

SPACE TRAVEL TECHNOLOGY

Innovative valve technology in the beverage industry boosts efficiency as well as savings

Valves play a central role in the beverage industry's production processes.

They control, mix, dose, fill and regulate processes in drink production and are therefore required in large numbers and infinite variety by the beverage industry. The valve market itself is characterized by a relatively small number of innovations and a large number of manufacturers who often have hundreds or even thousands of valves in their inventory. There's a separate valve for almost every application. Today's valve technologies sometimes represent a bottleneck, a limiting factor in production innovation. Common valves are driven pneumatically, electrically or electro-pneumatically, requiring connectivity with complex peripheral systems. The insides reveal delicate springs, needles, spindles and diaphragms in various configurations, and these can limit applicability, service life and reliability of the valves.

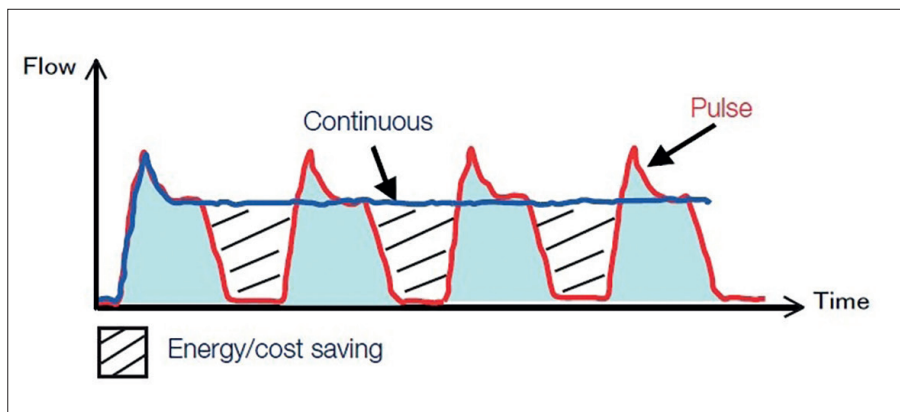
In a market study on pneumatic valves by the renowned consulting firm Frost & Sullivan (K1B6-17), from November, 2017, detailed reports of manufacturing challenges of pneumatic valves are presented. These include energy efficiency improvements, higher reliability and competitive pricing. According to Frost & Sullivan, users of valve technology have high expectations of manufacturers: lower disruption of productivity, higher reliability and greatly improved energy efficiency through reduced consumption of compressed air and energy. Frost & Sullivan sees opportunities here – especially for “smart” solutions – thereby openly challenging the status quo.

Smart technologies

KTW Technology, a fairly young company located in Wehr am Laacher See, Germany, has responded. KTW Technology was founded just over a year ago by three experienced engineers and two international managers. Aerospace innovations have been incorporated and transferred to the broader industry landscape in a number of business sectors. The Investitions- und Structurbank (ISB) in Rheinland-Pfalz is also involved. The business unit “Realtime Valves,” a spinoff by the wholly-owned subsidiary KTW Systems, is bringing special innovations in valve technology to market.



Ingenious design and functionality play a decisive and unique role compared with the status quo in valve technology, as it dispenses with wear-prone parts and complex installations.



The valve, electronically controlled by means of a light barrier, activates the flow and pulses for 60 milliseconds.

The smart technology was developed for a space mission and operates without pneumatics, springs, needles or spindles. The real-time valve from KTW Systems is controlled by electromagnetic pulses. A magnetized caliber serves as closure and metering element.

The patented design allows the valve controlled by an electronic circuit to switch in real time (fast, direct and stochastic) while being extremely durable and reliable. The stainless steel solenoid valve is suitable for all types of media, whether gas, air, water or viscous liquids. Other unique selling points include:

- a dosing range which is much wider than offered by conventional valves
- heat and cold resistance (-200 °C / +200 °C)
- suitability for pressurized applications between 0.5 and 1,000 bar
- energy efficiency
- corrosion-free
- easy cleaning
- requires no lubrication
- frequencies in the 1,200 Hz range, without resonance.

Versatility

The new valve technology from KTW Systems has diverse applications and promises a wide range of solutions that will increase efficiency and, therefore, savings. The company sees itself as a systems supplier and not purely as a valve manufacturer. A combination of valves, electronics and, if required, flow meters from its partner Bronkhorst is designed to provide the customer with workable solutions for increased efficiency and reliability while reducing costs.

Wolfgang Teichmann, the official company spokesperson, has been a Managing Director in the beverage industry for 15 years and is familiar with the challenges of valve technology in this industry. It therefore made sense to develop the beverage industry as an important strategic market.

The choice was based on low adaptability, inadequate service life, exaggerated space requirements, high energy consumption and the need for a complex supporting infrastructure for present valve technology.

The company's engineers have installed Realtime Valves in three different projects in the beverage industry worldwide in order to demonstrate the reliability of their systems.

Pressurized air

An installation at one of China's leading food companies is in full swing. The Realtime Valve is used there as an air flow saver. The aim is to save between 50 percent and 70 percent on compressed air consumption, depending on the application. The production of compressed air is the most expensive energy-related factor at the company and accounts for about 30 percent of production energy costs.

The customer uses compressed air in various stages of the production process and is very interested in the high savings potential offered by the new air flow saver.

For example, beverage containers are blown dry with compressed air prior to printing on the lid. Compressed air is continuously applied to the passing containers on the line at a rate of about four containers per second. In the future, the amount of compressed air and the time of application will be controlled by KTW Systems' real-time switching valves.

The valve, electronically controlled by means of a light barrier, activates the flow and pulses for 60 milliseconds. Instead of expelling more than ten liters per second of compressed air applied continuously, as in the past, the application of compressed air in this application



A company in China uses the Realtime Valve as an air flow saver.

is limited to approximately three liters per second, since the nozzle and valve are only opened for 0.3 seconds at a time.

The Realtime Valve in this particular application reduces compressed air volume and thus energy and CO₂ output at a rate of between 60 and 70 percent. The investment is amortized within 0.2 and 0.5 years, depending on uptime of the filling machines. This does not include the positive effects on the compressor, which endures less wear and tear as well as reduced maintenance and capital commitment costs, along with a longer service life due to lower effective output.

KTW Systems shareholders view the air flow saver as making an important contribution to energy savings in general.

Integrating energy drinks into existing filling lines

The “Filling Concentrates” project, using Realtime Valves at a well-known contract filler in Europe demonstrates further potential for the beverage industry. The project will receive funding from the European Space Agency (ESA) as part of a European initiative to transfer space-related innovations to other industries.

The bottler running the project operates several different bottling plants and is a key player in the fast-growing market for flavor-intensive drinks. The bottler’s problem is that energy drinks are only bottled at one of his plants, because the flavor enhancers used in the energy drink are so intense that they settle in the pipes and seals. Despite undergoing intensive rinsing, there is a risk that other drinks will take on the undesired taste when being bottled.

KTW Systems, in cooperation with the electrical engineering division of FH Aachen, along with Bronkhorst, a manufacturer of flow meters, has developed an autonomous solution that allows the bottler to fill all drinks – including flavor-intensive beverages – in all of its plants in the future.

KTW’s Smart and Realtime Technology business unit provides the solution to this problem. The aroma-intensive flavor enhancers used in the energy drink are combined

separately as a concentrate and introduced to the base beverage in another process step by means of the Realtime Valve.

The basic beverage is filled in a carousel of more than 100 valves along the filling line and the challenge of this autonomous solution – consisting of Realtime Valve, light barrier, electronics and flow meter – is to deliver a volume of concentrate of precisely 2 ml to 800 – 1,000 cans per minute with a maximum deviation of +/- 5 percent.

If successful, the project will provide the beverage industry with a completely new outlook. It not only increases the flexibility in the occupancy and utilization of filling machines – obviating complex cleaning processes – but also enables companies, who until now have been wary of additive-intensive beverages for good reason, to expand their product portfolio. In the future, filling operations will be able to dispense with elaborate and costly mixing plants and syrup rooms for energy drink products that require complex additives.

Low-maintenance valves

Project No.3 in the beverage industry is installed in a German brewery. The brewery has lent KTW Systems engineers their pilot brewery to test their Realtime Valves. The goal is to significantly increase reliability, efficiency and systems longevity. Brewery management has issued the following statement: “We still bottle the same amount we did ten years ago, but a bit more precisely now. Plants and valves have become much more

complex and vulnerable. Each year we initiate a three-week shutdown to replace, maintain and clean our valves. Your valve solution comes at just the right time.”

In this particular project, bottling consists of the following steps:

1. Introducing carbon dioxide to the bottle
2. Adding the beverage
3. Ventilating the bottle while filling

Currently, this process takes place using complex valve systems. KTW Systems has introduced a new process here. The entire process takes place using a single valve, which is only a fraction of the size of presently available valve systems.

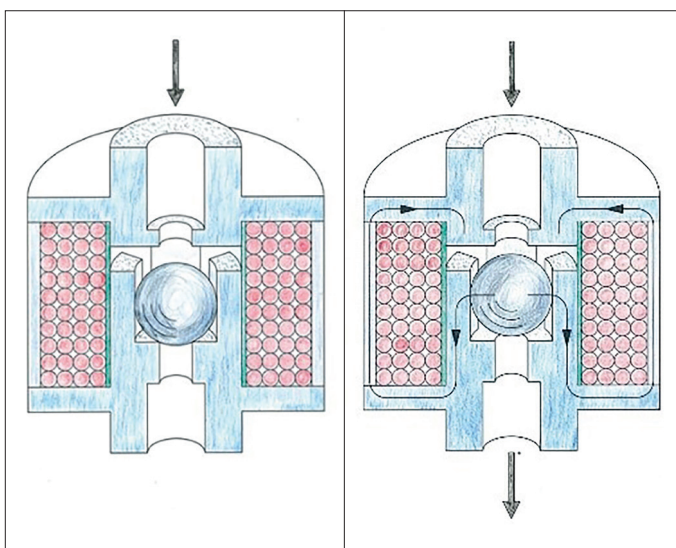
Conclusion

Smart valve technology from KTW Systems has the potential to contribute significantly to increased efficiency, reliability and cost control in the production sectors of many industries – especially within the beverage industry. New applications and processes suddenly become possible. Ingenious design and functionality play a decisive and unique role compared with the status quo in valve technology, as it dispenses with wear-prone parts and complex installations. This technology also dramatically reduces the complexity of valve technology, as the manufacturer only needs a few valve to handle media, pressure and flow.

The versatility of the Realtime Valve is demonstrated by two current projects from other industries. In initial tests, the company’s engineers reduced NOx emissions in a diesel engine by more than 50 percent through water injection. Along with Aachen’s University of Applied Sciences and the DLR, they are working on a project to reduce pesticide emissions by more than 80 percent using sensors, high-performance cameras and the Realtime Valve. Sustainability and environmental protection are high priorities for the company. □

Wolfgang Teichmann

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The Realtime Valve from KTW Systems is controlled by electromagnetic pulses. A magnetized caliber serves as closure and metering element. (All Images: KTW Systems)