An ingredient called innovation

Innovations for the food and beverage industry

GERNUT VAN LAAK – It is easy to assume that food and beverage manufacturing is a bit like cooking at home, only that everything is on a bigger scale. Making food is about both art and science, and in an industrial size operation, the physics side presents challenges concerning such topics as thermodynamics and fluid dynamics. A selection of ABB's innovative solutions in these areas are presented here.

Cavitation stops here

It is often said that time is money. In the logistics of drinks manufacturing, speed is also money. A liquid sluggishly moving along a pipe or a tank taking a long time to drain do not represent a good utilization of equipment and resources. When a truck of milk arrives at a dairy, for example, it would appear logical that it should be emptied as rapidly as possible so that the truck can be released for its next trip and the milk transferred to the next process step. Physics, however, disagrees. If pumped too quickly, foam forms, which disrupts the process further downstream. So is there a way to pump faster without such repercussions? ABB offers a solution involving variable-speed drives combined with algorithms respecting the sensitivity of the fluid.

Anybody working with fluid dynamics is sooner or later likely to encounter the problem of cavitation. Simply put, the faster a liquid flows, the lower its pressure drops. A sudden increase in flow velocity can cause shockwaves in the liquid. In the case of fluids such as milk or beer this can lead to the formation of bubbles or foam, or worse still, irreversibly damage the product.

ABB has developed algorithms to control variable-speed drives ensuring that the pressure and speed of the fluid remain within a defined envelope. These algorithms automatically adjust pump speed to react to any change in pressure caused by the flow of draining vortex. The result is better protection of the product while optimizing pumping speeds. ABB estimates a return on investment of three months.

When is a bottle full?

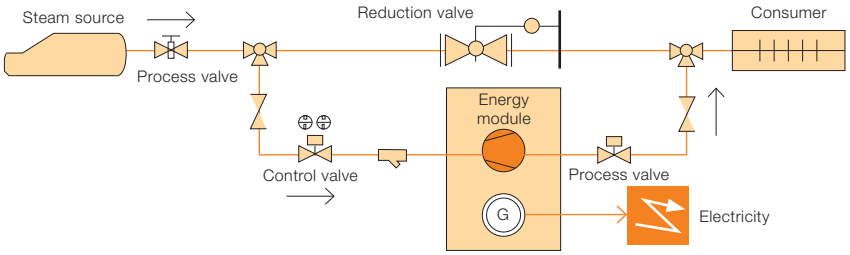
How much juice is there in a one liter bottle of juice? What may sound like a trivial or a trick question can in fact make a difference of tens of thousands of dollars per year, per filling machine for the bottling plant.

A bottling plant typically fills marginally more than the nominal volume to allow for variability in the process. Tackling that variability means reducing the necessary margin and thus having more filled bottles to sell.

Much of this variability comes from the measurement method. Fluids with low conductivity, high oil or alcohol content or suspended matter are especially difficult to measure with great accuracy.

ABB offers a solution involving a highly accurate mass flowmeter combined with control algorithms for mass compensation, and also including installation and testing. ABB estimates a return on investment of eight months.

Full steam ahead in saving energy



Process steam is ubiquitous in the food and beverage industry. It serves as a source of heat and sterilization in numerous scenarios. Typically, steam is generated in a central boiler and piped to the various points of application where it is reduced to the required pressure. This reduction mostly occurs through mechanical reduction valves (typical pressures being 6, 3 and 1 bar). Although this method works well, dissipation in valves is a wasteful use of valuable energy resources.

ABB has, in partnership with the German company ENVA Energy, created an alternative. Rather than using a valve, pressure is reduced using a turbine and the energy recovered provides electricity. This means some of the energy invested in the production of steam can be reused productively elsewhere in the plant or even sold to the grid, reducing both energy bills and carbon emissions. The turbine was created by ENVA Energy and the generator and electrical systems by ABB.

Calculations by ABB show that a customer can on average recover the costs in as little as two years.

Of yeast and yield

Fermentation is a central process in the brewing of beer. Brewery owners want to optimize this process to improve throughput and yield. Fermentation involves the mash being digested by yeast organisms. So how can brewers keep track of what these tiny organisms are doing?

One of the telltale signs of fermentation activity is the production of carbon dioxide. This gas is typically already captured during fermentation because it can be used elsewhere in the process and is costly to purchase. So the trick to keeping track of fermentation is to use this existing capture to closely observe the quantity produced.

ABB can supply a complete solution to this involving its CO_2 mass flowmeter, Sensyflow, as well as its controller and application libraries.

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