



Beer We Go! A Study of Carbonated and Nitrogenated Beers

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Introduction

A flavorful crisp beer is a popular, worldwide beverage. Beer can be either carbonated or nitrogenated, each giving a different sensory outcome. Carbonated beer, such as Budweiser, has a crispy and light texture, whereas nitrogenated beer, such as Guinness, has a creamy, smooth mouthfeel. A comparison study of these two different beer types was done using a Packaged Beverage Analyzer (PBA). The PBA is used to analyze the density, CO₂, O₂, N₂, and alcohol content of various beverages, such as beer, sparkling water, and soda. The parameters assigned to the carbonated beer were container type and temperature at which it was stored. In contrast, the parameters for the nitrogenated beer were container type and widget variation. Consumers desire consistent tastes and longevity in their beverages, and these parameters could potentially impact the shelf stability and sensory outcomes of each type of beer.



Carbonated Beer Comparison

Room Temperature Containers

	CO ₂ [vol.]		O ₂ [ppm]		Alcohol [%v/v]		Calories [kcal/12oz]	
Can	2.687	2.663	0.071	0.012	5.00	5.05	143.93	144.29
Aluminum bottle	2.602	2.584	0.035	0.016	5.06	5.06	144.11	144.27
Glass bottle	2.556	2.499	0.064	0.012	5.03	5.03	141.76	141.83

Refrigerated Containers

	CO ₂ [vol.]		O ₂ [ppm]		Alcohol [%v/v]		Calories [kcal/12oz]	
Can	2.767	2.735	0.154	0.036	5.03	5.03	143.27	143.34
Aluminum bottle	2.689	2.683	0.033	0.026	5.07	5.07	144.18	144.54
Glass bottle	2.634	2.628	0.056	0.015	5.03	5.03	141.67	141.95

For each parameter, the first column is the first date of testing, and the second column is the last date.

Methods

All beverages were analyzed using a PBA instrument to obtain the density and alcohol, calories, O₂, CO₂, and N₂ index content.

Carbonated Beer:

- Readily available & multiple container types.
- Each container type was stored at refrigerated and room temperatures.

Nitrogenated Beer:

- Widget type (Irish vs American).
- Container type (bottle vs can).

All Nitro Beverages were stored at refrigerated temperatures.



Results & Conclusions

Carbonated Beer:

- Container type made no difference in data.
- Cold beer retains CO₂ better.
- No discernible changes in tested parameters over time.

Nitrogenated Beer:

- Widget type makes a difference in testing.
- Cans pose a greater chance of exploding under high pressure.

The PBA can confidentially be used for quality assurance for beers. The next stage is to offer these services to local breweries.



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Sample Type	Alcohol [% v/v]	CO ₂ conc. [vol.]	O ₂ conc. [ppm]	Calories [kcal/12 oz]	CO ₂ N ₂ -index [ppm]
Guinness Nitro Coffee – Aluminum Can	4.07	1.064	0.031	120.84	72.9
Lefthand Key Lime Pie – Aluminum Can	7.27	0.67	0.567	240.61	13*
Guinness Extra Stout (not Nitrogenated) – Glass Bottle	5.60	2.83	0.014	169.81	1.7
Guinness Draught Stout – Glass Bottle	4.26	1.674	0.030	127.59	55.1
Lefthand Milk Stout – Glass Bottle	5.85	1.146	0.027	216.00	66.9