ASTG

Hazards of Alternative Sources of Carbon Dioxide (CO_2)

Traditionally, CO_2 used in the food and beverage industries was a byproduct of processes such as ammonia production and natural gas processing. However, in recent years, these industries have faced increasing challenges regarding the sourcing of carbon dioxide (CO_2) due to the growing environmental concerns and the need for sustainability. As a result, these industries have turned to alternative sources for CO_2 such as fuel cells, landfills, anaerobic digesters, and direct air capture systems. While these sources offer potential benefits, they also come with significant hazards that must be carefully managed to ensure product safety and quality. These sources, although promising in reducing the carbon footprint, introduce new risks and challenges.

Key Risks Associated with Alternative CO_2 Sources

Chemical Contaminants: Alternative sources of CO_2 can introduce a variety of chemical contaminants that are not typically present in traditional CO_2 supplies. For instance, fuel cells and anaerobic digesters may produce CO_2 that contains trace amounts of harmful substances such as hydrogen sulfide (H2S), hydrocarbons, and heavy metals. These contaminants can pose serious health risks and affect the taste and quality of the beverage.

Microbial Contamination: CO_2 sourced from biological processes, such as anaerobic digesters, is at a higher risk of microbial contamination. Pathogenic bacteria and other microorganisms can be introduced into the CO_2 stream, leading to potential health hazards and spoilage of the final product. Ensuring rigorous microbiological testing and sterilization processes is crucial to mitigate these risks.

Variability in Purity Levels: The purity of CO_2 from alternative sources can be highly variable. For instance, CO_2 captured from landfills may contain volatile organic compounds (VOCs), Fluorinated compounds and other impurities including potentially mercury that are not present in CO_2 from traditional sources. Additionally, these impurities can fluctuate and may not always be present. This decreases the effectiveness of "fingerprinting or spot checking" and more emphasis on the need for continuous monitoring. This variability necessitates more stringent monitoring and purification processes to ensure the CO_2 meets the required standards for food and beverage production.

Implementing Higher Standards of Testing and Monitoring

Regulatory Compliance: The regulatory landscape for CO_2 used in food and beverage is evolving, with new guidelines and standards being introduced to address the unique risks associated with alternative sources. Food and beverage producers must stay updated with these regulations and ensure their CO_2 supply chains comply with the latest safety and quality standards

To mitigate the risks associated with alternative CO_2 sources, the industry must adopt a higher level of scientific rigor in testing and monitoring. This includes:

Advanced Analytical Techniques: Utilizing advanced techniques: such as Cryo-GC-MS-MS, IC-ECD, ICP-MS, and FTIR to detect a wide range of contaminants. The list of potential contaminants coming from these new sources is growing and industry must be prepared to utilize these advanced analytical technologies for continuous monitoring of both the inlet and outlet sides of the process to ensure safety and quality.

Comprehensive Risk Assessments: Conducting thorough hazard analyses and establishing robust sampling and analysis plans to identify potential blind spots.

Continuous Improvement: Regularly updating guidelines and standards to incorporate the latest scientific knowledge and technological advancements.

CONCLUSION

While alternative sources of CO_2 offer promising solutions for sustainability, they come with significant hazards that must be carefully managed. The beverage industry must invest in advanced testing, rigorous quality control, and continuous improvement to ensure the safety and quality of their products. By doing so, they can not only protect consumer health but also maintain the integrity and trust in their brands.

ASTG SOLUTION

AirBreather Systems™

State-of-the-Art Continuous Gas Analysis

Based on the success ASTG has demonstrated using our AirBreather Systems™ for CO_2 purity in the Food and Beverage industries from traditional sources, we were able to take advantage of our advanced technologies and expand our list of contaminates measured to over 50 including Mercury down to the ppb level. We provided this new breed of AirBreather Systems™ to a large landfill owner measuring the following lists of compounds:

0	1,2,4,trimethylbenzene	18	Carbon Dioxide	36	Ammonia
1	Acetone	19	Carbonyl Sulfide	37	Nitrous Oxide
2	Acetylene	20	Carbonyl Disulfide	38	Nitrogen Dioxide
3	Tetrachloroethylene	21	Ethane	39	Nitric Oxide
4	Vinyl Chloride	22	Ethylbenzene	40	PFBI
5	Acetaldehyde	23	Ethylacetate	41	Propane
6	Ethylene	24	Ethanol	42	Sulfur Dioxide
7	Trichloroethylene	25	Freon-12	43	Styrene
8	Propylene	26	Freon-13	44	Sulfur Hexaflouride
9	2-Propanol	27	Freon-14	45	THF
10	1,3-Butadiene	28	Freon-22	46	Toluene
11	Benzene	29	Freon-141b	47	o-xylene
12	Cyclohexane	30	Freon-218	48	p-xylene
13	m-Xylene	31	Freon-225	49	Oxygen
14	Carbon Monoxide	32	Water	50	Methane - Purity
15	Methylene Chloride	33	Formaldehyde	51	Carbon Dioxide Purity
16	Methanol	34	Hydrogencyanide	52	"Total Reactive Sulfur"
17	Methane	35	Heptane		

*Plus: Mercury as an option

For contact Information,
visit: www.ASTG.com
email: info@astg.com
or call: +1 888 363 2541

ASTG
Analytical Science and Technologies Group, Inc.

PRECISION | POWER | PERFORMANCE

YOUR BENEFITS

- Exceeds ISBT Standards
- Fastest Response Time (4 minutes)
- Least amount of precious sample gas required
- No carrier gases required other than air
- No Span Calibration Gases required / internal validation
- Secure Certificate of Analysis Module — COA™
- Truck Filling Option
- Automated Fill Panels speed up distribution time
- Can be used for Re-cycled or Alternative CO_2 sources
- Expandable for raw gas
- Low cost of ownership
- Simple design makes it easy to service