# Welcome to our Tech Talk!

- **Welcome to the Grab Sampling Tech Talk**
  **Presented by: Brian Misutka, Swagelok Field Engineer**

- Please put your phone or computer on ***mute*** to prevent background noises

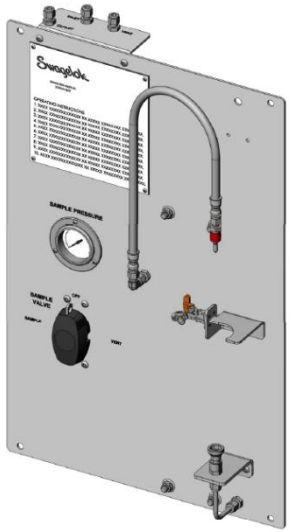
- If you have questions throughout the webinar, please utilize the ***chat function*** to submit them

# Grab Sampling

What is Grab Sampling?

# What is Grab Sampling?

- Collection of a sample of fluid in a pipeline, tank, or system
- Sample is transported to laboratory for analysis
- Many different types in two broad categories:
  - Cylinder Panels
  - Bottle Panels
- Other names:
  - Spot sampler
  - Laboratory sampler
  - Field sampler



# Grab Sampling in Processes

## Why grab sampling?

- Validation of the process conditions
- Validation that end products meet specifications
- Validation of online analyzers
- Loading platforms, reference sample of sold product
- Evaluation of environmental emissions according to local regulations

# Grab Sampling in Processes

## Sample Locations:

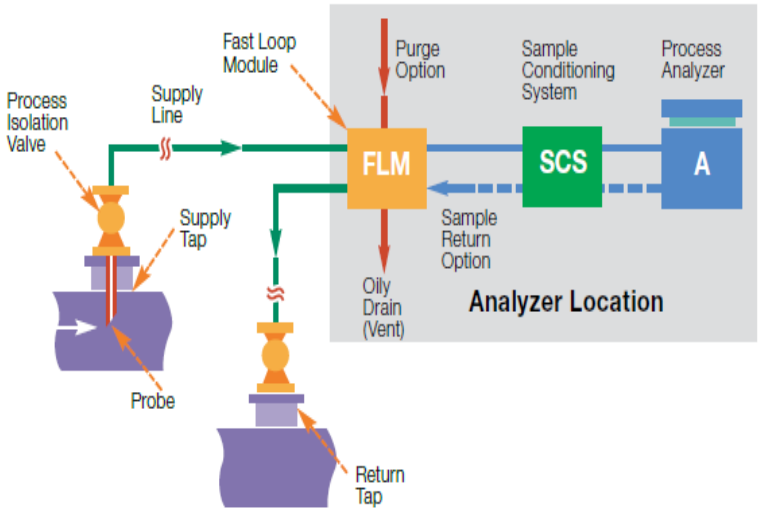
- Storage
- Long transport lines
- Process lines
- Flare / Environment (Emissions monitoring)
- Process Analyzers

# Grab Sampling vs. Online Analyzer

# Grab Sampling vs. Online Analyzer

## Grab Sample Advantages:

- Grab sampling is less expensive
- Easier to install / maintain
- Can be installed closer to process
- Expertise concentrated in laboratory



# Grab Sampling vs. Online Analyzer

## Grab Sample Disadvantages:

- Time delay
- Harder to maintain sample at process conditions
- Potentially more dangerous
- Sample purity if container is not clean

# Grab Sampling

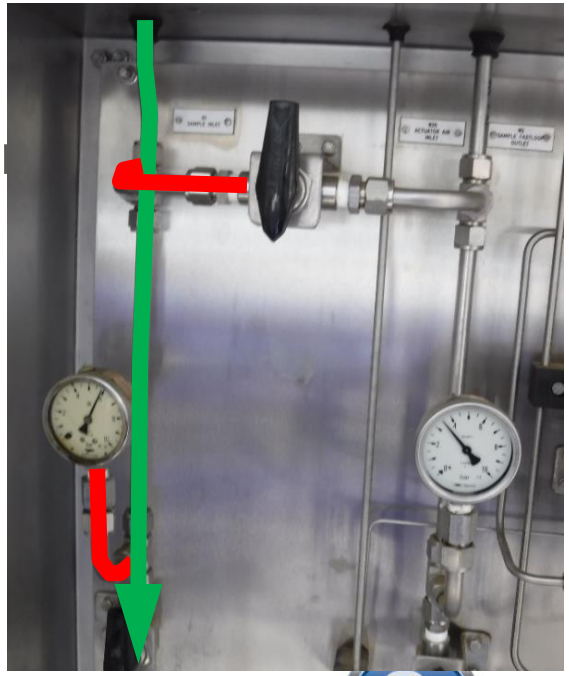
Sampling System Basics

# Basic Rules of Sampling

- ***Representative*** – The sample must be the same as the process
- Avoid phase changes in the sampling system and transportation
- Use probes to sample from middle of pipe

- ***Timely*** – Understand when the sample was take
- Minimize transport time from process to sample container
- Not as important as with online analyzers

- ***Pure*** – Do not contaminate the sample
- Avoid deadlegs upstream of sample container
- Allow for adequate purging/flushing
- Use clean sample containers

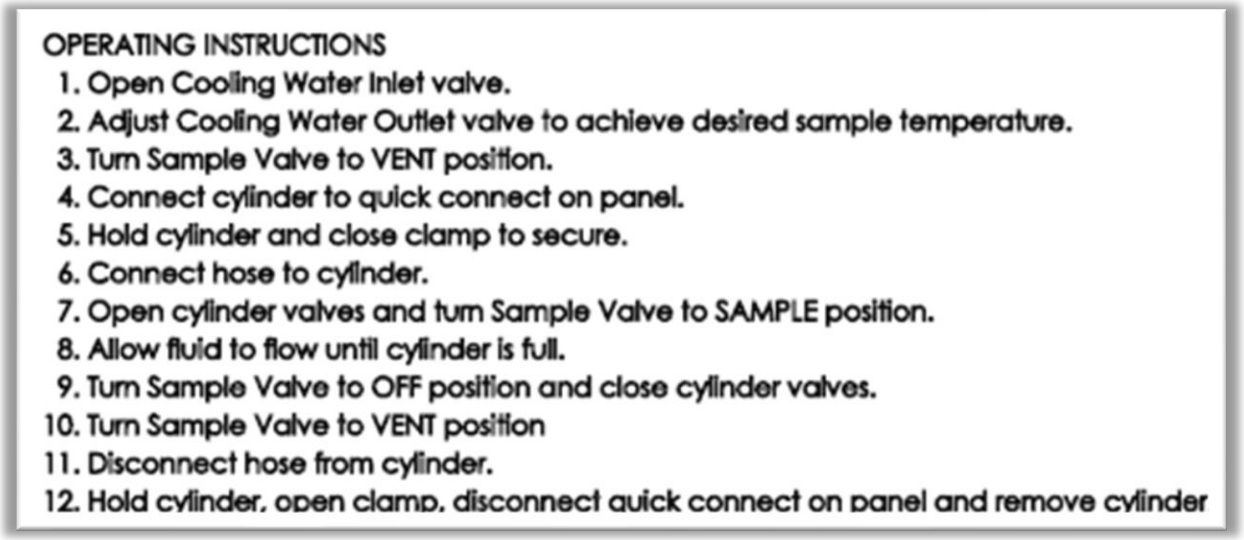


# Grab Sampling System Design Considerations

- ***"Flush" time***
- Deadhead volume trapped in transport line and grab sample system must be flushed!
- Flush time $t = \frac{Volume_{transport\ line} + Volume_{grab\ sample\ system}}{Flow\ Rate}$
- ***Continuous flow***
- Keep a viscous sample from solidifying in transport line
- Use when transport lines are long to decrease "flush" time
- ***Purge fluid***
- Removes contamination
- Removes potentially harmful residuals

# Grab Sampling System Safety

- Standardization and training
  - Simplifies sample gathering



OPERATING INSTRUCTIONS

1. Open Cooling Water Inlet valve.
2. Adjust Cooling Water Outlet valve to achieve desired sample temperature.
3. Turn Sample Valve to VENT position.
4. Connect cylinder to quick connect on panel.
5. Hold cylinder and close clamp to secure.
6. Connect hose to cylinder.
7. Open cylinder valves and turn Sample Valve to SAMPLE position.
8. Allow fluid to flow until cylinder is full.
9. Turn Sample Valve to OFF position and close cylinder valves.
10. Turn Sample Valve to VENT position
11. Disconnect hose from cylinder.
12. Hold cylinder, open clamp, disconnect quick connect on panel and remove cylinder

- Cylinder sampling for dangerous liquids / gases
  - Reduces risk of operator exposure associated with bottle sampling

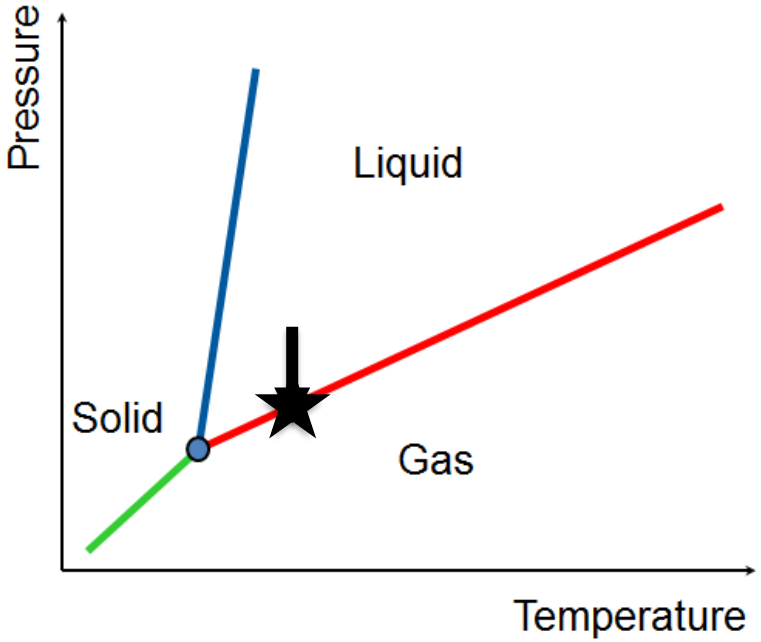
# Sample Container Selection

How to select the type of system and sample container?

- Toxicity – Sample cylinders are better for toxic samples
- Cost – Bottles are less expensive
- Sample pressure – Bottles are not pressure containing
- Sample volatility
  - Bottles can be used for *non-volatile* liquids.
    - Maximum vapor pressure of 14.7 PSIA (1.01 Bara) at ambient conditions
  - Use a sample cylinders for gases and volatile liquids

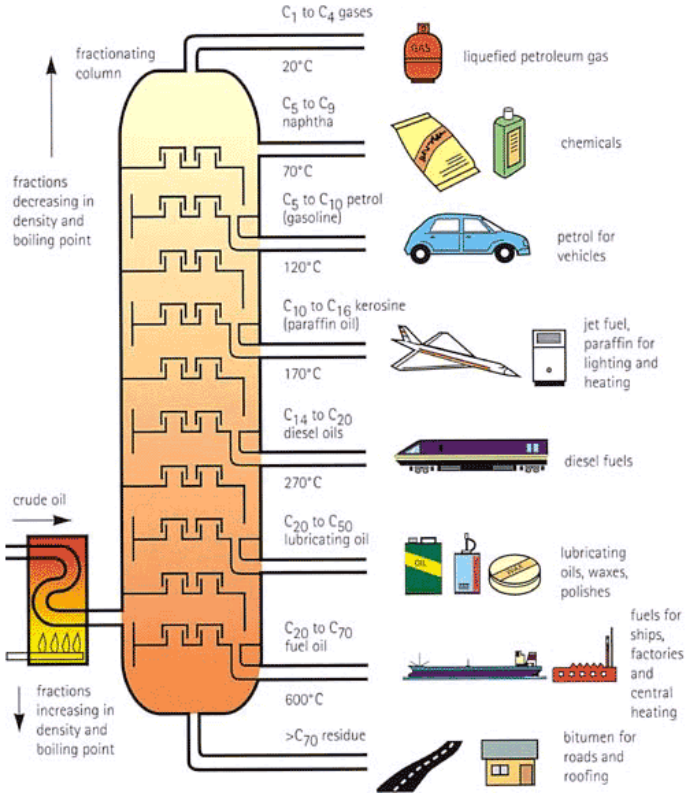
# Behavior of Samples

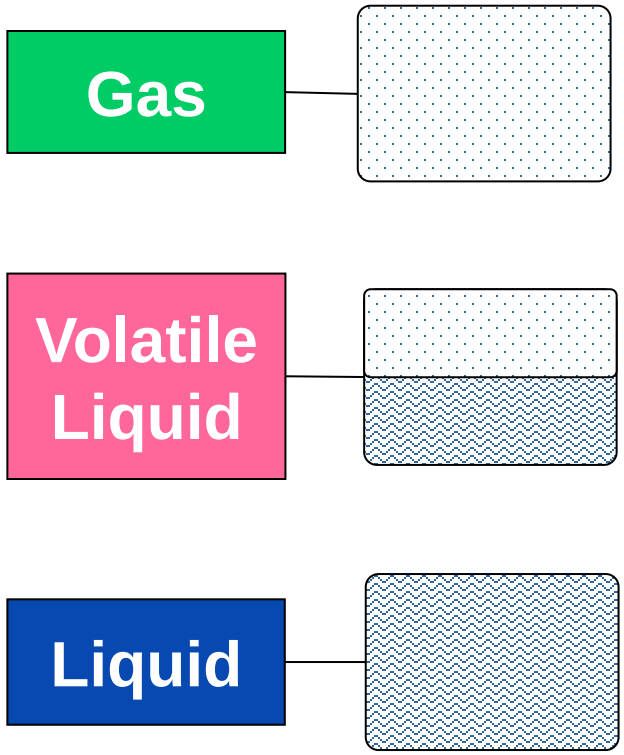
- Pressure / Temperature changes can affect the sample:
  - ***Temperature ↑ or Pressure ↓***
    Lighter components will boil (vaporize) out of liquid sample before the heavier ones
  - ***Temperature ↓ or Pressure ↑***
    Heavier components will condense out of gas samples before the lighter ones



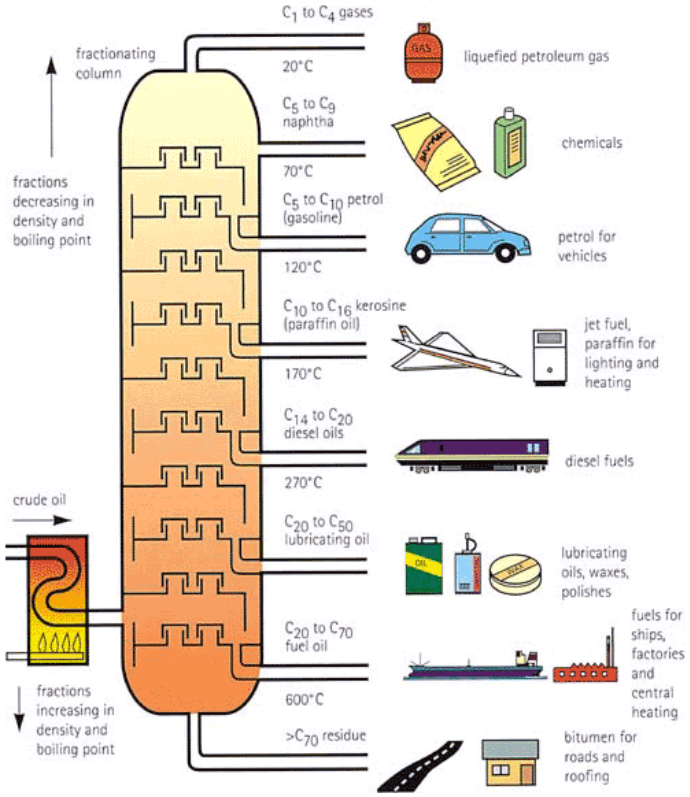

- Avoid phase change – it will change the composition of the sample
- Maintain the sample at process conditions if possible

# Sample Container Selection



# Sample Container Selection



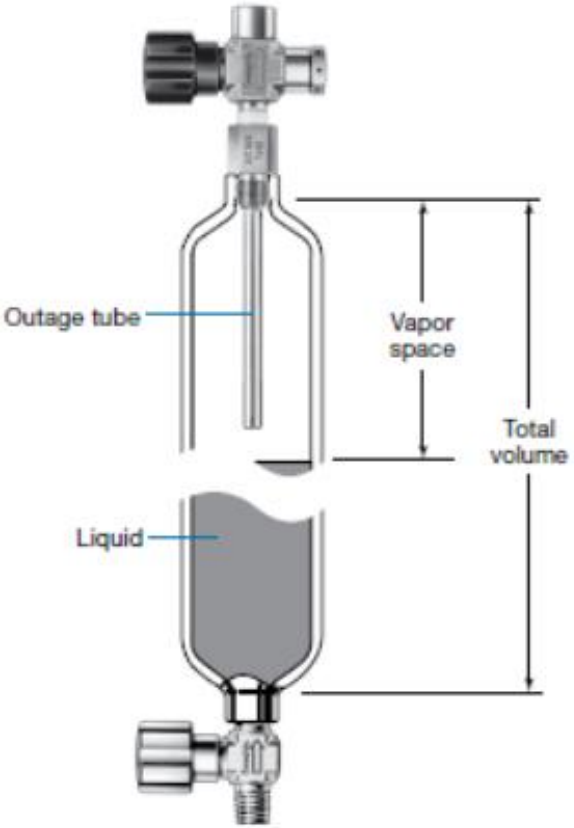

| Molecular Formula | Name | Number of Carbon atoms | Prefix | Melting Point (C) | Boiling Point (C) | Physical State |
|---|---|---|---|---|---|---|
| $CH_4$ | Methane | 1 | Meth- | -183 | -162 | Gas |
| $C_5H_{12}$ | Pentane | 5 | Pent- | -130 | 36 | Liquid |
| $C_6H_{14}$ | Hexane | 6 | Hex- | -95 | 69 | Liquid |
| $C_7H_{16}$ | Heptane | 7 | | -91 | 98 | Liquid |
| $C_8H_{18}$ | Octane | 8 | | -57 | 126 | Liquid |
| $C_9H_{20}$ | Nonane | 9 | | -54 | 151 | Liquid |
| $C_{10}H_{22}$ | Decane | 10 | | -30 | 174 | Liquid |

# Best Practices – Cylinder Sampling

- Fill in vertical orientation

- Fill liquid from bottom of cylinder
  - Ensures full cylinder
  - Use outage tube
    - Creates vapor space to avoid over pressurization

- Fill gas from top of cylinder
  - Any liquid droplets shoot straight through
  - Any liquid on walls is pushed out bottom or drains by gravity

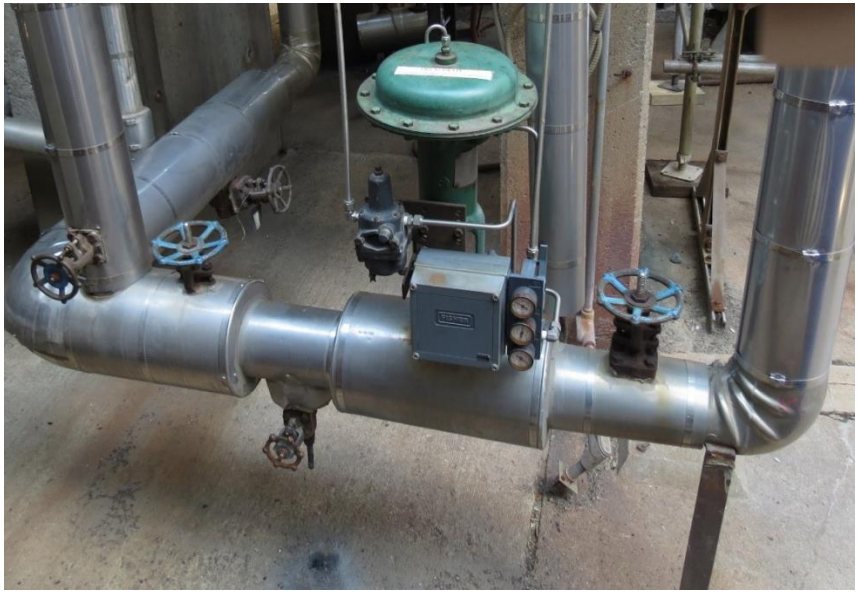


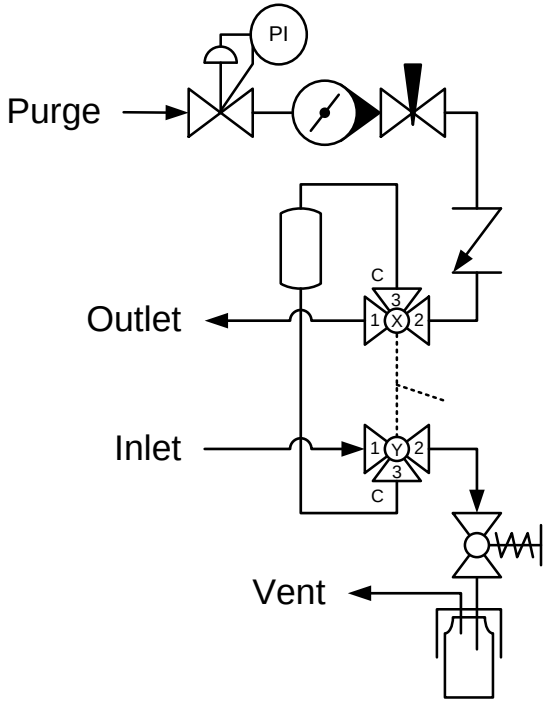
# Best Practices – Bottle Sampling

- Use needles and septum
  - Consider viscosity of fluid and particle size when sizing needles
- Use shroud to guide bottle into needles
  - Reduces risk of bending needles

# Best Practices – Bottle Sampling

- Use fixed volume sampler if overfilling is a concern
- Do not flow or dump onto ground!





# Upcoming Tech Talks

## July Tech Talk: Mechanical Seal Support

### Wednesday, July 21st 11:30 am to 12:00 pm

Safe seals make for safe plant operations, but seals fail for a variety of reasons. Ensuring the proper operation of mechanical seals requires following established best practices.

**Topics to be covered include:**

- Background and objectives of API 682
- Designing Seal Support Systems for Reliability and Safety
- Advantages of Using Tubing vs. Piping
- Swagelok Onsite Services and Systems


Swagelok