The decision for or against an expansion of the product portfolio is often also a decision for or against a significant investment in machine technology. The extension of existing plants with additional mixers, additional tanks, the necessary piping or even completely new filling and packaging plants can be a major investment.
The high costs of new product launches reduce the profitability of new product launches or increase the requirements for minimum sales figures - a contradiction to the trends and developments that are active and discernible on the market.

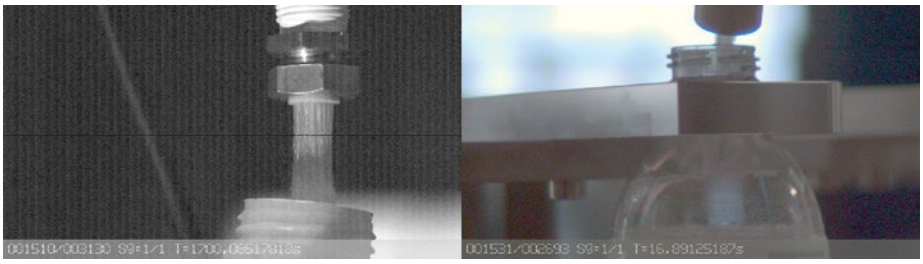
While the technical development of plant technology in recent years has concentrated very strongly on increasing throughput, the beginnings of a new way of thinking, a new technical trend, can be seen in many places today. Many companies, whether they are bottlers or plant manufacturers, want to be able to add small quantities of aroma, additives and flavourings to the container pre-filled with a basic beverage. In this case, the dosing is carried out at high speed through the container opening due to the process, without any unwanted foam or splashes occurring in the container - even with carbonated liquids.

The advantages of this new technology are obvious: the necessary mixing processes are reduced, flavourings remain outside the filling line and product changes can be carried out more easily and more quickly. Depending on the basic beverages used, a product change can even consist of only changing the flavouring (including the necessary adjustments in the packaging technology, such as changing the labels).

In addition to the pure process-related advantages, however, this new technology also significantly reduces the required investment in new or additional filling technology - so it is of interest to many beverage producers and bottlers who are currently faced with an investment and/or portfolio decision.

Technology from space travel

With its High-Speed Precision Dosing System, the company KTW Technology has now developed the world's first comprehensive rapid dosing system ready for the market and is in the introductory phase with the first projects at customers. The innovation-driven company, which is committed to the transfer of unique and powerful technologies from aerospace to relevant industrial applications, is using its proprietary KTW Smartvalve technology - an extremely fast-switching solenoid valve which, in addition to ultra-short reaction times (approx. ms1) and switching cycles (approx. up to 1,5ms2), also has a long service life. Due to its design, the valve can do without any reset elements (such as springs, diaphragms or similar) and is therefore low-wear and maintenance-friendly. The maximum number of possible switching cycles, which is at least in the single-digit billion range, increases the expected service life to several years. KTW Technology has developed an uncomplicated, but very reliable functional principle, which is the basis for an entire product family of high-speed feeders (see illustration).



Dosing is carried out at high speed through the container opening without any unwanted foam development or splashing in the container - even with carbonated liquids.

Application

At the core is the dosing valve, which can be varied in size and nominal diameter according to the application, together with the dosing nozzle, which should also be designed according to the application. In addition to the question of which beverage container is involved (e.g. can openings are larger than bottle openings), the properties of the dosing medium and the base beverage also play an important role. The shape of the nozzle defines the shape and momentum of the jet and significantly influences the reaction of the beverage. With a portfolio of commercially available but also self-developed dosing nozzles, almost all applications can be covered. The dosing valve is continuously supplied with dosing medium from a pressure vessel. A pump promotes the

If required, the system replenishes the quantity of dosing medium taken from existing supply containers.

On the control side, the high-speed dosing system is designed to be largely self-sufficient. This makes it possible to retrofit existing beverage filling systems with an easy-to-integrate module without having to make changes to the higher-level system control or the safety circuits. Information and commands can, but do not have to, be exchanged. The control system of the fast dosing system receives the trigger signal either from sensors that confirm the presence of a beverage container in the dosing position or from the system control system. The trigger signal is converted into a dosing signal for the dosing valve in a minimum of time (approx. ms1) by the control system of the rapid dosing unit, which uses the previously defined valve opening time for this purpose. Together with the system pressure, the opening time correlates with high accuracy with the dosing quantity. The filled quantity can also be measured and documented for each individual dosing via a flow meter in the valve supply line. The same applies to the prevailing system pressure. Assuming a constant system pressure, rapid dosing achieves a shot-to-shot repeat accuracy of >= 99%.

The functional principle described is the basis of all quick dosing solutions from KTW Technology. However, they differ in the concrete design. Basically, a distinction is made between integration systems and stand-alone systems.

Integration systems

Integration systems are optimised for structural integration into a filling plant - this can be new plant equipment or a retrofit for an installed plant. The valve station is

mounted within the system. For this purpose, translator wheels or linear transport sections between filling and closing are usually suitable. The beverage containers can be freely or positively guided. All other necessary components, i.e. the supply module with the control system, the flow meter and the pressure vessel, can be flexibly positioned outside the filling room in the vicinity of the system.

Stand-alone systems

Stand-alone systems are particularly suitable for filling lines in which the filling and lidding functions are performed in separate machines. In this case, the fast dosing can take place on the transport route between these two systems. In this case, the conveyor belt is driven by the stand-alone system.
leads. Of course, the dosage of the flavouring or additive can also be added before filling into the empty beverage container. All the necessary components and functions are combined in a single machine frame. Both models have a food-compliant design and CIP functionality.

The maximum possible dosing quantity is essentially determined by the size of the valve and the nominal diameter. In addition, parameters such as the system pressure, the properties (e.g. viscosity, carbon dioxide content) of the dosing medium and the base beverage as well as the container shape (opening and body) and the speed are decisive. Even if the possible flow rates from the valve can be optimised, the available time span during which the container opening passes below the valve is quantity-limiting. This does not mean, however, that larger quantities cannot be handled with fast dosing. A simple and in many cases feasible solution is the use of a valve module with several sequential dosing points, i.e. with several dosing valves. The system control distributes the required dosing volume evenly to the available dosing valves. During the run, the individual valves then dose the required total dosing volume into each individual container one after the other in several shots. This solution strategy can be used not only for larger dosing volumes or higher speeds, but also for sensitive media that foam up easily, for example.

In addition to the targeted dosing of small quantities of an aroma substance into a container filled with a base drink, this innovative technology of rapid dosing opens up an even wider range of possibilities. On the one hand, instead of preventing foaming in the bottle, rapid dosing can also be used for targeted foaming of the base beverage and thus for expelling oxygen from the bottle before closing. Today, this effect is often solved with a continuous water jet, which, however, leads to increased cleaning effort in the system. In this case, a small amount of water can be shot into the bottle at a higher pressure in order to give a foaming impulse on the liquid surface. On the other hand, the use of several dosing valves - supplemented by a corresponding number of additional pressure containers - offers the possibility of switching from dosing a single bottle to dosing a large one.

The technology thus enables the filling or dosing of specific recipes, which can then also vary in composition between the individual doses.

Conclusion

The latter application in particular, variable recipe dosing, offers a technical opportunity to tread a new, hitherto very rocky path. Away from today's established form of beverage production, which is characterised by the filling of large-volume, pre-mixed and prepared batches, towards filling that is geared towards more individualisation and the efficient filling of small batch sizes. This innovative solution from the innovation forge in Wehr in the Volcanic Eifel meets a growing market trend and enables the beverage industry to meet individualisation and product diversity with efficiency and sustainability.

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