeed for many other companies across the globe, not least the British brewers in the sixties and seventies. For instance, Bass employed tower fermenters with up-flow of the liquid stream through heavily sedimentary yeast capable of forming a plug at the base of the vessel. By adjustment to the yeast content and the rate of wort flow, green beer could be produced in less than a day. The main problem was inflexibility, most breweries producing a diversity of beers from a mix of streams emerging from the brewhouse. And, for whatever reason, the flavour match with the same beer brewed batch-wise was not good.

But continuous fermentation would absolutely be the way to go for those embracing the new concept of doing things – with a stream of simple made-up feedstock flowing into the fermenter. And logically the next stage would be the Sinebrychhoff expedient of streaming the green beer through a heat exchanger and a column of immobilised yeast to scavenge the resultant vicinal diketones prior to blending in the requisite cocktail of colour, flavour and foam pre-packaging.

I see the elegance in the process. I see true beauty, however, in more time-honoured approaches. Rachmaninoff rather than rap. But there is room in this world for both, albeit not on my iPod. 📱

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**MORTON COUTTS**

Morton Coutts was born into a brewing heritage. His grandfather, Frederick Joseph Khutze, a German native, started to brew in Otago late in the 19th century. As the 20th century dawned he relocated to Palmerston North to establish the brewery inherited by his son William Joseph Khutze, who opted to shift at the time of World War One to the more Anglicised surname Coutts. His son Morton started to run things at the age of fifteen when William succumbed to Spanish flu. Coutts became the first person in New Zealand to send a telegraph message – to Britain.