Carbon dioxide in food & beverages

By Sam A. Rushing on Sep 01, 2011 | 0 FEATURE

Sam Rushing guides us through purity and maintenance protocols

Carbon dioxide is principally sold in the developed markets to the food and beverage industries. Food grade standards are somewhat vague at times, however, beverage applications demand strict quality standards.

Carbon dioxide (CO_2) specifications for food related service, as I have observed over the years, have a range of standards. On the subject of food specifications, whether this is dry ice or liquid applied via cryogenic freezers, or flashed into snow for grinding and blending, or even modified atmosphere packaging (MAP), the specifications from production plant to the point of application are, in most cases, much less defined than beverage service definitions.

Over the years, the food industry has created varying levels of definitions for CO_2 standards, many companies have adopted the Compressed Gas Association (CGA) 'I'

grade definition with respect to limiting the impurities of the CO2 content. In terms of handling CO2 from the point of production to the point of application, for general food processing applications this generally calls for many common-sense protocols relating to maintaining clean storage, transfer and transportation vessels, hoses used in transfer and delivery, and little more. However, beverage related service is altogether another story.

Here, we're focusing on standards in the US and Canada rather than European, Asian, and other world market standards. These other international standards, for example, have their own requirements and definitions.

Delivering the required purity for beverage carbonation, per major soft drink firms, requires following published guidelines by the International Society of Beverage Technologists (ISBT). However, the definitions provided are further defined by major soft drink producers such as Pepsi Bottlers Group (PBG). Due to a few major contamination reports in the past by the global soft drink firms, in Europe, principally, the multinational beverage firms demand a strict protocol for service to their facilities.

This includes the following points:

- Vendor would warrant compliance with the Federal food and drug acts, and other applicable agency initiatives.
- Transport of the product must meet with the DOT and CTC regulations and specifications.
- CO2 standards must be complied with, to include tests for specific impurities, with test procedures and limitations defined. This includes sampling protocols.
- A qualification process for suppliers must be followed prior to any delivery.
- Each source of CO2 and each refining plant must be approved; and only CO2 transports are allowed.
- A supplier development initiate is usually required, starting with CO2 source process descriptions; all the way through loading and unloading procedures. Analytical equipment and test capability at the source are defined. History of production analysis, and feed gas source definitions with potential trace contaminants, and approved independent lab analysis for all specification definitions are further provided.
- MSDS to be supplied.
- Analytical testing data submissions are required generally for an initial period of service. After one year of service, an annual complete analysis can then be supplied.
- Often, specific independent labs are pre-defined for use; and additional labs must be approved for use.
- After the approval for the initial delivery, and prior to the initial delivery to an individual plant, it is usually necessary to provide all procedural and delivery related information.
- Often, individual certificates of compliance and analysis are the protocol for each load delivered to each plant. Often the purity/assay and sulfur content are analyzed and defined for beverage service.

On the subject of beverage carbonation applications, on average this represents some 30 percent of the developed merchant market tonnage. There are significant demands placed upon this type of service, unlike many food industry related applications. As alluded to previously, the actual CO2 specification in the food industry (per se) is sometimes adopted from the CGA 'H' or 'I' grades. However, despite the specification defined or adopted, the definitions surrounding sourcing, certification of refining plants, transport, handling, and the testing of each load are often not the protocol of the food processor.

I believe the lack of such stringent management, maintenance and ultimately all the steps defined for large soft drink firms, are driven by less press coverage associated with contamination. And in the case of foods compared to beverages, the contamination from anything relating to CO2 has been much smaller, and contained

in-house.

With respect to off-specification complaints, many of the incidents which resulted in 'contamination' of a processed food product generally were not of a specific impure (CO_2) chemical nature. However, these complaints have often been of a particulate nature, such as plastic, rubber, or metal seals, bearings, or grinder components disintegrating and falling into the processed food product. In such cases, whether correctly or wrongly accused, the CO_2 system or vendor is often accused, or at least initially said to be at fault. When handling the CO_2 liquid, there are definitions when making reference to CGA and allied publications for clean storage vessels, transport equipment, and transfer hoses/containers.

Maintaining purity

In terms of maintaining the purity of food grade product, once the storage and transport trailers are well maintained in a clean and safe manner, the same is required for application equipment in food service such as snow horns, cryogenic freezers, and dry ice pressing equipment.

All of these measures are downstream of producing a pure, viable CO_2 product, which meets the vendor's and oversight requirements. Mechanical wear problems must be monitored with rotating/automated components to circumvent physical deterioration and breakdown and the loss of oils, mechanical fluids, and debris into the CO_2 product being manufactured at the point of application. It has been known that oil and like substances are found in produced dry ice, however, major recalls of a significant nature have not usually been reported, since handling dry ice via boxes, slicing and dicing is not an extraordinarily sterile business – or an exact science.

Logical, practical, and safe handling techniques and operating standards are the bottom line protocol for managing and maintaining food grade CO_2, when little more is defined. If significantly more is defined in terms of handling food grade CO_2, then such definitions must be maintained in order to operate a safe, quality, and profitable business.

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