

INDUSTRY ARTICLE

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Batch size 1: The source of all good things for the beverage industry

The right product for everyone: Personalised, customer-specific products are currently in strong demand. But what about the world of beverages? The idea of “single-unit batches” may not be all that obvious in a sector that tends to think in tens of thousands rather than individual bottles. But even so, a lot is happening in this area. At BrauBeviale, the most important international capital goods exhibition for beverage production and marketing this year, some 1,100 exhibitors will be presenting their products and solutions for all the latest themes of interest to the industry. For details see www.braubeviale.de.

“Batch size 1”: It sounds like a bingo call that has been ringing in the ears of business operators in recent years. It’s abstract, mysterious, says everything and yet somehow nothing, and thus slots nicely into the series of bingo calls involving “digitalisation”, “Industrie 4.0” and “something to do with Blockchain”.

Defining “Batch size 1”

The underlying idea is easy to explain: as everyone knows, batch size describes the number of units of a given product type that are combined into a single batch and manufactured in one go without interruption. Batch size 1 is therefore a one-off. A special order. Or a custom-made product. Of course, these have always been a possibility. Just make one of something. But on what terms? “Batch size 1”, a term that’s bandied around a lot these days, means being able to produce individual, special orders as if they were mass-produced, on the conveyor belt, and as far as possible on the same terms as mass-produced items.

Impossible? Surely a made-to-measure suit can’t be made as fast or as cheaply as off-the-rack clothing from the factory? It can. That’s the

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objective of Batch size 1 in today's world. One way is to use automation (in common parlance, using robots), and digitalisation (e.g. artificial intelligence controlling state-of-the-art systems, but more besides). In other words, everything that makes up "Industrie 4.0".

More specifically: research is currently in progress to establish how manufacturing plants can be constructed and controlled, with no need for conversion work that will take up too much time, generate all kinds of costs and lead to losses, to manufacture Product A (say a carbonated orange drink in a 300 ml bottle), then Product B (an organic lemonade with 5 percent juice content in a 500 ml bottle) and then Product C (another organic lemonade but with 19 percent juice content in a 300 ml bottle), all at lightning speed.

Why "Batch size 1"?

But why should anyone want to? Easy: Because that's what the customers want. Professor Peggy Näser, who researches and teaches Factory Planning and Operation at the Brandenburg University of Cottbus-Senftenberg, explains the interest in Batch size 1 like this: "There is increasing interest in ensuring that all customers can get their own product, designed exactly in accordance with their wishes. The trail-blazer here must surely be the automobile industry, where customers have long been able to configure their own vehicles. Now, however, we can see the shape of customisation in quite different fields: for example, you can configure your own muesli online and have it sent to you, or personalised sneakers." It's a simple matter to order individually printed t-shirts, your own personal photobooks, or even Coke cans with your own name on.

The age of Me

Me, myself and I – it often seems individuals today are entirely focused on themselves. We are dealing with a social phenomenon, which arrived with the Internet. "The message we get from today's world is that we are entitled to have input into everything." That was the recent analysis by Fabian Kienbaum, head of the HR consultancy that bears his name. "Personalised shoes, customised Nutella glasses, direct contact with senior ministers via Twitter: social networks are creating an individual platform that enables visibility and the opportunity to contribute." As a result, consumers who are

used to this situation ask themselves why they should continue simply consuming what is put before them. They would rather talk to the manufacturers and express their individual wishes.

Implementation in the beverage industry: RoboFill 4.0

Looking at the subject of “Batch size 1” in the beverage industry, major players in both industry and research combined forces four years ago to make advances in this area. Between 2015 and 2019, the Faculty of Brewing and Beverage Technology (Technical University of Munich, TUM); the Faculty of Foodstuff Packaging Technology (TUM); the Fraunhofer Research Institution for Casting, Composite and Processing Technology (IGCV) – Resource Efficient Mechatronic Processing Machines (RMV) project group; the Bavarian State Brewery Weihenstephan; Beckhoff Automation GmbH & Co. KG; infoteam Software AG; Krones AG; ProLeiT AG; Siemens AG; Dekron GmbH; Yaskawa Europe GmbH and Zimmer GmbH worked together to turn “beverage batch size 1” into reality. The result: RoboFill 4.0.

RoboFill 4.0 is a “completely new and flexible automation concept for the industrial supply of customised beverage bottles or batches, [which can] be easily extended by further production modules”, according to the website. Currently there is “only” one demonstrator, in other words, there is precisely one machine in the world that meets and implements the objectives of the four-year research project. It is located in the research brewery at Weihenstephan, and is in the care of project manager Christoph Neugrodda. “Using this system we can produce 150 bottles per hour, each individually filled and printed,” he comments.

Because Weihenstephan boasts of performing “research for practical purposes”, Neugrodda is ready with a number of specific applications for systems like RoboFill 4.0: “Something like this could be cool for a brewery visitor centre to have in place. When visitors arrive for a tour, you take a photo of them, and then they get a bottle filled specifically for them with their photo on the label to take away.” Batch size 1 is a marketing asset above all else, in other words. “It’s of interest for small-scale brewers in particular,” continues Neugrodda. “With the rise of the craft brewery

movement, the trend is increasingly toward more individual beers. Using RoboFill 4.0, you can make your special beer even more special.”

Innovations in production planning, too

Anyone thinking at this stage that it's all very good, but just a gimmick at the end of the day, should read on. There is more to the RoboFill 4.0 technology than just this. “It impacts on the entire production planning process. Instead of the rigid chain of individual processes in the filling department that we are currently familiar with, all autonomous plant components are networked together in an intelligent structure as cyber-physical system components. That means there is a filling plant that is there in physical form, and a digital twin to go with it. Each individual bottle even has its own digital twin. The digital twin enables all components to communicate with each other, with the customer, or with the system operator. So it is now possible to control production individually and autonomously. The bottle has become an intelligent product, one that “directs itself” through the production process. As a result, individual orders can be brought forward, ahead of scheduled production if necessary. We are no longer tied to fixed plans, in which you first have to fill 10,000 500 ml bottles and then switch to the 300 ml bottles, for example.” If the 300 ml order is urgent and has to be loaded onto the truck sooner, it can be quickly slotted in.

A web portal has also been developed as part of the project, via which customers can submit their individual beverage requests and transmit them directly to the plant – with no need to have someone sitting in the office and performing the complicated task of scheduling many minor orders.

One major advantage with the RoboFill 4.0 concept is its great flexibility: additional components can be added to expand it, and conversely, individual components can also be used with no need for all the others. Krones, for example, reports that direct printing is one such component that is already in wide use, and the company is working hard to refine it. Even if this particular process does not produce an individually mixed shandy, it can still be fascinating to have a standard drink come in a highly customised bottle design.

Innovative fill valves

A further core element is the fill valve, fed by a main and a secondary line, developed in connection with RoboFill as part of the “bottling on demand” concept study at Krones. What flows into the bottle is individually measured, entirely in line with the spirit of the times. This could be particularly interesting in the area of soft drinks, since there is no need to use a mixer earlier in the process to do the mixing: the main line supplies the water, while the secondary line provides the proportions of syrup, fruit juice or other components established specifically for this bottle. Because several secondary lines are connected to the valve, you can switch from one ingredient to another, say from cherry syrup to orange syrup, without having to change the equipment over. “The product customisation that can be achieved in this way may be of particular interest for health drinks or customer-specific sports drink mixtures in the future,” says Jennifer Schöffel, Control Technology, Corporate Research and Development at Krones AG.

Innovative transport system

The transport system used in RoboFill is also an autonomous component that plays a crucial part on the path toward Batch size 1. Different manufacturers have different innovations to offer in this area. Acopotrak, from automation specialist B&R, solves one of the greatest challenges of Batch size 1 manufacturing: how to direct the flow of materials to ensure the component you need right now is always where you want it? The Acopotrak transport system achieves this thanks to a unique high-speed point system that switches products from one track line to another – at full production speed – and the ability to make the shuttles, which deliver the components at high speed, run on completely flexible and individually constructed track lines at very short intervals.

Thinking outside the box: applications for Batch size (almost) 1

Disruption is a standard theme nowadays. Looking at everything in a different way. So we should have some examples here to illustrate how Batch size 1 in the beverage industry can be further thought through, beyond the question of individually printed logos and special mixtures.

There are a few eye-catchers in the area of water, of all things: one start-up from Munich has built on the concept of retronasal smell to develop a “drink bottle system” in which water is given the appearance of taste through the use of scent alone. This is how it works: an “air pod” sits in the neck of the bottle, a sort of scent ring that releases the desired fruit/herb/blossom smell into the nose and pharyngeal area of the person drinking from the bottle. Flexibility and individuality at its best: “With our system you can flexibly adjust the taste nuances at any time,” according to the company’s website. “If your favourite taste isn’t already in our range, send us your suggestion. In theory we can turn anything with a scent into something you can taste.”

An Austrian company uses “flavour capsules” inserted directly into the bottle to supply the taste. Pimp almost a litre of water with just one capsule – or mix it if you want. Tiny scent cubes dropped into a water bottle or jug also add flavour. There are currently twelve different varieties that customers can select from the online shop at their leisure and have made up into colourful packages. That means no-one at the table or in the office has to drink the same boring water – everyone can have a flavour of their own.

A flavour of their own – an important credo for everyone aiming to make their customers happy. Not easy, but not impossible. And the idea will be with us for some time yet.

About BrauBeviale

BrauBeviale is one of the most important capital goods trade fairs for the beverage industry worldwide. During this three-day event at Exhibition Centre Nuremberg, international exhibitors showcase a comprehensive range of solutions for the entire beverage production process chain, including raw materials, technologies, logistics and marketing ideas. Visitors come from the technical and commercial management segments of the European beverage industry as well as from the retail and catering sectors. The product display is rounded out by an attractive supporting programme that explores and discusses the trending issues in the industry. The main topic is the future viability of the beverage sector. Other highlights include the BrauBeviale Forum, Craft Drinks Area and numerous themed

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pavilions. The usual relaxed atmosphere will once again make BrauBeviale 2018 the No. 1 meeting place for the industry. Private Brauereien Bayern (Bavarian Association of Private Breweries) is the honorary sponsor of BrauBeviale. BrauBeviale is a member of the Beviale Family, the global network of events focusing on the manufacture and marketing of beverages. www.braubeviale.de

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