Food & beverage

Using AODD in soda production

Billions of gallons of soft drinks are consumed annually. But production quotas can be put under strain if the manufacturing process experiences inefficiencies or breakdowns. Therefore, soft-drink producers must employ the best systems and technology to meet these quotas.

This article will illustrate how one type of pumping technology, air-operated double-diaphragm, or (AODD), can help to streamline the soft-drink manufacturing process by optimizing liquid-transfer operations at several critical points along the production and supply chain.

Though per-capita consumption of carbonated soft drinks in the United States has been on a steady decline since peaking in the 1990s, the average American still consumes more than 41 gallons of the fizzy drinks annually, which is the equivalent of 437 12-ounce servings, or 1.2 cans a day. To address this decline, though, the major soft-drink conglomerates (Coca-Cola Co., PepsiCo, etc.) have begun expanding their product portfolios to include items that fit the new soft-drink definition, such as juice drinks and, more significantly, the energy drinks that have become extremely popular with millennials.

The challenge
The global landscape is dotted with soft-drink production facilities, more commonly known as canning and bottling plants, that take such regularly required ingredients as high-fructose corn syrup, various concentrates, different flavourings and phosphoric acid (which adds acidity to the final beverage) and converts them into finished products that are ready for consumption. In many instances, the large multinational companies that dominate the global soft-drink market, contract with bottling companies to produce their soft drinks in accordance with their highly guarded, tried-and true formulas. There are also smaller operations that produce, for example, root beers and ginger ales on a much smaller scale, but still require the assistance of the canning and bottling company.

Achieving the desired end-product requires carbonated soft drinks to be manufactured according to a strict regimen:

- Common tap water is treated at the production facility so that any impurities that may affect the soft drink’s

Manufacturers of carbonated soft drinks, fruit juices, teas and energy drinks are constantly searching for the most reliable, safe and energy-efficient pump technology.
taste or colour are removed. The water’s alkalinity level is also adjusted so that it meets a regulated pH level.

• The treated water is sterilized in order to destroy any bacteria or organic compounds it may still contain. A small amount of chlorine is used to complete the sterilization process.

• After the sterilized water ‘rests’ in a storage tank for a few hours, it is run through an activated-carbon filter that de-chlorinates it. From there, the completely sterilized water is transferred to a dosing station.

• The pre-mixed concentrate, which arrives at the facility in drums and totes, and gives the specific soft drink its colour, flavour and sugar content, is pumped into the dosing station, where it combines with the water. The amounts of concentrate used at this stage are usually determined by weight, not volume, so the batch tank is placed on a load cell or scale and a pre-programmed weight, for example, 500 pounds (227 kg), is pumped into a tank before the pump turns off.

• At a precise temperature, the mixture is passed through a carbonator that adds carbonation to the product at predetermined levels according to the recipe for the soft drink. Generally, juice drinks require far less carbonation than traditional soft drinks or carbonated energy drinks.

• The finished carbonated product is transferred to filling lines where it is injected into bottles and cans of varying volumes at high flow rates. When filled, the containers are sealed with pressure-resistant closures like aluminium caps or twist-off plastic tops.

• The filled cans and bottles (which must also be labelled) are then packed into cartons or trays before being placed on larger pallets for shipment to distributors, who ensure they find their way to store shelves and into the hands of consumers.

Transfer pumps are required at several junctures along this production and supply chain, and for many years, the pump technology of choice for bottlers and canners of soft drinks was the centrifugal-style pump. For many bottlers and canners, the lower purchase price of centrifugal pumps when compared to the cost of positive-displacement (PD) pump technologies is the key determinant in their selection.

However, while centrifugal pumps may have a lower up-front cost than PD pumps, they do feature some operational inefficiencies that usually lead to higher ancillary costs during the lifetime of the pump. Upon closer inspection, centrifugal pumps are not self-priming, which hampers their efficiency at startup. Also, they can encounter operating issues when pumping at higher flow rates, especially when handling higher-viscosity liquids like corn syrup, and they are unable to deadhead, which can lead to pump damage if a dry-run condition is encountered.

Centrifugal pumps also have mechanical seals, which can lead to costly leaks, and their mechanical seals generally cost more to repair than some other pump technologies. Seal damage and breakage can be caused by the heat that is generated during dry-run operation. Double mechanical seals are also required for tacky or sticky concentrates, which creates additional costs, increased operational complexity and the need for a water flush for cleaning. Centrifugal pumps are also powered by electrical motors that must be kept dry during operation, which can be problematic when the product being pumped is a liquid.

The solution
The Wilden® Hygienic Series (HS) and Saniflo™ FDA AODD pumps, from Wilden Pump & Engineering, Grand Terrace, CA, USA, can pump a wide range of viscosities and shear-sensitive products, and can be used for corn syrups, phosphoric acids, concentrates and flavourings which play a major role in the production of soft drinks.
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