The up-and-coming champion in the carbonated soft drink industry – Carbonated bottled water

Relevant for: Bottled Water Industry

Carbonated bottled water becomes more and more important in the carbonated soft drink category. It fulfills the consumer need for a healthier fizzy alternative compared to sugary or artificial sweetened refreshments perfectly.

1 Industry

Seltzer, sparkling water, carbonated, mineral water or soda are different names for this fast-growing beverage segment. All key players are launching new products in this category, like ‘bubly’ and ‘bubly bounce’ by PepsiCo and ‘evian +’ by Danone, as well as ‘AHA’ by The Coca-Cola Company. Not only big brands cover this trend, roughly 20 % of the market are private labels producing their own spark in the bottle with or without a twist.

The boost for this segment is health conscious consumers seeking for a fizzy alternative to sugary and artificial sweetened carbonated beverages. The combination with fruit juice, vitamins, caffeine, essential oils and alcohol covers additional functions and occasions, making this refreshment category even more attractive to bottlers and consumers. With caffeine as an afternoon booster or as a hard seltzer with alcohol, carbonated bottled water is an all-around companion in our daily life.

To guarantee a constant consumer impression the dissolved carbon dioxide concentration needs to be controlled. A special challenge for the producers is the oxygen content in the package: Firstly, natural ingredients like vitamins or fruit juices are prone to oxidation, which can influence the taste of the product during the shelf life. Secondly, oxygen enhances the risk of can perforation and metal uptake. Therefore, both parameters, the dissolved carbon dioxide and oxygen content need to be determined accurately.

2 Measuring dissolved CO_2

When it comes to dissolved carbon dioxide determination (CO_2) in carbonated water, it is essential that the CO_2 result is unaffected by other dissolved gases such as air or nitrogen (N_2). Many commercially available CO_2 meters measure the sum of all dissolved gases and attribute the result to carbon dioxide, thus obtaining erroneously high results. Those devices are based on the classical pressure/temperature method.

CarboQC and CboxQC avoid this error because of their working principle: The patented Multiple Volume Expansion (MVE) method. This method includes a double pressure/temperature measurement with an intermediate volume expansion which eliminates the impact of foregin gas on the determined CO_2 concentration. Using the CarboQC or CboxQC offers additional advantages: The value is independent from the measured altitude, due to the relative pressure sensors. Snifting, which is necessary with many conventional CO2 meters and easily leads to erroneous results, is eliminated. Last but not least, samples can be transferred directly from tanks in the production area or from bottles and cans for final quality control. Overall, the devices offer an easy-to-use handling and a versatile applicability.

3 Measuring dissolved O_2

The CboxQC or OxyQC have an optical oxygen sensor integrated. This sensor measures quickly, reliably and selectively the amount of oxygen in liquids or gaseous media.

Optical oxygen sensors are based on an optode with an integrated dye. The dye gets excited by light and emits light depending on the concentration of dissolved oxygen in the liquid. The brighter the emitted light, the lower is the oxygen concentration.

Additionally, the determination is non-destructive. So, no oxygen is consumed during the measurement. It is highly user-friendly since no electrode is used and highly ecologically friendly as no chemicals are required.

4 What happens during shelf life?

It is in the bottler's interest to guarantee a consistent consumer experience over the products' shelf life. Depending on the packaging material, the carbon dioxide concentration and/or the dissolved oxygen concentration need to be considered.

The dissolved carbon dioxide level should stay over a product-specific level. Especially with PET-bottles, the most popular container type, this task is challenging. Over time carbon dioxide diffuses out and oxygen diffuses into the bottle. A selective dissolved carbon dioxide measurement is key to understand this process, because a decreased dissolved CO2 concentration results in a flat taste of the product. On the other hand, the slowly rising oxygen content may oxidize natural ingredients in the beverage, which finally influences the taste of the beverage.

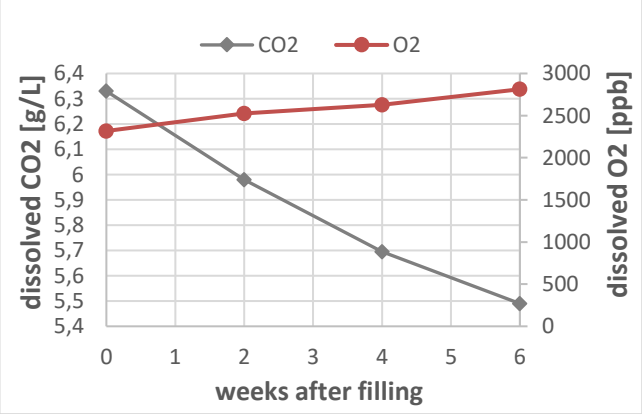

Figure 1: The increase of oxygen and decrease of carbon dioxide inside a PET bottle over time.

A large share of functional carbonated water brands is packaged in cans. Beverage cans do not allow oxygen ingress. Nevertheless, oxygen can get into the can during the production and filling process. The packaged oxygen harms the beverage and the can itself. The investigation of aluminum uptake revealed a correlation with the entrapped air level.

5 Recommendations

Carbonated bottled water is an up-and-coming beverage category with the necessity to measure dissolved carbon dioxide and dissolved oxygen in the final container. With the CboxQC (At-line) or CarboQC (At-line) both parameters can be measured selectively and highly accurate, as well as simultaneously and user-independent. Knowing the true dissolved carbon dioxide concentration with a resolution of 0.01 g/L allows the fine tuning of your production line. Only add as much carbon dioxide as necessary, save money and have satisfied consumers! At the same time keep your oxygen uptake in the final package during the production process under control.

Not convinced yet? The return-on-investment calculator for your particular production facility will speak for itself.

Figure 2: CboxQC At-line

6 References

1. Application Report XPAIA048EN "The importance of oxygen measurement in soft drinks"

2. Application Report D35IA008EN "The truth about CO_2 in beverages"

3. Application Report XDLIA043EN "How an Optical Oxygen Sensor works"

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