

# Under pressure

Modern food and beverages trends drive demand for effective liquid nitrogen dosing technologies

By Rob Cockerill



Have you ever picked up a bottle of lightly carbonated water or juice from a vending machine or shop chiller? Perhaps you've quenched your thirst and energy needs with a popular isotonic sports drink after exercise? Well the chances are, you've handled or drank from a lightweight plastic bottle enhanced by technology from Belgium-based Vacuum Barrier Systems (VBS).

VBS is the exclusive distributor of Boston, Massachusetts-based Vacuum Barrier Corporation (VBC), the leading American manufacturer of liquid nitrogen transfer systems. As a supplier of liquid nitrogen transfer systems since 1978, the company has an in-depth knowledge of a number of specialised cryogenic processes. Vacuum Barrier designs, engineers, fabricates and tests liquid

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nitrogen handling systems in its Massachusetts facility for various applications that include food and beverages, semiconductors and pharmaceutical and biotech. This expertise is rolled out across Europe, the Middle East, Africa, Russia and India by its European arm VBS, based out of the Brussels area (Belgium).

VBS offers a unique range of vacuum jacketed lines and cryogenic transfer systems, from short flexible hoses to large plant distribution systems, and exudes confidence in being able to handle projects big and small. This is exemplified in the food and beverages business, where the company also specialises in specific cryogenic process equipment such as liquid nitrogen dosing systems for the food and beverage industry.

A particular area in which VBS has risen to the challenge in the beverages business since the turn of the Millennium has been in package pressurization. A two-fold challenge has emerged as a result of consumer trends, perhaps even described as societal megatrends: firstly, there has been a health-conscious worldwide shift from carbonated soft drinks towards more still and lightly carbonated juices and waters; secondly, efforts to reduce the amount of plastic used in each bottle have resulted in more

environmentally friendly packaging. What both of these trends have in common, is a resulting lightweight bottle or container that is more susceptible to collapsing during transit and handling.

### Package pressurisation

Without the internal pressure of a fully carbonated drink, or with the vessel in ever-larger sizes and ever-thinner wall structures, these PET (polyethylene terephthalate) packages can be unstable.

Dosing the headspace of the filled bottles with liquid nitrogen, however, pressurises the container and adds rigidity, which helps during packaging and handling. A precise drop of rapidly expanding liquid nitrogen into hot and cold fill lightweight PET packages and aluminum cans allows for consistent pressure from package to package and eliminates panelling and palletising problems.

VBS' NITRODOSE® liquid nitrogen injection systems are used to pressurise and/or inert delicate packages, like cans and PET bottles. These systems provide the most precise liquid nitrogen dosing to add strength to non-carbonated beverages for lightweight packaging, as well as displace oxygen to extend the shelf life of products. A drop of liquid nitrogen is injected into the headspace of a container before capping or sealing, adding strength to thin-walled containers and reducing the headspace oxygen content that would otherwise degrade a sensitive product such as a fresh juice. Various types of NITRODOSE® Liquid Nitrogen Injection systems are available for different requirements.



Figure 2. Easy Dose.

There is also an efficiency factor to consider here, with liquid nitrogen dosing understood to potentially reduce nitrogen consumption by as much as 80% when used instead of gaseous nitrogen tunnel systems. At a time when quality, nutrition and consumer convenience dominate food and beverage business demands, and concerns over environment and sustainability (particularly with plastics in focus more recently) dominate their products' packaging, the ability to provide such solutions and efficiencies is surely a win-win situation.

### Other food and beverages applications

The same equipment used for pressurisation can also be used for inerting packaged foods and the nitrogenation of beer or coffee, with or without a widget.

NITRODOSE® systems are used to inert packaged foods,

reducing the oxygen absorption of the product to extend its shelf life and maintain product taste, colour and freshness, for example in the wine industry. Taking a jar of peanuts that you might find a hotel minibar as an example, measured amounts of liquid nitrogen evacuate the air in the jars and minimise spoilage of the peanuts.

Meanwhile, the nitrogenation of beer or ready-to-drink coffee products results in a smooth, creamy product with an attractive cascade effect after pouring – and adding liquid nitrogen just after filling adds pressure to aluminum cans. This provides the can with some rigidity, making it more stable, while dosing can also help to reduce oxygen in the headspace and preserve both the flavour and aroma of the coffee. As cold-brew coffee continues to grow in popularity, more companies are looking to add nitro-coffee to their offering.

When it comes to beer, nitro-style beers are also a growing segment, in the craft brewing industry. As with coffee in the can, oxygen in the headspace can spoil the flavour and aroma of a well-crafted beer and liquid nitrogen dosing can mitigate this by reducing the oxygen headspace – as well as enabling the same smooth and creamy effect upon pouring. Though observers might keenly point out that dissolved oxygen is closely monitored and controlled throughout the brewing process, VBS notes that oxygen pick-up can occur during filling and there is, therefore, demand for its effective NITRODOSE® systems. 

TABLE 1. LIQUID NITROGEN DOSING COMPARISON

SOURCE: VACUUM BARRIER SYSTEMS

	Mini-dose	Easy Dose G2 and G2 LITE	Easy Dose G2 Plus	Nitro-dose G2	Nitro-dose G2 Pro	Nitro-dose G2 Servo-doser	HS Aseptic
Maximum discrete dosing speed	200 CPM	450 CPM	2000 CPM	450 CPM	2000 CPM	2000 CPM	750 CPM
Minimum dose duration	25 ms	25 ms	6 ms	25 ms	6 ms	5 ms	12 ms
Maximum direct LN <sub>2</sub> feed pressure	1,5 bar	1,5 bar	1,5 bar	6,9 bar	6,9 bar	6,9 bar	12 bar
Monitored level control	No	No	No	Std	Std	Std	Std
Accuracy in dose weight	+/- 5%	+/-3%	+/-3%	+/- 3%	+/- 3%	+/-1%	+/-3%