Liquid Nitrogen Dosing Application Focus

Preservation

Vitamin & Mineral Supplements Packaging

Supplements are designed to supplement the diet with nutrients and other substances that exert a physiological effect on the human body. In most parts of the world supplements are, along with dietetic foods and fortified foods, considered to be food products and are subject to food law rather than pharmaceutical law.

It is good manufacturing practice that a product should meet qualitative and quantitative specifications for all ingredients throughout the product's shelf-life. Products are generally labeled with a date through which the product's potency is assured by the supplement manufacturer. A product's stability is used to determine its shelf-life. For supplements, assurance of product stability is primarily related to the quality of the product and consumer confidence.

The Challenge

There are a number of environmental, chemical and physical factors which can affect the stability, and thus the shelf-life, of supplements and their ingredients.

The most important factors are:

- Temperature
- Moisture
- Oxygen
- Light
- pH of the product, particularly liquid products
- Oxidizing and reducing agents
- Presence of metallic ions (e.g. iron and copper)
- Presence of other ingredients
- Other components of food, such as sulphur dioxide
- Combinations of the above

The Solution

Chart offers liquid nitrogen dosing systems to aid in oxygen reduction. To demonstrate this capability, several popular size and style containers were evaluated to determine the effectiveness of the technology.

LN_2 is supplied to the doser by a vacuum insulated hose and flows into the dosing head. A sensor detects the speed of the line (encoder compatible for higher speeds); a second sensor detects the presence of a container. When a container is detected, the dosing head opens and dispenses an exact amount of pure LN_2. The LN_2 gasifies and is either trapped in the container to add rigidity or escapes with oxygen to inert the headspace.

CHART®

Test Summary

Several popular sizes and styles of vitamin supplements were tested. The supplement type included softgels, tablets, caplets, and gummies. The containers were either PET or HPDE with foil or plastic inductive seals.

O_2 levels were measured with a "6500 Headspace Oxygen Analyzer" by Illinois Instruments.

For this test, O_2 readings were taken to establish a baseline or 'pre-dose' condition on each container. The O_2 level in the room was also noted. After these readings were taken, each container was dosed with liquid nitrogen using a Chart 0.090" nozzle for 100 milliseconds (ms).

Results varied depending on the type of supplement and container but overall there is a significant difference in O_2 levels post liquid nitrogen dosing.

	O_2 Levels (%)		
	Before LN_2 Dosing*	After LN_2 Dosing	% Reduction
1000mg Fish Oil (200 softgels in clear PET container with adhesive seal and twist closure)	20.55	4.35	79
Multi Vitamin Gummies (60 gummies in clear PET container with heat shrink plastic seal and child proof twist closure)	5.16	3.18	38
500mg Vitamin C (100 vegetarian caplets in brown HDPE container with clear adhesive seal and twist closure)	17.35	4.58	74
500mg Vitamin C (100 tablets in white HDPE container with adhesive seal and twist closure)	20.30	5.03	75
1000IU Vitamin D3 (200 softgels in orange PET container with adhesive seal and flip top closure)	20.20	5.52	73
1000mcg B-12 (100 tablets in green PET container with adhesive seal and flip top closure)	19.05	4.6	76

**O_2 level in lab: 20.60%*

Conclusion

The testing demonstrated that the Chart LN_2 Dosing System is capable of reliable oxygen reduction, often times upwards of 70%. Oxygen reduction may yield the following benefits for supplements:

- Extended shelf life, reduction of returns and yield loss
- Reduction in active ingredients needed in order to meet shelf life targets
- Reduction in stabilizers and a cleaner label
- Obvious reduction of paneling, reduction of returns

Sample testing is required to determine exact results for specific containers and supplements and to determine the optimum machine configuration.

Test results achieved in the test laboratory may be different from results seen in the production environment.

Your Local Representative

Chart Inc.
46441 Landing Parkway • Fremont, CA 94538
Phone +1 800.371.3303 • Fax +1 408.577.1567 • Service +1 408.371.4932
www.chartdosers.com

PN 20843183