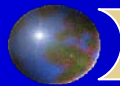


Proper Sampling, Non-Hazmat Shipping & ISBT Test Program Strategies for Fountain CO₂ Mini-Bulk Tanks

The Missing Link has been found!

Presented at the ISBT Fountain Conference – San Diego - 2012



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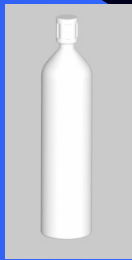
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Background - Review Fountain CO₂ Market + Unique Distribution Chain

- **Over 250K** Minibulk Tanks (MBT's) – USA alone
- **+ Over 150 LCO₂ Depots**
- End Users: Restaurants / Bars / Hospitals / Cafeterias / Stadiums / Ships (*Excess of 635,000 In US alone* (small users use HPC's))
- MBT's = RFL storage / PB Vapor Delivery / Kept on-site & topped off with LCO₂ load when empty
- Delivery Chain: Feedgas Source – Producer – Transport – Regional Depots – Transport – MBT Storage – Fountain Bev Use

MBT



HPC


**Several Points for Potential Contamination Introduction
& MBT build-up over time**

Fountain CO₂ Purity Grades

Incomplete list - shown for Purity Grade Comparisons

ISBT Beverage Grade CO ₂	ISBT Limit	Food Grade Limit	Food Grade (USFCC CO ₂ Monograph)
CO ₂ Purity	99.9	99.5	CO ₂ Purity
TNMHC/THC	20/50 ppm	50 ppm	THC
TSC	0.1 ppm	Not tested	TSC
SO ₂	1.0 ppm	5.0 ppm	SO ₂
AA	0.2 ppm	Not tested	AA
AHC (as Benzene)	20 ppb	Not tested	AHC
NVR (particles + Oil)	10 ppm (w)	10 ppm (w)	NVR
NVOR (oil & grease)	5 ppm (w)	Not tested	NVOR
NO _x (NO + NO ₂)	5 ppm (2.5 ea)	5 ppm (total)	NO _x (NO + NO ₂)
HCN / VCL	None detected	Not tested	HCN / VCL
MeOH	10 ppm	Not tested	MeOH
Odor/Taste	none	Not tested	Odor/Taste

Bev-Gas Quality Challenges

- Fountain Ops = *Mini-Bottling Plants* 
- CO₂ Quality Assurance is a challenge & Needs to be ensured for *all beverages*
- Fountain Customer Complaints happen & need to be quickly, efficiently & properly addressed

So how can this be done?

Fountain Bev Customer Complaint Investigation – 5 Big Questions

Complaint = Typically Sensory Driven – received by Phone Call

Q1: Is the complaint legitimate = Real or Imagined?

Q2: If it is Real - is it CO₂ related?

Q3: If it is Real & CO₂ related – is it MBT confined – or a Widespread Problem with more complaints likely?

Q4: Immediate Corrective Actions needed?

Q5: What is root cause & how can it be prevented in future?

Fountain Bev Customer CO₂ Complaint Investigation – *Getting the Answers ASAP!*

4 Basic Steps

- Take a representative MBT sample
- Ship it to a Qualified Analytical Lab
- Ensure the proper tests are run to ID the problem
- Get expert advise on what the data means

Until Now “Missing Link” has been Lack of Practical MBT Sampling Tools & Methods!

Elements of a Fountain MBT Sampling Kit

Most Important Sample Point = Liquid Phase
(vapor phase sample also needed on occasion)

- Passivated Flash Vaporizer / Pressure Regulator (for liquid phase sampling)
- HP / LT Quick Connect Fittings / spare plug + tools (easy mating to MLB liquid PB source port)
- Flare fittings included + tools (easy mating to MLB vapor source port)
- Clean / Sturdy ISBT-grade Multi-Layer Barrier Sampling Bags (most ISBT tests run from 2 x 2L bags) an additional set of 2 MLBs for vapor phase sampling + T-fittings
- Clean, easy-to-use, particle-free SnowMaking equipment & snow containers
- Battery powered, digital top loader balance for Snow sample tests (**NVR / NVOR**)
- Personal Safety equipment (gloves, goggles) + Sampling / NH Shipping Instructions
- Custom Shipping / Storage Case with wheels & handle + security tags



On-Site MBT Sampling

Ensure adequate ventilation is available – this is especially important for Snow-making step if / when needed. A properly grounded electrical outlet & cord also needs to be present

Staff member used should be trained on proper handling of Refrigerated LCO₂ & MBT's

All Sampling Instructions should be understood & followed

A sampling plan should be designed & agreed to in advance:
ex. liquid phase in polybags (always), vapor phase in polybags (sometimes) + Snow Sampling (most of time)

PROPER IDENTIFICATION OF THE SAMPLE KIT ON RETURN SHIPMENT PAPERWORK IS ESSENTIAL (EX. NON-HAZARDOUS INDUSTRIAL SAMPLE OF NO COMMERCIAL VALUE)

CO₂ = Class 2.2 gas = non-flammable, non-toxic gas. When it is NON-compressed (LT 28 PSIG IN CONTAINER) = IT IS PROPERLY CLASSIFIED AS A NON-HAZARDOUS MATERIAL FOR SHIPPING PURPOSES

MBT Sampling Video



Training Film Highlights

- **QC Connection @ PB port plug of MBT**
- **VPR warm-up / 2x MLB flush & fill – vaporized liquid phase**
- **Flare fitting connection / 2x MLB flush / fill – vapor sample option**
- **Snowmaker NVR can weigh / line purge / 1.5 min can fill / reweigh / sublime time**
- **Repack & Ship Overnight as Non-Hazmat**

Analysis Test Program

(screening)

- **TSC + VSC speciation option** (common odor source)
- **AA + VOX speciation option** (common odor source)
- **AHC (as benzene)** (insurance check)
- **THC + VHC speciation option** (overall organics check)
- **NVR / NVOR** (on sublimed NVR can =check for accumulated oil / leached plasticizers & semi-volatiles)
- **NO_x, HCN by DT** (insurance check)

Fountain Complaint Case Study

Customer Complaint: Odor in vicinity of MBT- description of odor **varied** + not constant odor – “periodic – whiffs”

Fountain MBT Kit sent Overnight. MBT polybag samples taken from **both** liquid & vapor phase - snow not taken in this case – due to nature of odor complaint. Kit with sample returned as No-Haz shipment *overnight*.

Fountain Analytical Screening Program run same day, TSC = **0.13** ppm (in liquid phase) = **failed** ISBT (still passed Food Grade TSC), Vapor phase sample = 0.05 ppm TSC = pass

VSC speciation follow up found **COS** + dimethyl sulfide (**DMS**) – all other tests run were A-OK, no other detectable impurities

Follow-up at Supplier’s Storage Depot Tank = vaporized LCO₂ – polybag sample showed TSC = **0.59 ppm** = **failed** ISBT + **COS / DMS** ratio!

Root Cause: CO₂ Supplier discovered their TSC analyzer was not operating properly & did not catch the TSC excursion = off spec lot!

Summary



Major practical issues related to safe, proper, simple sampling of MBT's have been removed with the development of a *Non-Hazmat*-based MBT sampling kit

The benefits of overnight MBT kit shipment to / from a customer complaint site have been demonstrated

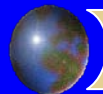
The benefits of a *rapid* analytical screening program tailored for fountain applications have been demonstrated

The benefits of a *rapid-response program* to investigate customer complaints and for *root cause identification* have been demonstrated

These MBT sampling kits also allow for the development of efficient MBT quality “**spot check**” programs for on-site, new or refurbished MBT's, delivery trucks, and to QA check supplier depots (*ex. Paying for ISBT-Grade - Getting ISBT-Grade?? = Trust BUT Verify!*).

The Missing Link from the Fountain CO₂ Quality Chain has been found!

Questions??



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