

Liquid Nitrogen Dosing Application Focus



Packaging

PET Container Reduction & Enhancement

Chart is known industry wide for its frost-free, vacuum insulated, liquid nitrogen equipment and piping distribution systems. With over 3,000 dosing units installed, Chart has a wealth of application specific knowledge across a wide variety of dosing applications.

The Challenge

A bottling company was asked to design a new sports drink bottle that is easier to squeeze, cheaper to produce, and better for the environment. The company accomplished this and won three awards, stating their bottle had the lowest weight in its category. Removing weight helped make the bottle more flexible, which when combined with the design and reapplication of the sport closure delivers an improved flow and consumer experience.

With the previous filling process, they were quite constrained on the design. Now with the new filling process, they have more freedom with the design so they can focus on having a grip and delivering on the easy to squeeze bottle.



The Solution

The cross-functional team, from engineering to marketing, wanted to avoid the limitations of conventional bottle manufacturing. The team created a manufacturing process called warm-fill that combines filling the bottle with warm product and dosing it with liquid nitrogen. This process creates an initial pressure, offsetting the product displacement that occurs when the product cools down.

The warm-fill process also allows for weight reduction and uses less energy for manufacturing and filling. The PET material is comprised of the same resin used in water and sparkling water products, helping to create efficiencies in the company's supply chain.

Testing the early prototypes was difficult because it was challenging to precisely inject the drop of nitrogen before the bottle was capped in a lab environment.

They said the biggest challenge was to sign off the performance of the bottle and the closure with the new filling process without having a large scale production line to validate everything, while making a multi-million dollar investment on new production lines.

The product did pass all the validation tests and is now successfully produced on two production lines and well received by the customers and consumers.





Key Benefits

- **Lightweight PET** – reduce the weight of PET for cost and environmental savings
- **Glass to PET Transition** – eliminate glass safety hazards and weight of containers
- **Bottle Rigidity** – maintain bottle shape even with lighter weight containers
- **Eliminate Paneling** – increase the internal pressure to offset paneling issues common in hot filling
- **Oxygen Reduction** – create an inert environment to preserve product freshness
- **Extend Shelf Life** – minimize oxygen levels
- **Ease of Labeling** – consistent bottle rigidity creates an efficient labeling process
- **Reduce Nitrogen Consumption** – measurable and repeatable liquid doses
- **Maximize Warehouse Storage Space** – increasing product stackability utilizes less square footage
- **Stabilize Organic Products** – extend shelf life without preservatives

Inerting with Liquid Nitrogen

- Effectively flushes O₂ out of the bottle head space, extending shelf life
- Saves money by reducing the weight of PET
- Keeps the product fresh longer
- Brand identity through container design
- **Provides Container Design Creative Flexibility** – to match design to market

PSI Data

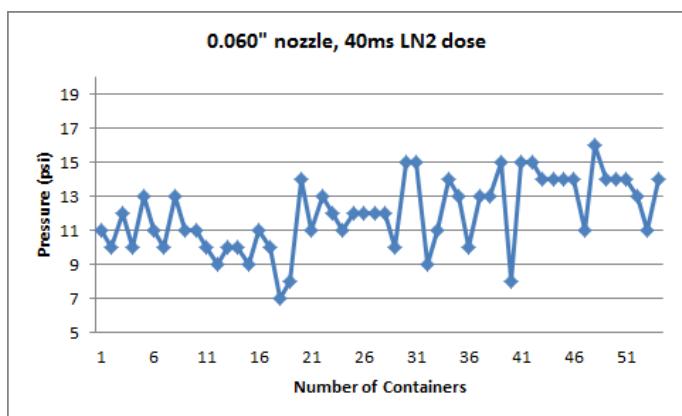


Chart Services

- Application support
- On-site equipment demonstrations
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- Maintenance

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