Draught Beer Basics & How Gases Affect Beer

Master Brewers Association of the Americas
District New England
Winter Meeting 2018
Bob Bernier

What Makes Draught Beer Special?

Draught beer is one of the greatest profit makers for Bars

(88% profit margin is the national average)

Draught Beer is the most environmentally friendly

Kegs save 165- 12 oz. bottles with each use and

Each keg is reused 1,000's of times

Draught beer most closely equals brewery conditions

Tastes almost like having one in the brewery

10% of beer sold in the USA is Draught

90% of the beer sold in Ireland is Draught

Why Are Draught Systems Important?

- Have you ever purchased a foamy or a flat beer?

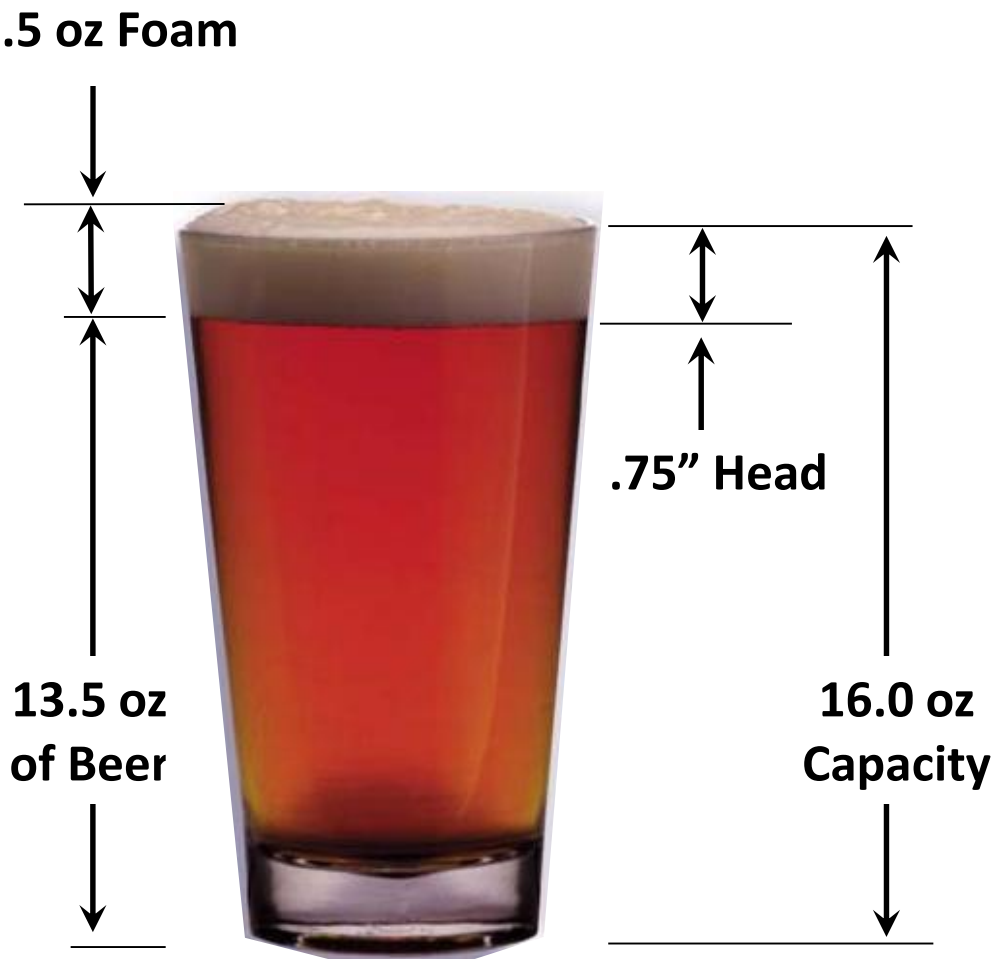
  - How did it look?
  - How did it taste?
  - Did you buy another one?
  - Did you go back to this place again?
  - Did you buy that same beer again?
  - Did you tell your friends how much you enjoyed the foamy or flat beer?

The Perfect Pint:

An Introduction to Draught Beer Systems

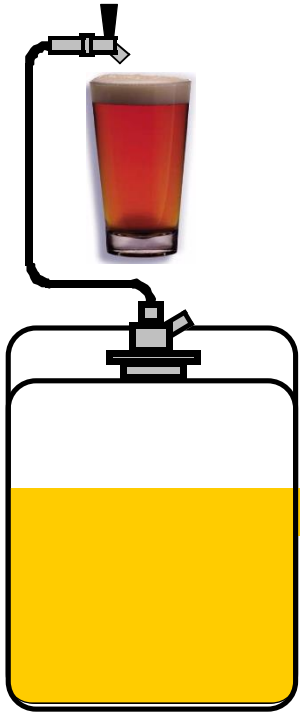
Notes:

1. 38° F
2. No off Flavors
3. Produces 88% Profit
4. Pours quickly and easily to end of keg
5. Pleases customers and brewers alike
6. Appearance and taste varies with beer not draught system
7. Gas content never changes



MATHESON
ask. . .The Gas Professionals℠

What Is Draught Beer?



Draught Beer is a bulk delivery system using kegs…

That is maintained on premise by the retailer…

And is Dispensed through a "draught system"

MATHESON

ask. . .The Gas Professionals℠

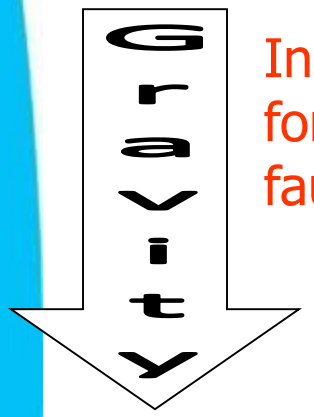
The Jobs of a Draught System

1. Consistently deliver perfect beer to the glass
2. Protect the quality of the beer
3. Make no changes to beer flavors
4. Maintain consistent temperatures

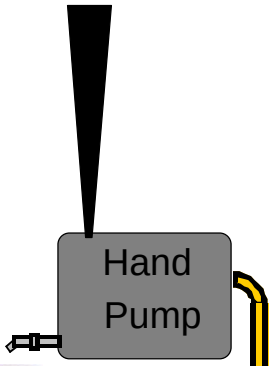
MATHESON
ask. . .The Gas Professionals℠

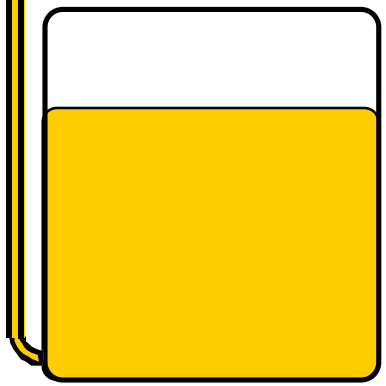
Types of Draught Systems-

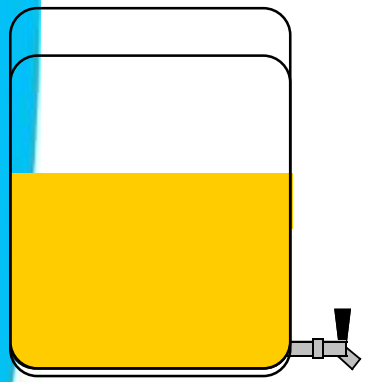
Very Basic System



In all draught systems, there is a force that powers Beer to the faucet!







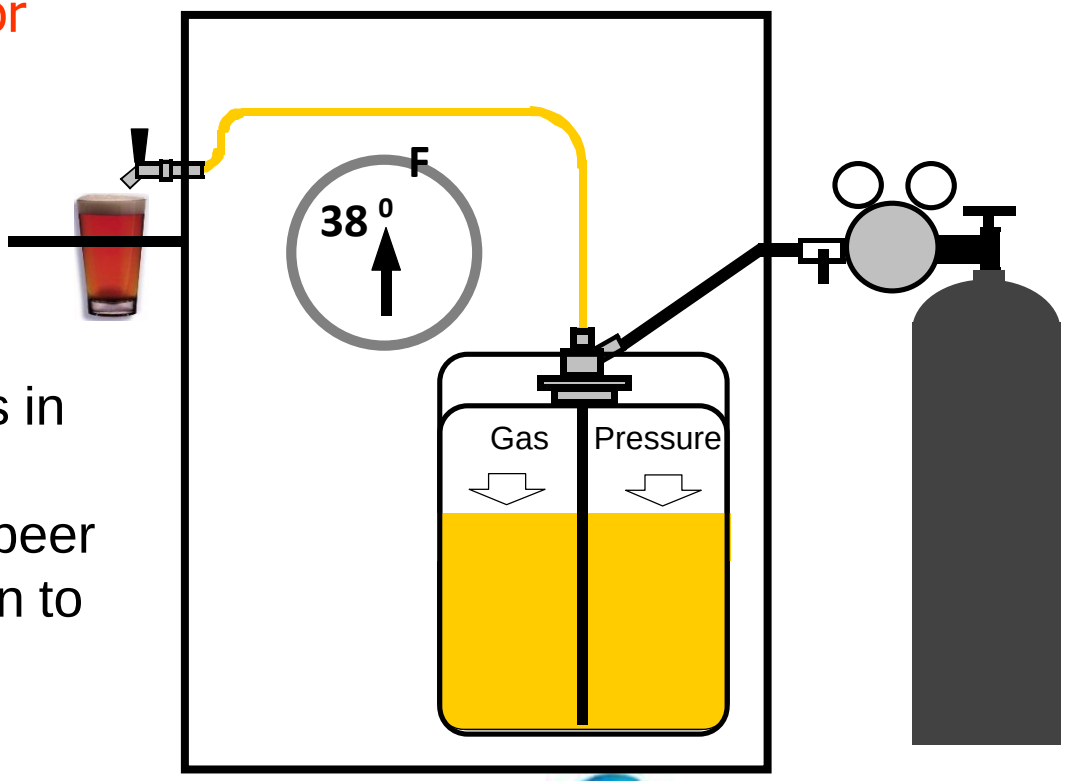
Very basic systems use gravity or hand pumps to serve beer.

MATHESON
ask. . .The Gas Professionals℠

Types of Draught Systems-

Direct Draw System

In a "Direct Draw" System
The entire beer line is contained within the box or cooler.



All modern draught systems in the USA use gas to provide hydraulic pressure to push beer to the glass and refrigeration to maintain perfect beer temperatures

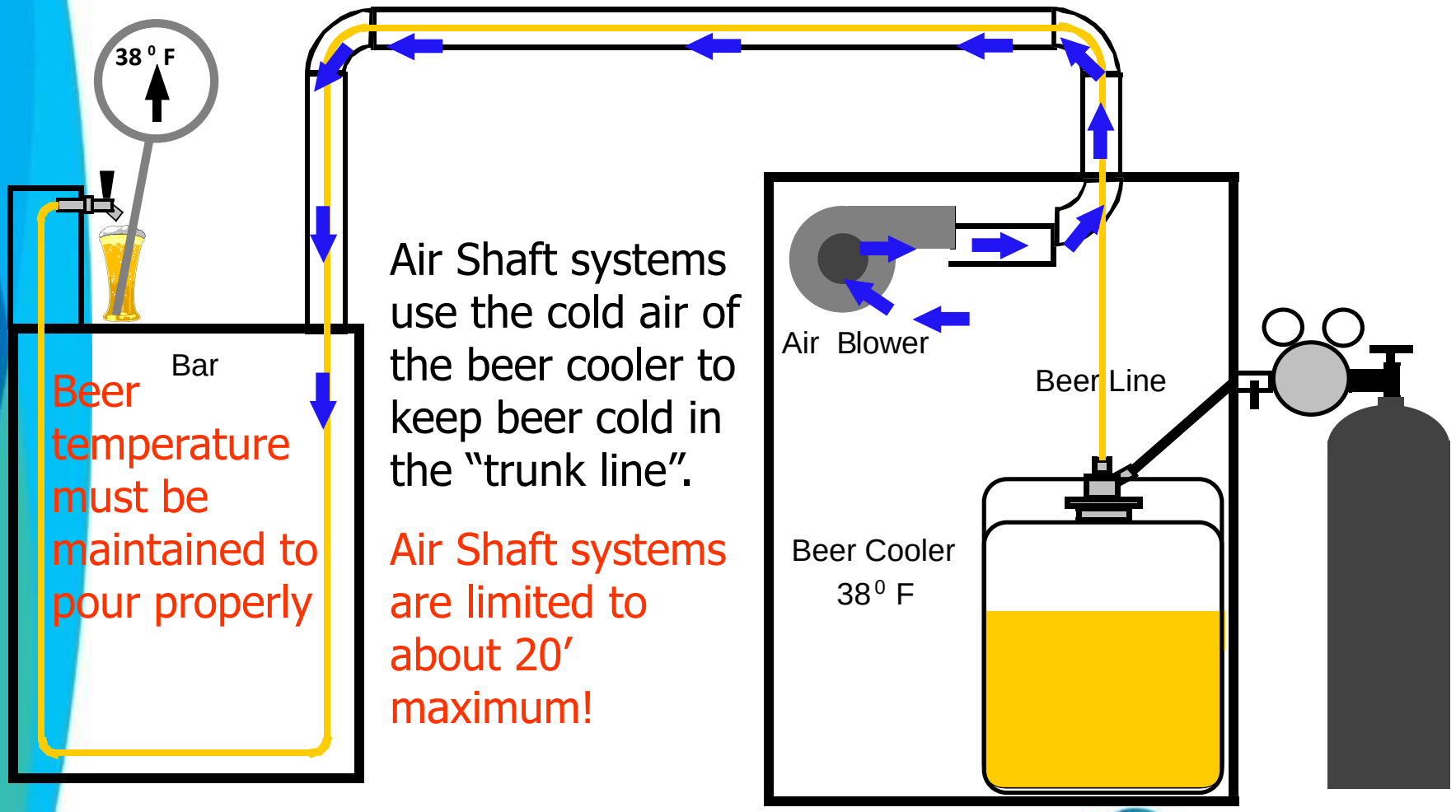
MATHESON
ask. . .The Gas Professionals℠

What you Need to Know-
Direct Draw System

- 38 Degrees F
- 12-13psi of 100% CO2
  - The system must use 60”, 3/16” diameter beer lines, or the equivalent.
  - Lines must go up- no downhill lines.
  - Be concerned about having more than 2-3 lines on one CO2 regulator.
  - Monitor the last few pours from the kegs for changes in CO2 content of the beer.

Types of Draught Systems-

Air Shaft System



MATHESON

ask. . .The Gas Professionals™

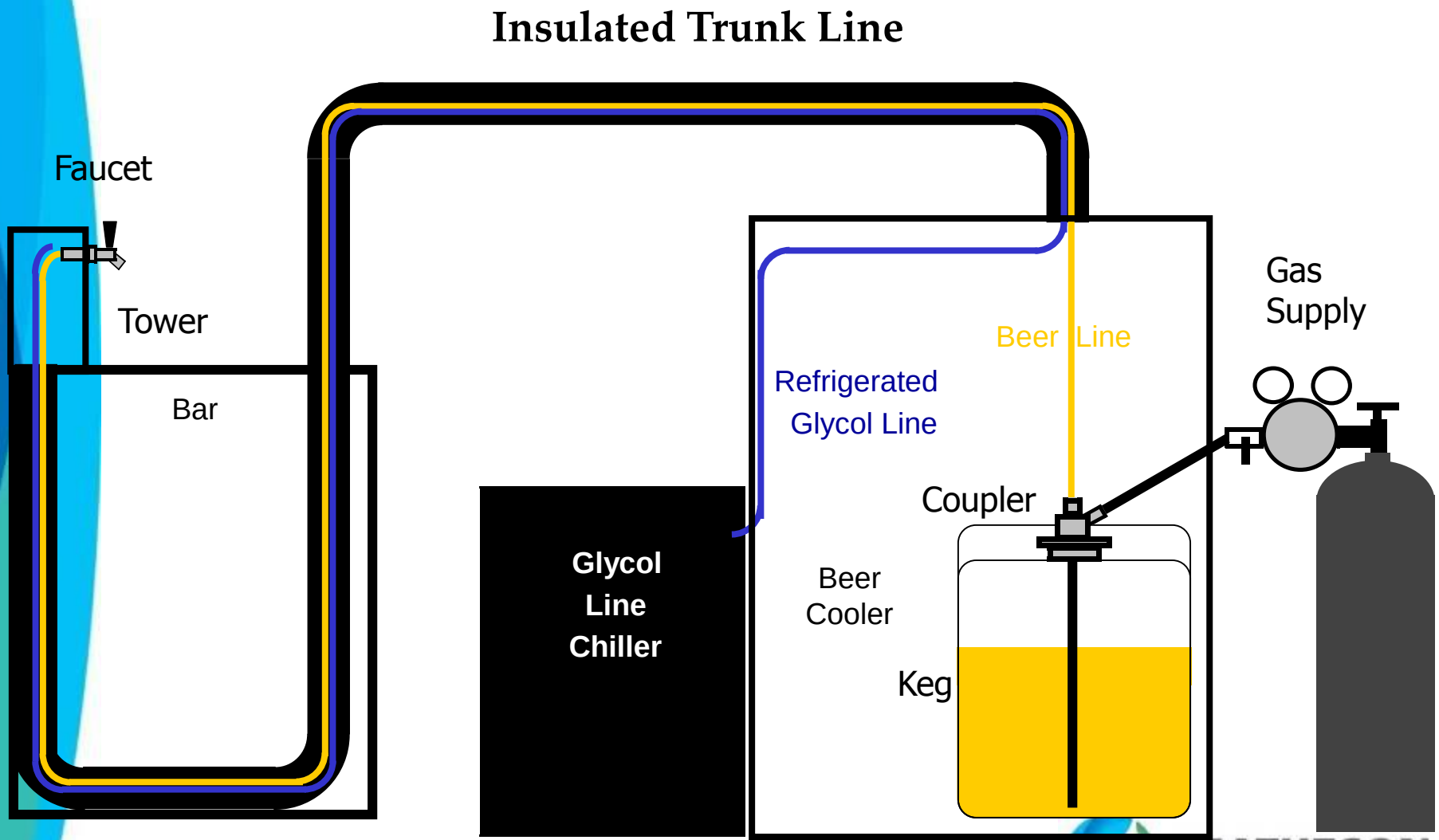
What you Need to Know-
Air Shaft System

- 38 Degrees F
- Maintain CO2 balance for the beer
  - The system should pour at 2 ounces per second. (7.5 second pint)
  - Lines must go up-no downhill lines.
  - The air must have a return line.
  - Be concerned about having more than 2-3 lines on one CO2 regulator.
  - Monitor the last few pours from the kegs for changes in CO2 content of the beer.

MATHESON
ask. . .The Gas Professionals℠

Elements of Draught Systems-

Long Draw/Remote System



MATHESON

ask. . .The Gas Professionals™

What you Need to Know-

Long Draw/Remote System

- 38 Degrees F
- Maintain CO2 balance for the beer
  - The system must pour at 2 ounces per second. (7.5 second pint)
  - Lines must go up- no downhill lines, unless the pressure is over 22 psi.
  - Be concerned about having more than 2-3 lines on one CO2 regulator. (pressure recovery)
  - Monitor the last few pours from the kegs for changes in CO2 content of the beer.

Key Factors in Draught Systems

Temperature:

Maintain Beer Temperature below 40F.

38F is the best!

No hot Spots

Cleaning:

Cleanliness in all components that contact beer

Balanced Restriction and Pressure:

Maintain beer flow at 1 gallon/min (2oz/sec) or less

No kinks, light or problem areas

Gas Supply:

Gas "powers" the beer through the system to the glass

Gas Supply maintains CO_2 equilibrium in the beer

MATHESON

ask. . .The Gas Professionals℠

Key Factors in Draught Systems- Temperature

Temperature:

Must consistently maintain Beer Temperature below 40° in beer cooler and trunk lines. The temperature should be consistent, all the way to the glass.

Too Cold: Hides essential flavors and causes waste

Too Warm: Pours badly (foams) and causes waste

Hot Spots: Beer pours badly and wastes beer

Light Spots: Keep your beer in the dark

MATHESON

ask. . .The Gas Professionals℠

Key Factors in Draught Systems-
Cleaning

Cleaning:

Elements in the beer will cause mineral and biological build-up in the beer lines that create pouring problems and ruin flavors. Proper cleaning prevents these problems

Beer lines with mineral or organic deposits can create a CO2 Nucleation site and result in foamy pours and can change the flavor of the beer.

MATHESON
ask. . .The Gas Professionals℠

Key Factors in Draught Systems- Restriction & Pressure:

Restriction/Pressure: "Balancing"

Beer should pour at 1 gallon/min (2oz/sec) or less depending on the system needs. More challenging circumstances (like inexperienced bartenders or frosted glasses) require slower flow rates.

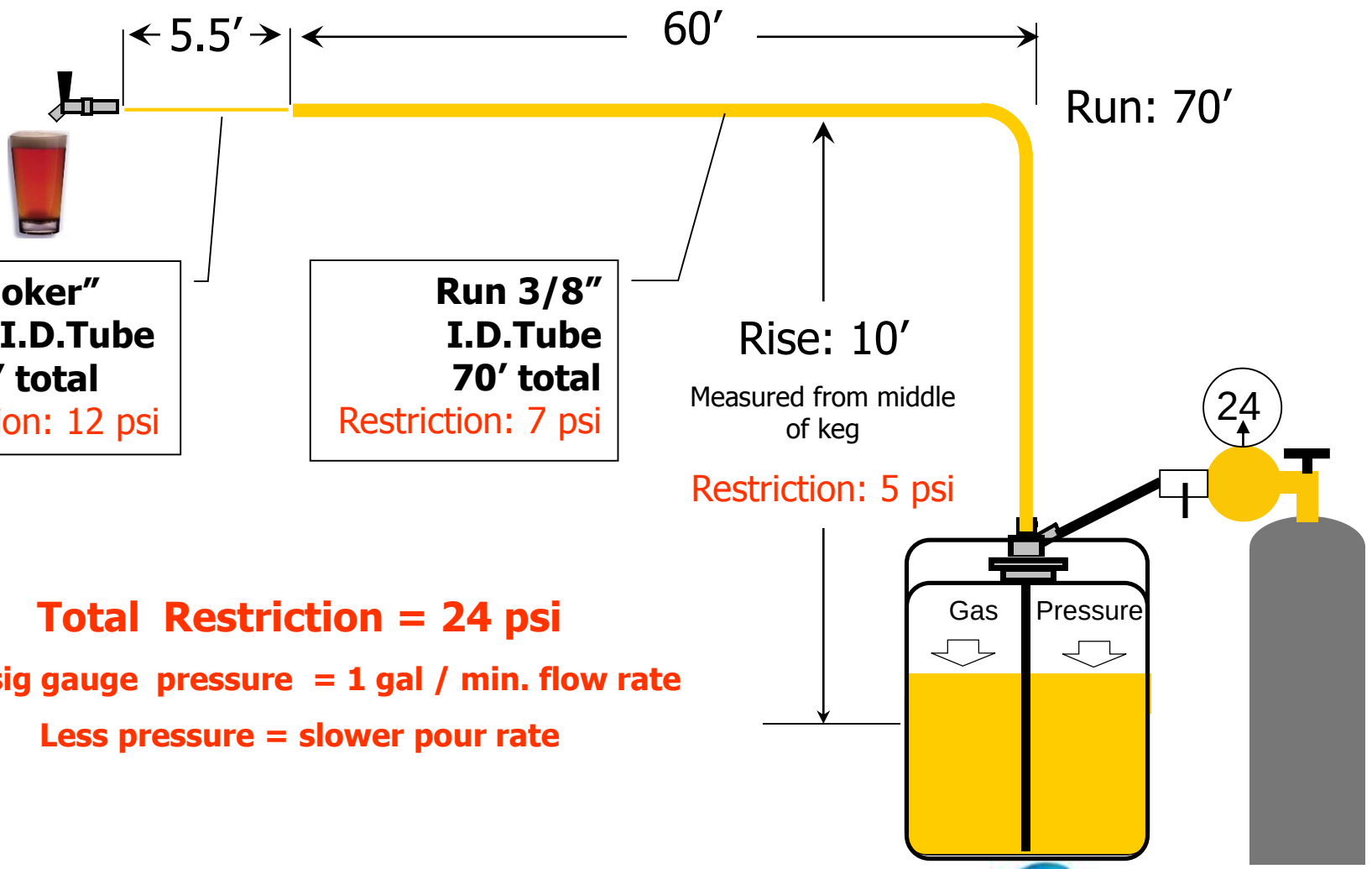
All good beer systems should be designed to take into account length of run, amount of elevation change, and types & sizes of tubing to achieve the desired flow rate to maintain hydraulic pressure and constant smooth flow

Restriction is usually adjusted by selecting a specific length of 3/16" inside diameter tube called "choker line".

Smaller diameter lines have higher restrictions because of increased friction. This is referred to as line loss.

Key Factors in Draught Systems-

Restriction & Pressure:



Total Restriction = 24 psi

24 psig gauge pressure = 1 gal / min. flow rate

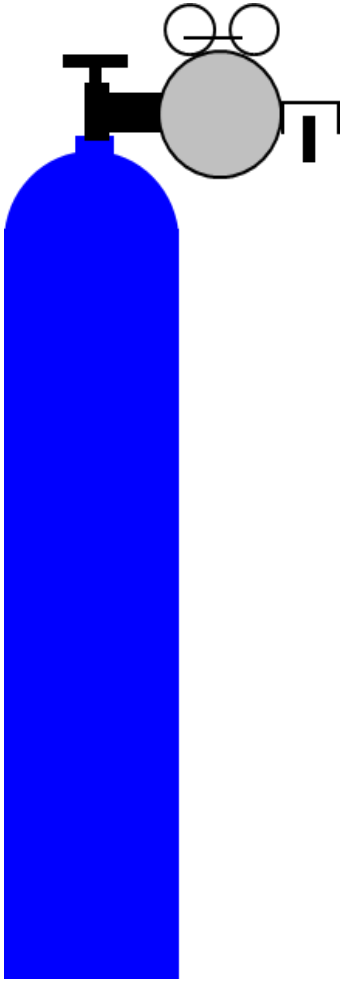
Less pressure = slower pour rate

MATHESON

ask. . .The Gas Professionals℠

Key Factors in Draught Systems-

Gas Supply



Gas (CO_2) is an ingredient in beer!

CO_2 content is chosen by brewers as are yeast, hops and malts to give the final taste and appearance desired

Gas in a draught system plays a dual role, maintaining CO_2 content and propelling the beer through the draught system

The challenge is to accomplish both in spite of different circumstances in each bar.

MATHESON

ask. . .The Gas Professionals℠

Why we use Draught Beer Systems-

Draught Beer is a profitable, high quality product delivered in bulk containers (kegs)

The purpose of all draught systems is to deliver beer to the glass in perfect condition-

1. At the correct temperature
2. Without adding or changing flavors
3. Without creating any problems or waste
4. One of the most critical elements (and the one we control) in a draught beer system is the gas supply

MATHESON
ask. . .The Gas Professionals℠

Let's talk about some "Situations"

- I have one customer who always asks for a credit because my beer poured flat.
- My beer pours fine until the bowling team comes in on Tuesday nights.
- Why does the beer pour fine when I'm there and pours foamy when I leave?
- I can tell when a keg is almost empty by the amount of foam in the beer.
- Should I dedicate one line for funk beers?
- How important are stainless steel parts in a draught beer system?

MATHESON
ask. . .The Gas Professionals℠

How do Gases affect Beer?

How do Gases affect Beer?

- **Carbon Dioxide** (CO_2)-
  - This gas will dissolve in cold beer and other cold liquids.
  - Adds flavor
  - Adds Bubbles (carbonation)

How do Gases affect Beer?

- **Nitrogen** (N2)-
  - This gas will not dissolve in liquids at low pressures, but it will suspend in cold liquids at pressures over 26psi
  - Nitrogen will remove some bitterness in liquids.
  - **Helium** (He) and **Neon** (Ne) will act in a similar manor as Nitrogen.

How do Gases affect Beer?

- **Argon** (Ar)-
  - This gas is heavier than air and will provide blanketing on top of liquids at low pressures.
  - Will act much like Nitrogen
    - Will not dissolve in liquids at low pressures
    - Can be suspended in liquids at high pressures
    - Can scrub bitterness from liquids

How do Gases affect Beer?

- **Oxygen** (O2)-
  - Will dissolve in most liquids and at most pressures and temperatures.
  - This gas will promote organic growth in liquids
  - Caution: Oxygen is an Oxidizer and can make almost anything burn.

What about Food & Beverage Grade Gases?

- Why the fuss?
  - US Food and Drug Administration (FDA), says that manufacturers of gases will produce different grades for public consumption ***Food Safety Modernization Act, (FSMA).*** Implementation compliance date is 3-15-18.
  - The Common Grades of Gases are:
    - Beverage Grade
    - Food Grade
    - Medical Grade
    - Industrial Grade
    - Siphon Grade

What about Food & Beverage Grade Gases?

- What does the ***FSMA*** do for us?
  - Gas Grades are specific to each industry
    - Cylinders must be quarantined to specific industry
      - No cross contamination
    - Gas purities are industry specific
      - Meets purification specifications for each industry
      - Example:
        - » Medical CO2 must be 99.0% Pure and can have up to 25ppm of Ammonia.
        - » Beverage CO2 must be 99.9% Pure and can only have up to have 2.5ppm of Ammonia.

CO2 Grades

	Medical	Beverage	Industrial
CO2	99.00%	99.90%	99.00%
Ammonia	25ppm	2.5ppm	
Acetaldehyde		.2ppm	.5ppm
Carbon Monoxide	10ppm	10ppm	
Nitric Oxide	2.5ppm	2.5ppm	
Nitrogen Dixoide	2.5ppm	2.5ppm	
Oxygen		30ppm	50ppm
Sulfer Dioxide	5ppm	1ppm	
Hydrogen Sulfide	1ppm		
Water	200ppm	20ppm	32ppm

How do you Know what Grade of gas you have?

- Read the cylinder label

- Look for the Grade ID label

MATHESON
ask. . .The Gas Professionals™

Common Gas "Situations"

- My CO2 Regulator constantly freezes.
- My gauge won't return to zero…
- What pressure is empty pressure?
- Why do I need to turn the gas pressure up when the cylinder is getting low?
- Why aren't the gas cylinders for CO2 all the same color?
- What is a two stage regulator?
- Why can't I lubricate a regulator?
- Why can't I use a CO2 regulator for Oxygen?

MATHESON
ask. . .The Gas Professionals℠

CO2 Poisoning

CO CONCENTRATION IN AIR	INHALATION TIME AND SYMPTOMS
9 ppm	ASHRAE maximum allowable concentration for short exposure in a living area.
50 ppm	Maximum allowable concentration for continuous exposure in any 8-hour period.
200 ppm	Headache, tiredness, dizziness and nausea after 2 to 3 hours.
400 ppm	Frontal headache within 1 to 2 hours and life threatening after 3 hours. Maximum allowable amount (air-free) in flue gases.
800 ppm	Dizziness, nausea and convulsions within 45 minutes. Unconsciousness within 2 hours. Death within 2 to 3 hours.
1,600 ppm	Headache, dizziness and nausea within 20 minutes. Death within 1 hour.
3,200 ppm	Headache, dizziness and nausea within 5 to 10 minutes. Death within 30 minutes.
6,400 ppm	Headache, dizziness and nausea within 1 to 2 minutes. Death within 10 to 15 minutes.
12,800 ppm	Death within 1 to 3 minutes.

MATHESON

ask. . .The Gas Professionals™

Draught Beer Basics & How Gases Affect Beer

Master Brewers Association of the Americas
District New England
Winter Meeting 2018
Bob Bernier

MATHESON
ask. . .The Gas Professionals℠