

CO₂ Quality Incident Protection for Fountain Drink Dispense

Carbonated soft drinks (CSD) continue to be popular and around the world billions of beverages are sold each year. Popular brand offerings are available in PET (polyethylene terephthalate) or glass bottles, canned or through fountain dispense. The carbonated soft drinks dispenser is commonly known as a 'Soda Fountain'. The soda fountain combines flavoured syrup and Carbon Dioxide (CO₂) with chilled and purified water. The soft drink when mixed is dispensed through the soda fountain. Post mix syrup is supplied and pumped from bag-in-box (BIB) containers and virtually all of the popular brands of soft drink are now available in this format. Fountain dispense machines are most often seen in quick serve restaurants.

Beverage Quality:

Consumers expect a high-quality and consistent taste. Poor quality will impact on consumer safety, damage brand reputation and ultimately revenues. Soft drink manufacturers must adhere to national regulations based on codes and standards ensuring that their BIB post mix syrup meet regional legislation. In the United States, soft drinks are regulated by the Food and Drug Administration (FDA). Soft drinks ingredients must comply with all applicable FDA safety requirements which are globally recognised.

The reputation of many soft drink manufacturer have been established over many years through providing an excellent product and service. While BIB syrup is manufactured to meet FDA standards, CSD fountain dispense offers a challenge of ensuring that the best quality product is dispensed each and every time by the QSR.

Quality guidelines are supplied by the major soft drink suppliers of BIB post mix syrups and relationships with the QSR and fountain dispense equipment suppliers are traditionally strong to ensure consumer safety and maintain brand reputation.



Fountain Dispense Quality:

Around 90% of a conventional CSD serving is composed of water, with the remaining 10% consisting of the post mix syrup and CO₂. The CO₂ content is low, usually between 0.3% - 0.6%.

The recommended quality steps undertaken to ensure a quality soft drink by the soft drinks post mix

syrup suppliers include, sterilization checks, temperature checks, the inclusion of an line water filter system and the checking of fresh syrup 'Use By' dates.

Use of a CO₂ filter is now recommended and is used in the same way as the water filter – to protect the consumer and taste.

Definition of 'Gas Quality Incident':

A quality incident is defined as gas delivered to the point-of-use with contamination levels exceeding the specification in this table.

Potential Contaminant	Critical Limit ppm (v/v)	Rationale
Total Volatile Hydrocarbons (as Methane)	50 ppm (v/v) max , of which a maximum of 20 ppm (v/v) as total non-methane hydrocarbons	Sensory
Total Aromatic Hydrocarbon	0.02 ppm (v/v) max.	Regulatory
Acetaldehyde	0.2 ppm (v/v) max.	Sensory
Total Sulphur (excluding SO_2 , as S)	0.1 ppm (v/v) max.	Sensory

Table 1:
ISBT CO₂ Quality Guidelines & Analytical Procedure Bibliography, 2010

The ISBT changed their 'Fountain Carbon Dioxide Quality & Food Safety Guideline' in 2016 on the use of an in-line CO₂ protection device from "optional" to "recommended", such are the concerns in the industry about contaminants being introduced through the CO₂.

Carbon Dioxide Gas Quality:

In recent years, growing interest and concern has been shown by the beverage industry in the possible effects of poor quality carbon dioxide used in carbonation of the beverage. This has resulted in a greater focus being placed on the purity of the CO₂ used at fountain dispense. In CSD dispense 'Food' grade CO₂ is recommended, this gas has a purity of 99.9%. Food grade gas has to comply to set standards, failure to comply with these standards may result in a quality incident.

ISBT (International Society of Beverage Technologists) & EIGA (European Industrial Gas Association) both have International recommended standards. In these standards, potential contaminants are named with a critical PPM limit of acceptance, referenced in table 1.

CO₂ used in CSD fountain dispense is generally supplied by gas supply companies using cylinders or by replenishing on site mini bulk tanks. The quality of CO₂ is controlled and monitored at the production plant and will be accompanied by a Certificate of Analysis from the gas supplier.

Using ISBT beverage grade gas still comes with the risk of post shipment contamination.

- Cylinders and fittings wear and are subject to fatigue
- Leaks expose the gas to atmosphere and potential contamination
- Non-volatile residues may be present in distribution pipes, metal fittings cylinders and welded assemblies
- Non-volatile organic residues may be present in compressor oil carry over, joining agents, valves and antifreeze
- Use of non-food grade elastomeric parts such as O-Rings, gaskets and tubing



Rusty / Fatigued
Cylinders



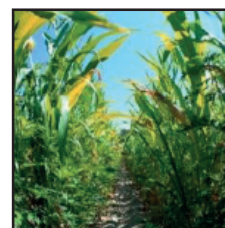
Leaking valves
and fittings



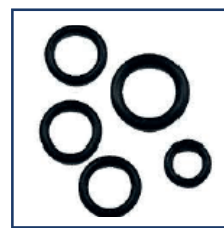
Compressor Oils



Elastomeric Hoses &
Tubings



Feed Gas
Bio-Oil
Residues



O-Rings and
elastomeric parts

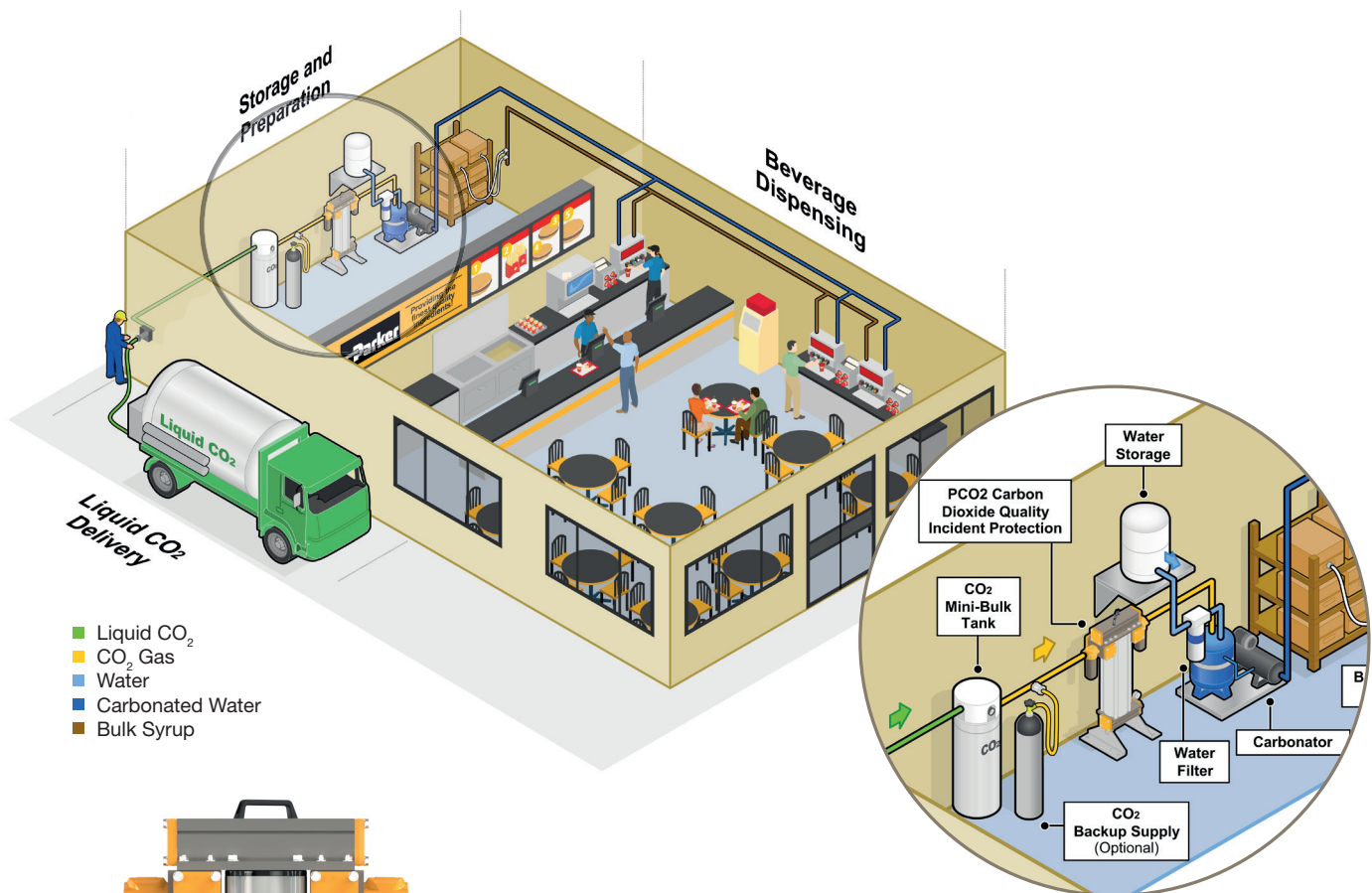
CO₂ Quality Incident Protection Systems:

For two decades Parker has supplied Quality Incident Protection systems for the CSD bottling industry. The Parker PCO2 CO₂ Quality Incident Protection system is installed to protect against poor quality contaminated gas which may pass through the supply chain and into the beverage during the bottling process. As with CSD bottling process, the CO₂ gas used in fountain dispense must be free of particles, micro-organisms and unwanted chemical compounds.

Existence of these contaminants may result in a quality incident.

The same established Parker multi-bed adsorbent technology as used within bottling and canning plants worldwide can also be used to protect the dispense process from a quality incident.

A typical Quick Serve Restaurant – highlighting the CO₂ purifier installation



The Parker PCO2-400 system has been designed to operate within the CO₂ flow rate requirements of a typical quick serve restaurant or beverage dispense facility that uses a mini- bulk supply of CO₂. Located post cylinder, the single column system will act as a protective barrier against any potential impurities that may be present in the gas stream guaranteeing CO₂ quality and consumer protection.

Parker multi-bed technology:

The Parker three layered adsorbent bed adsorbs contamination as it flows through. The three materials preferentially adsorb differing contaminants providing effective protection against a wide spectrum of potential contaminants known to create beverage flavour defects.

Parker multi-bed advantage:

A multi adsorbent system has increased retention ability over earlier generation activated carbon beds. The Parker multi layered approach means that several types of molecules can adsorb simultaneously on the surfaces, with less competition for active sites than found in activated carbon beds.

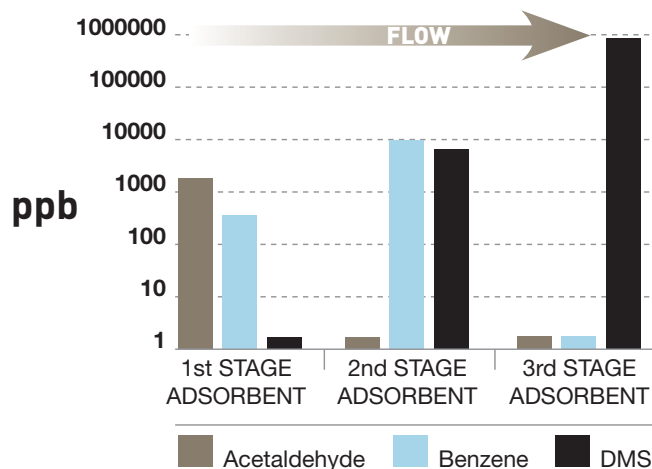
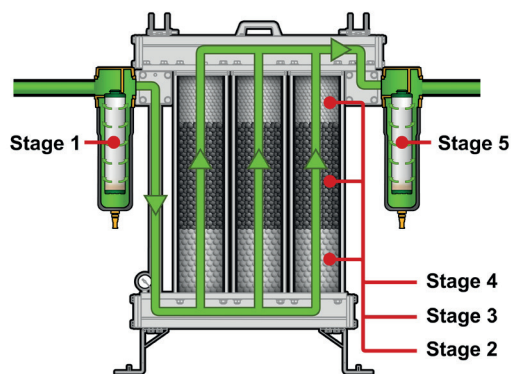


Table 2: The benefits of 3 Layer Adsorption

Conclusion:

Quality standards in the food and beverage industry are stringent and are under constant review. CO₂ usage is subject to active guidelines to ensure the quality of gas remains within safe limits for contaminants and impurities. Parker's multi-bed technology is well established in bottling plants throughout the world, helping producers to reduce the risk of quality incidents the beverage maintains its high quality taste and they maintain brand reputation.

Parker CO₂ Quality Incident device provides the same protection for quick serve restaurants. Meaning the same multi-bed technology can successfully be used as a quality incident protector for point of use fountain dispense.



- Stage 1**
0.01 Micron Particle filtration
Removal of non-volatile organic residue (NVOR) and other contaminants down to 0.01ppm
- Stage 2**
Removal of water vapour
& partial removal of hydrocarbons

- Stage 3**
Primary removal of hydrocarbons (Benzene, Toluene etc) Acetaldehyde
- Stage 4**
Removal of sulphur compounds (COS, H₂S, DMS etc)
- Stage 5**
0.01 Micron Particle filtration

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