



ASK THE EXPERT

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What's All the Fizz About?

The industry has a new definition for beverage quality CO₂

In keeping with the world's ever-changing expectations for quality and food safety management, beverage manufacturers are still looking for ways to ensure the quality of their beverages and the integrity of their trademarks.

Since carbon dioxide is an integral part of many beverages like soft drinks, sparkling water, beer and wine, its specification has recently been under extensive scrutiny. After all, it is the CO₂ that is used to carbonate these types of drinks so that there is a nice acidic flavour and some fizz to the beverage. Basically, carbonation occurs when carbon dioxide gas is added directly to a water-based liquid. The carbon dioxide reacts chemically with the water molecules to form carbonic acid as follows: $\text{CO}_2 + \text{H}_2\text{O} \Rightarrow \text{H}_2\text{CO}_3$. This reaction works well when the water is under pressure, but at normal atmospheric pressure, the reaction tends to reverse. This is why carbonated beverages fizz when they are opened but eventually go flat.

Although CO₂ is found in the atmosphere at a concentration of about 330 ppm (0.033%), typically large quantities of raw carbon dioxide come from natural sources or as a by-product from many different biological (fermentation) and chemical processes. The variation in the sources results in a variety of specific impurities from each source. These different impurities can cause food safety issues for a beverage manufacturer unless the proper controls are in place.

As a result, a new chemical specification for a "beverage quality" CO₂ product has been jointly defined by a professional organization of the beverage industry (International Society of Beverage Technologists) in conjunction with the compressed gas industry (European Industrial Gases



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Association and Compressed Gas Association). Other sources such as the U.S. Food Chemical Codex and the Joint Expert Committee on Food Additives have also been used in order to define the new requirements.

Improvements to the previous specification include a slightly higher CO₂ purity requirement and tighter controls on impurities, like total volatile hydrocarbons (methane, for example), acetaldehyde, aromatic hydrocarbons (benzene), carbonyl sulfide, hydrogen sulfide, sulfur dioxide and total sulfur as H₂S.

In addition to the new beverage quality specification, carbon dioxide suppliers need to ensure that they have a quality management system in place. The quality system provides the organizational structure, policies, programs and procedures needed to manage product quality and safety from the purchase of materials and services used in the manufacturing of carbon dioxide along with process monitoring, and the management of the finished product, through to the necessary traceability, recall and security programs. An on-going audit process of each CO₂ manufacturing facility ensures that the quality programs are working effectively and are adapted to meet the changing needs of the beverage industry.

In the near future, further improvements for carbon dioxide will include the implementation of a HACCP system and third-party certification. An effective HACCP plan should complete the CO₂ supplier performance requirements for the beverage industry...unless there are further developments.

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