



# Sampling Methods for Dissolved Gases

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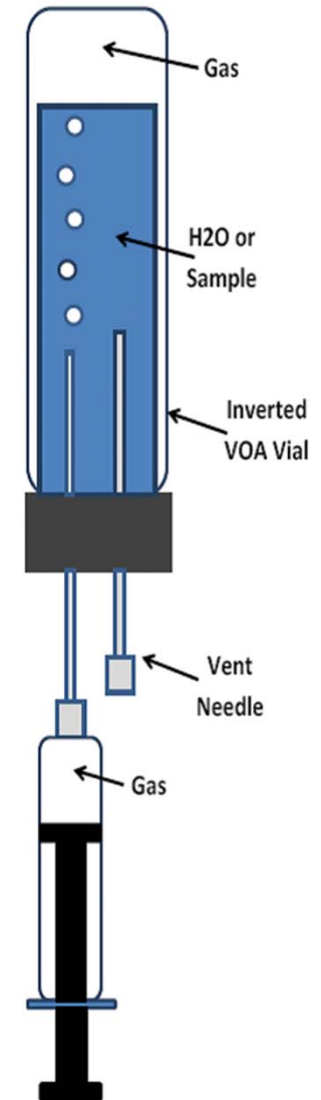
- Introduction
- Gas Properties
- Analysis Methods
- Current Methods for Sampling
- Open Systems
- Closed Systems
- ASTM/GPA Sampling Methods
- API Methods
- Recommendations

- Dissolved Gas Analysis Method
- Standards
- Use of Micro GC's
- MSC studies ongoing (ESI presentation)
- Sampling Methods
- API, ASTM and GPA Methods

IBP for C1 – C4 hydrocarbons

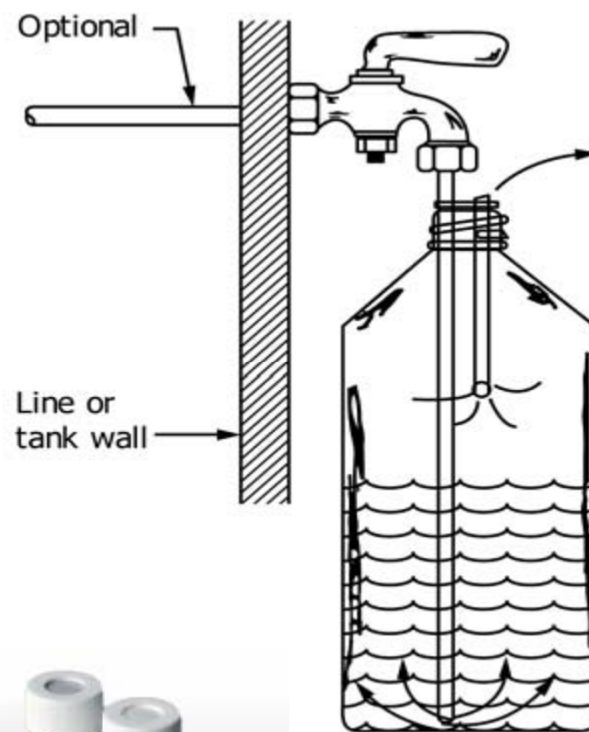
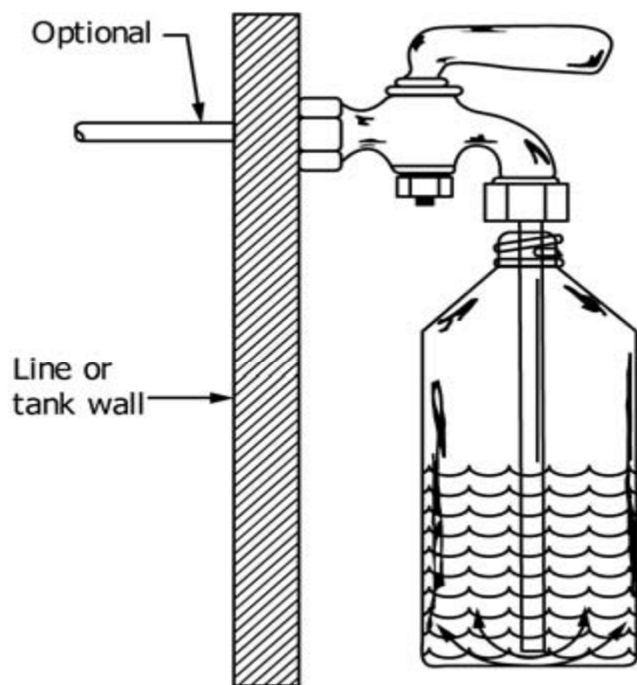
- C1 = -259 °F (Methane)
- C2 = -127 °F (Ethane)
- C3 = -44 °F (Propane)
- iC4 = 11 °F (Iso-butane)
- C4 = 31 °F (n-butane)
- C5 = 97 °F (n-pentane)

- Headspace Analysis
- Manual Injections
- Automated Analysis
- COLD STANDARDS (room temperature)
- COLD SAMPLES



- Open systems
- Closed systems

- **SINGLE PHASE LIQUIDS**



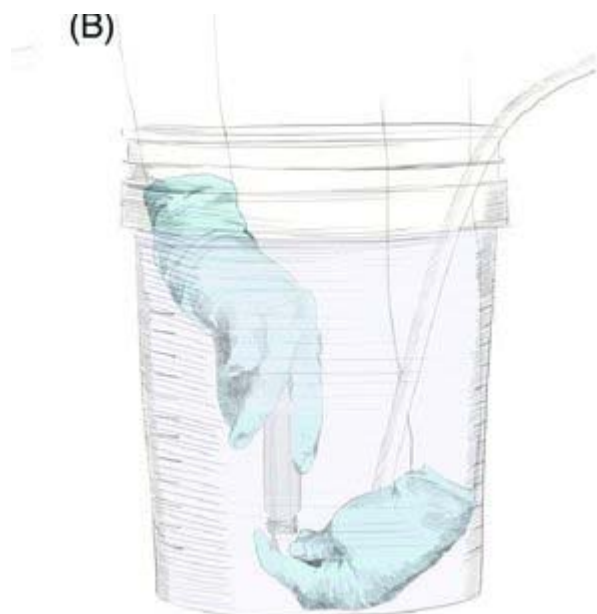
Ref: ASTM D4057-12

Ref: Vials QECUSA





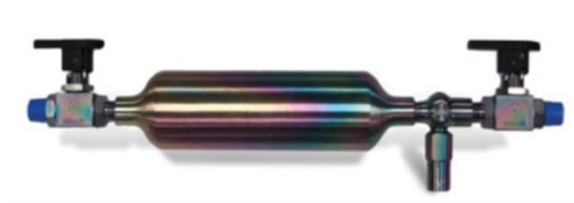
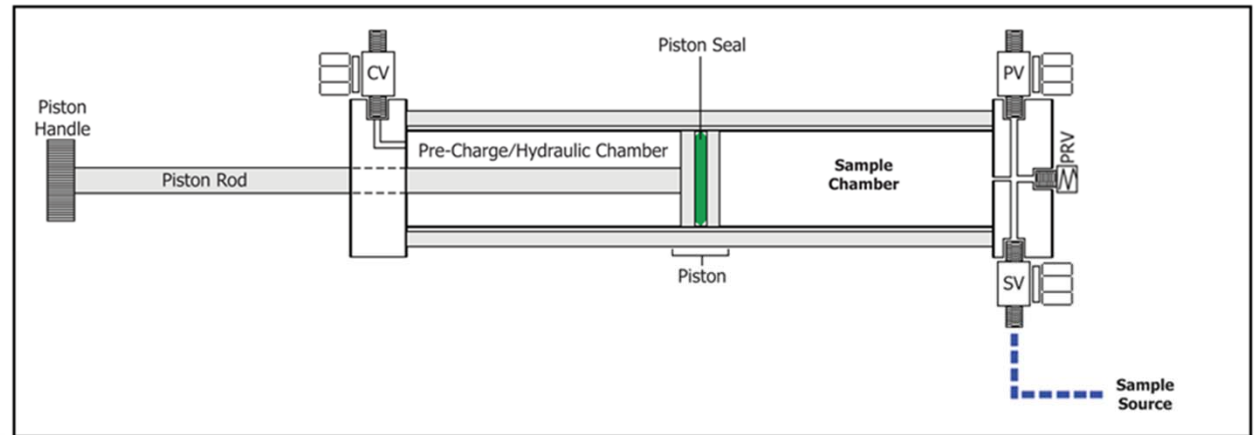
- IsoFlask®
- Semi Closed is the “Bucket Method”



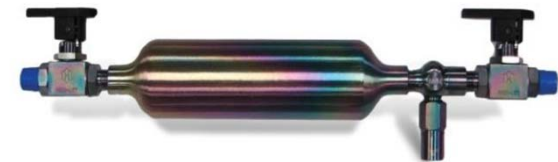
Inverted VOA



## Closed Systems



- GPA 2174 – Floating Piston Cylinder (FPC)
- ASTM D3700 – Floating Piston Cylinder (FPC)
- ASTM – D8009 – Syringe style Manual Piston Cylinder (MPC); Syringe style FPC
- ASTM D7975 – Syringe Style MPC
- ASTM 4057 – Boston Round Sample Bottle



*Images from: Welker, Parkes Scientific*

- Chilled Coil sample collection for low vapor pressure compounds
- Above method for RVP and VP methods
- RVP and VP methods measure light hydrocarbons
- Chapter 14.1 MPMS methods



*Images from: Welker, Parkes Scientific*

- Method for Sampling - Closed System
- New ASTM WK62308 – Collection of sample in a cylinder – headspace creation – analysis by ASTM D7833
- Consider a Micro GC for analysis

1. Kesavalu M. Bagawandoss, "Sampling and Analysis in light of the PHMSA/DOT Final Rule", COQA Meeting, New Orleans, LA, Oct., 2015.
2. <http://apps.nelac-institute.org/nemc/2017/docs/pdf/Thursday-Topics%20in%20Shale%20Gas%20Exploration%20and%20Production-20.5-Bagawandoss.pdf>
3. ASTM D4057
4. GPA 2174
5. ASTM D3700
6. ASTM D8009
7. ASTM D7975
8. API MPMS Chapter 14.1
9. ASTM D6377 & D323
10. ASTM D7833 (formerly D1945/D1946)
11. [http://www.gwpc.org/sites/default/files/event-sessions/Coleman\\_DennisFinal.pdf](http://www.gwpc.org/sites/default/files/event-sessions/Coleman_DennisFinal.pdf)
12. <http://www.intertek.com/petroleum/shale/> (bubbling crude)
13. <http://apps.nelac-institute.org/nemc/2016/docs/presentations/Tue-Topics%20in%20Shale%20Gas-11.1-McGarvey.pdf>
14. <https://www.astm.org/DATABASE.CART/WORKITEMS/WK62308.htm>
15. <https://www.google.com/search?q=Pictures+of+Isoflask&safe=strict&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjyKNXp9rDcAhWXxIMKHVg4BoUQsAQIJg&biw=1920&bih=950>
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THANK YOU !!!

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