Maximum security for Carbon Dioxide Bottling Production

Technical Application Publication

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Summary:

The global beverage manufacturing and bottling industry is one of the largest and most efficient manufacturing processes in the world. The market has benefited from many years of growth and innovation and each year we see more products being introduced into the global marketplace. Consumer demand has changed in recent years and traditional soda's though still in high demand have now eloped into a wider range of products. Carbonated cold brew coffee, tea, juice, sparkling waters and energy drinks all rely on Carbon Dioxide (CO_2) for creating the desirable fizz. The Carbonation of the beverage is undertaken by forcing carbon dioxide (CO_2) into the liquid and storing under pressure. The presence of this gas creates bubbles and fizzing in the liquid when pressure is reduced.

The quality of any beverage manufacturing system is related to its quality management system's effectiveness. The beverage industry benefits from some of the highest quality management systems in the global industry. Benefiting from internal and external audits, quality is maintained through a wide scope of processes and measures that ensure consumer protection, brand integrity and the avoidance of costly product spoilage and recalls.

The CO_2 that is injected into the beverage must be free of particles, microorganisms and unwanted chemical compounds. Existence of these contaminants may result in a quality incident. Such an incident may occur where a delivery of out-of-specification CO_2 has been made to the plant or where CO_2 has been contaminated on-site during the storage or production process. The regulatory landscape for CO_2 is of major importance to the global bottling community and is under constant review. Guidelines continue to evolve offering best practise recommendations with the purpose of ensuring a framework to a quality system which will safeguard CO_2 as it travels through the supply chain to its destination. Providing essential reference to safety and regulatory standards, guidelines also provide a source to the current analytical method and techniques references. Potential impurity types are named, and the individual critical limits detailed. These guidelines detail what is termed as 'Beverage Grade CO_2', this is the beverage industry's recommended Carbon Dioxide product grade for use in carbonated beverages.

A global recognised guideline is issued by the International Society of Beverage Technologists (ISBT). The ISBT are universally accepted as being a leader as a purity standard-setting body. The latest publication was released in 2019 and is seen as a crucial bibliography to the global beverage manufacturing and bottling industry.

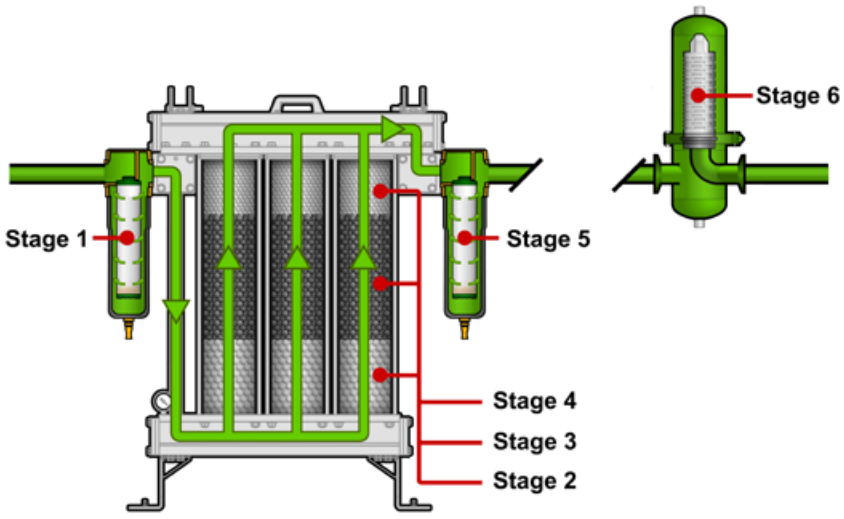
Parker Quality Incident Protection:

The PCO2 is a static adsorption bed constructed from specially selected adsorbents to remove trace contamination from CO_2. It is designed as a quality incident protection device, it will treat 'out of specification' CO_2 to return it back to specification within the limits of the specification.

Additional Parker specialised filtration is provided at both the inlet and outlet points of the system as standard. Pre filtration ensures protection of the adsorbent beds from Non-Volatile Organic Residue (NVOR) that may be present in the gas supply and other contaminants down to 0.01 micron. Post filtration ensures no carry- over of particles from the adsorbent beds to 0.01-micron particle filtration.

An optional - Sterilising Grade gas filter may also be supplied when live bacteria or phage contamination of CO_2 represents a hazard to product quality or consumer safety. The PCO2 purifier will treat CO_2 with up to 10 times the ISBT / EIGA levels of the named contaminants for a specified quantity of processed CO_2 gas. The installation of a PCO2 system allows production to continue by processing the contaminated CO_2 whilst the corrective actions are implemented.

For over twenty years Parker (formally domnick hunter) systems have ensured that global bottling sites have been protected from the threat of a quality incident. Parker are proud to be the global markets preferred technology.



Stage 1
0.01 micron particle filtration
Removal of non-volatile organic residue (NVOR) and other contaminants down to 0.01 ppm

Stage 2
Removal of water vapour and partial removal of hydrocarbons

Stage 3
Primary removal of aromatic hydrocarbons (Benzene, Toluene
etc and Acetaldehyde)

Stage 4
Removal of sulphur compounds
(COS, H2S, DMS etc)

Stage 5
0.01 micron particle filtration

Stage 6*
Point of use VBACE sterile gas membrane.
HIGH FLOW BIO-X

* Optional - Sterilizing Grade: consult Parker for operational use

Additional Security:

The potential risk in the presence of impurities in CO_2 gas and the dangers that they present ensure that there is always a requirement to protect the process and consumer. The Parker PCO2 product range will ensure protection from an impurities spike, minimising risk and maximising security. Acting as the final barrier to protection there is also a requirement to establish where the source of a contamination may have originated so that corrective and preventative actions can be implemented.

Our partners, BevSense offer a low cost of ownership solution with the VS5000 gas purity monitor. The VS5000 was designed to be easily installed in a facility without a CO_2 purity sensor and also to be a plug and play replacement for the Pulsar, currently in use at many bottling plants. The VS5000 infrared inline gas purity sensor measures gas contaminants real-time over a 24X7 period. Impurities are measured directly, not inferred or calculated. The sensor can measure purity levels at three locations.

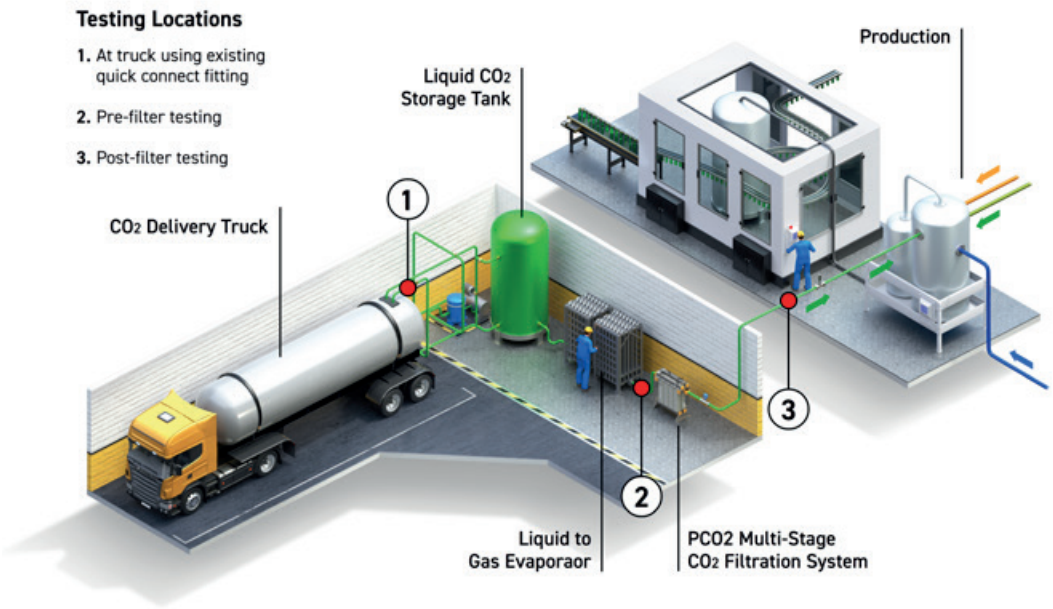
The recommended locations are:

① **At the truck before the holding tank, using existing quick connection fitting**
② **Post holding tank but pre-Parker PCO2 purifier**
③ **Post Parker PCO2 purifier, finished CO_2 product line**

Focused on the requirements of the industry, real-time, inline concentration readings available for:

- Volatile Hydrocarbons as Benzene
- Acetaldehyde
- Hydrocarbons as Methane
- Sulfur Dioxide

These impurities are detailed as being a threat as to the latest ISBT guidelines. Plant personnel can be provided both a detailed report about the amount and which contaminant and a simple PASS/FAIL/NEAR FAIL result. The VS5000 is a state of the art, solid state device which requires little maintenance while offering repeatable, high quality and accurate test results.



Conclusion:

Minimising risk is essential in the global beverage manufacturing and bottling industry. Quality practises and protocols are well established and under constant review. The requirement to protect the consumer from the damages of contamination is essential. Active steps to ensure no contamination enters the process stream is crucial, however the source of any potential contaminant also requires identifying.

The Parker PCO2 quality incident system used in combination with the BevSense VS5000 gas purity monitor ensures that risk is fully minimised. The industry's best filtration system combined with the industry's best purity sensor gives the user of CO_2 the ability to not only remove impurities but to identify and measure those impurities, find the source of them and measure the effectiveness of the CO_2 filtration system.

For full details please find recommended reading

PCO2 Next Generation- Product Information Sheet	**PISCO2-10-EN**
Bev Sense VS5000 Brochure	**P/n vs5000**
PCO2 - Quality Incident Protection - FAQ's	**PISPCO2FAQ-04-EN**
PCO2 – Shepley Spring	**MAPSHEPLEYSPRING-00-EN**
Carbonated Soft Drinks: Quality Incident Protection	**TAPPCO2QIP-02-EN**

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