DRAUGHT BEER QUALITY FOR RETAILERS

Prepared by the
Technical Committee
of the Brewers Association

BA BREWERS ASSOCIATION®

THE BREWERS ASSOCIATION'S DRAUGHT BEER QUALITY SUBCOMMITTEE'S OVERRIDING MISSION IS TO IMPROVE THE QUALITY OF DRAUGHT BEER DISPENSED TO OUR CUSTOMERS.

Retailers play a critical role in preserving the great flavor and aroma in beer created by brewers. Great beer in a consumer's glass is no accident: beer must be handled with care at retail. Draught beer systems commonly pour a wide range of brewers' and suppliers' beer, so everyone has an interest in keeping great beer great—brewers and wholesalers, but also especially retailers and consumers.

This publication is intended to help retailers consistently pour great beer and preserve profits through industry accepted best practices. When handled properly from brewery to bar to glass, draught beer delivers what many consider to be the freshest, most flavorful beer available. The job is only just beginning when the keg is tapped and beer begins to flow. Great beer quality depends upon proper alignment of dispense conditions (temperature and pressure) and diligent housekeeping (regular beer line cleaning).

As consumers, we find draught taps so often that we assume it must be relatively simple to maintain and serve beer this way. But behind the simple flick of a handle that sends beer streaming into our glass at the bar, you will find systems that require precise design, explicit operating conditions, and rigorous, regular maintenance to ensure the proper dispense of high-quality beer.

Larry Horwitz
Ten20 Butchertown Beer Exchange
Brewers Association Technical Committee Co-Chair

Jason Perkins
Allagash Brewing Company
Brewers Association Technical Committee Co-Chair

Bridget Gauntner
Bell's Brewery
Brewers Association Draught Beer Quality Subcommittee Chair

For additional information download a free copy of the
Brewers Association *Draught Beer Quality Manual*:
BrewersAssociation.org/educational-publications/draught-beer-quality-manual

Additional draught quality resources are available
on the Brewers Association Resource Hub:
BrewersAssociation.org/resource-hub/draught-beer

TABLE OF CONTENTS

Photo © Christine Celmins Photography

ACKNOWLEDGMENTS

Brewers Association would like to thank the Draught Beer Quality subcommittee for their continuing work for the advancement of draught beer quality: Bridget Gauntner (Chair), Ben Geisthardt, Rob Gerrity, Jaime Jurado, Charles Kyle, Matthew Laibson, Annette May, Matt Meadows, David Munro, Chris Shields, Ken Smith, Ryan Wagner, Neil Witte.

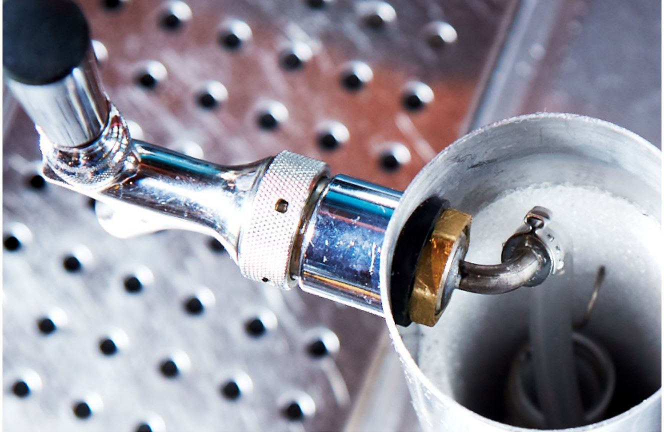
INTRODUCTION

It is easy to take for granted the planning and maintenance required to deliver fresh, flavorful beer from a keg to our customer's glass. However, anyone that has ever had to survive a Friday night with a draught system that is pouring nothing but foam knows that there is more to it than just tapping the keg and pulling the tap handle. If you buy a nice car, or any other large investment, it is essential to keep up on maintenance and cleaning if you want to keep it running in tip-top shape. Draught systems are no different. For them to function properly, they need regular maintenance. You also want to make sure that whoever is driving is doing so with absolute efficiency and care. This is why staff training is paramount to beer service excellence.

The first step is choosing the right draught system for your establishment. If you are not installing the system yourself, make sure that you are hiring a qualified draught installer that has had proper training and experience. Cutting corners to cut costs will only cause you headaches and lost profits in the long run. Invest in a high-quality draught system now or pay the unfortunate price later. This manual will cover what it means to have a balanced draught system and how to achieve a beautifully carbonated beer by taking into consideration temperature and pressure.

One thing that cannot be overlooked is maintenance. If you want to get the most out of your draught system, a regular cleaning schedule cannot be overlooked. Pages 21 through 26 describe industry standard cleaning methods as well as why cleaning lines on a two-week cycle are better for your bottom line than having a more relaxed cleaning regimen.

Finally, we stress the value of a well-trained, knowledgeable staff. You can have the best draught system money can buy but, without bartenders who are properly trained to pour a pint of beer with a proper head, the delivery will fall short. ■



KEY CONSIDERATIONS AND COMPONENTS: WHAT SHOULD YOUR SYSTEM LOOK LIKE?

Temperature and System Design: Draught systems are usually classified based on the mechanism used to refrigerate the beer. Temperature directly affects the pressure required to keep CO_2 in solution. As beer warms, dissolved CO_2 comes out of solution, requiring increasingly higher applied pressures to maintain carbonation. Conversely, as beer gets colder, CO_2 is more readily absorbed. The applied pressure must be adjusted downward to prevent overcarbonation.

Recommended serving temperature: Different styles of beer have different recommended serving temperatures. It is in most cases impractical to maintain different serving temperatures for different beers in the same draught system. Most draught systems are designed around a generally accepted common serving temperature of **36–38°F**.

Keeping Draught Lines Cold: Draught lines must be kept as cold as the keg. If the beer warms up in the draught line, CO_2 will break out of solution and cause foaming at the tap. There are three types of cooling systems for draught lines: direct draw, forced air, and glycol cooled.

TYPES OF SYSTEMS

Direct-Draw Systems

In direct-draw systems, the draught lines are fully contained in the keg cooler. The most common examples are keg boxes with the tower mounted on top, and walk-in coolers with the shank and faucet assemblies running through the wall.

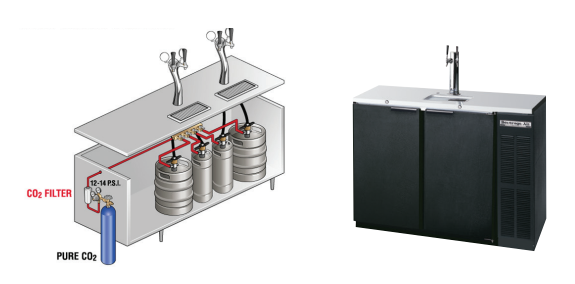


Figure 1. A keg box is a common direct-draw system.

Photo © Aaron Colussi

Forced-Air Blower Systems

Forced-air blower systems are for lines that exit the keg cooler and are not longer than a distance of 25 feet. Beer lines run to the tower through an insulated duct system. A blower is mounted in the keg cooler and blows cold air from the cooler through the ductwork to the tower (figs. 2 and 3). In some systems, a second duct is set up to provide a return for the airflow.

Forced-air blower systems are vulnerable to temperature pickup due to factors like high traffic in a walk-in cooler and high temperatures in the environment surrounding the duct.

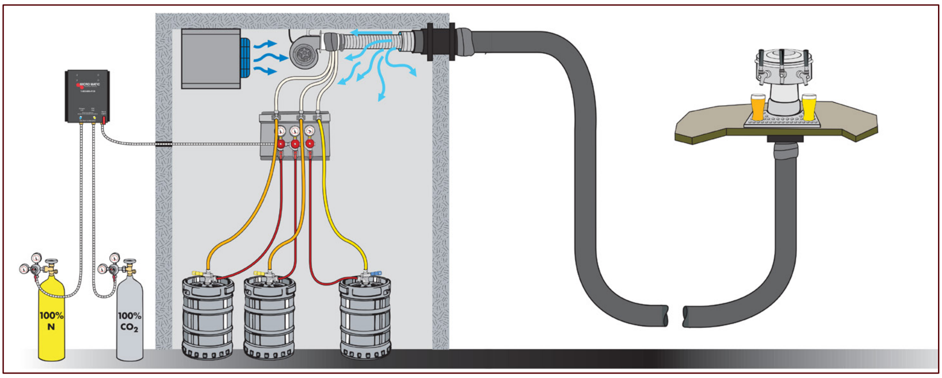


Figure 2. Single-duct forced-air cooling system.

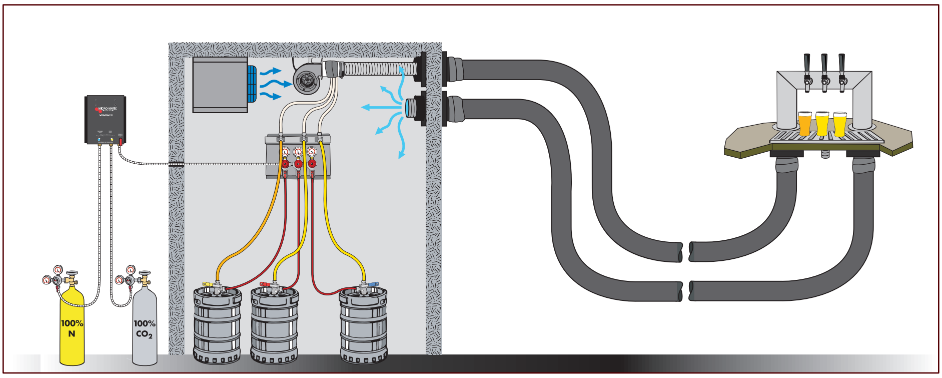


Figure 3. Double-duct forced-air cooling system.

Glycol-Cooled Systems

Longer draught beer systems typically use chilled liquid to keep the beer cold. A chiller maintains the temperature of a glycol/water mixture at **28–31°F** and continuously pumps the cold mixture through a specialized beer line bundle that is inside a tightly insulated housing (fig. 4). The beer lines inside the housing are bundled around the glycol supply and return lines, keeping the beer cold and the CO_2 in solution. Glycol systems are very efficient and can be used for runs of any length.

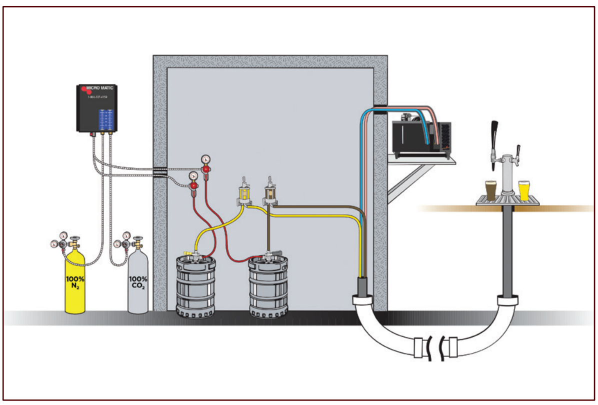


Figure 4. Configuration of a typical long-draw system using a glycol chiller.

GAS

Dispense gas in a draught system performs three critical functions:

1. Maintaining the carbonation level of the beer from start to finish
2. Preserving the flavor of the beer in the keg
3. Pushing the beer from the keg to the faucet

There are several different dispense gas options to choose from, depending on the system design.

Carbon Dioxide (CO_2)

Carbon dioxide (CO_2) is the ideal dispense gas for direct-draw systems. To keep the beer properly carbonated in the keg, relatively low pressures are used. Proper pressure is a function of the carbonation level of the beer (expressed in volumes of CO_2),* the temperature of the beer in the keg, and altitude (table 1). **Most craft beer styles in the US are carbonated to between 2.5 and 2.7 volumes of CO_2.**

If the proper pressure is exceeded, the beer will overcarbonate in the keg. With too little pressure, the beer will go flat in the keg.

DRAUGHT SAFETY

Breathing high concentrations of CO_2 can be deadly! Take care to prevent CO_2 buildup in enclosed spaces such as cold boxes. System leaks or beer pumps using CO_2 can cause this gas to accumulate in the cooler. To prevent this, beer pumps driven by CO_2 must be vented to the atmosphere. CO_2 warning alarms are available and recommended for installations with enclosed areas, such as walk-in coolers that contain CO_2 fittings and gas lines.

DRAUGHT SAFETY

Keep gas cylinders tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent the cylinder from falling or being knocked over. Cylinder temperatures should not exceed 125°F.

TABLE 1. DETERMINATION OF PURE CO_2 EQUILIBRIUM GAUGE PRESSURE (PSIG) FOR GIVEN VOLUMES OF CO_2 AND TEMPERATURE

	Volumes of CO_2										
Temp. (°F)	**2.1**	**2.2**	**2.3**	**2.4**	**2.5**	**2.6**	**2.7**	**2.8**	**2.9**	**3.0**	**3.1**
33	5.0	6.0	6.9	7.9	8.8	9.8	10.7	11.7	12.6	13.6	14.5
34	5.2	6.2	7.2	8.1	9.1	10.1	11.1	12.0	13.0	14.0	15.0
35	5.6	6.6	7.6	8.6	9.7	10.7	11.7	12.7	13.7	14.8	15.8
36	6.1	7.1	8.2	9.2	10.2	11.3	12.3	13.4	14.4	15.5	16.5
37	6.6	7.6	8.7	9.8	10.8	11.9	12.9	14.0	15.1	16.1	17.2
38	7.0	8.1	9.2	10.3	11.3	12.4	13.5	14.5	15.6	16.7	17.8
39	7.6	8.7	9.8	10.8	11.9	13.0	14.1	15.2	16.3	17.4	18.5
40	8.0	9.1	10.2	11.3	12.4	13.5	14.6	15.7	16.8	17.9	19.0
41	8.3	9.4	10.6	11.7	12.8	13.9	15.1	16.2	17.3	18.4	19.5
42	8.8	9.9	11.0	12.2	13.3	14.4	15.6	16.7	17.8	19.0	20.1

Notes: Values for psig assume sea-level altitude. Add 1 psi for every 2,000 feet above sea level. Highlighted section indicates the recommended applied pressure values within the most commonly recommended temperatures and volumes of CO_2 using 100% CO_2 for dispense.

Source: Values based on data from *"Methods of Analysis,"* 5th ed. (Milwaukee, WI: American Society of Brewing Chemists, –1949).

* In the US, the industry measures beer carbonation in units of "volumes of CO_2." A typical value for a keg might be 2.5 volumes of CO_2, meaning literally that 2.5 keg-volumes of uncompressed CO_2 have been compressed and dissolved into one keg of beer. Carbonation levels in the average craft beer are 2.5–2.7 volumes of CO_2. Values can range from as little as 1.2 to as high as 4.0 in specialty beers. Consult your distributor and/or brewery reps for specific information.

CO_2-Rich Blends and Gas Blenders

In longer systems the pressure required to deliver beer from the keg to the faucet may exceed the correct pressure to maintain carbonation if only using 100% CO_2. In this case, use a blend of CO_2 and nitrogen (N_2) gas.

A lower percentage of CO_2 in the dispense gas allows for a higher applied pressure without overcarbonating the beer.

For many long-draw draught systems, the proper blend is usually somewhere between 60%–80% CO_2. This blend is achieved by using a gas blender that produces the proper blend on site (fig. 5).

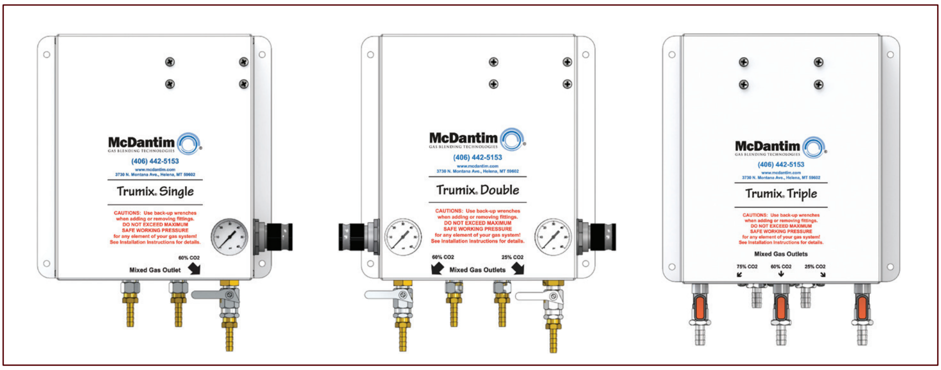


Figure 5. On-site gas blenders (*left to right*): single-mix, two-mix, three-mix blender.

Nitrogen generators are available for higher-volume operations that produce N_2 on site, which is then blended with the CO_2. Nitrogen generation eliminates the need to purchase cylinders of N_2.

Figure 6. Nitrogen generators.

Nitrogen-Rich Blend, a.k.a. "Guinness Gas" or "Pre-mix"

A 25% CO_2/75% N_2 gas blend is specifically formulated for dispensing nitrogenized, or "nitro," beers. These beers have a very low CO_2 content, yet require a high dispense pressure to push them through a specialized faucet.

Nitrogen-rich gas is only intended for use with nitrogenized beers. Its widespread use in some markets for dispensing fully carbonated beers has, in fact, been found to make those beers go flat in the keg over the course of just a few days.

The 25% CO_2/75% N_2 blend is available premixed in a single cylinder, usually a nitrogen tank. It can also be produced with an on-site gas blender. The premixed cylinders have much higher ongoing operating costs than gas blends produced on site with a blender

Table 2 compares the relative costs associated with using a premixed 25% CO_2/75% N_2 cylinder ("pre-mix") on your fully carbonated beers versus using an onsite blender box with a more appropriate blend of 70% CO_2/30% N_2.

TABLE 2. GAS COST ANALYSIS FOR BEER DISPENSED AT 25 PSIG

Gas type	Price	cu. ft.	Kegs dispensed[a]	Gas cost per keg
Pre-mix (25% CO_2/75% N_2)	$44.50	244	45.2	$1.02
CO_2 (50 lb.)	$54.50	405	75.0	$0.73
N_2	$47.50	244	45.2	$1.05
On-site blender box (70% CO_2/30% N_2)				$0.78

Notes: Figures based on gas costs in a large urban market in 2021. Prices may vary in different markets.

[a] A standard 15.5 U.S. gallon keg dispensed at 25 psig uses 5.4 cu. ft. of gas. Calculations assume no waste.

Pre-mix is more expensive than blending on site. Dispensing carbonated beers with premixed cylinders wastes money and makes beer go flat.

Beer Pumps

Beer pumps are an alternative to using blended gases for systems with higher pressure requirements (such as longer runs or rises from cooler to faucet).

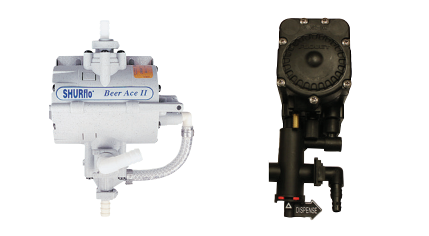


Figure 7. Beer pumps.

CO_2 is solely applied to the keg at ideal pressures as expressed in Table 1. This pressure pushes the beer to the pump, which is mounted on the cooler wall above the keg.

A higher gas pressure is applied to the pump, which in turn applies a direct pressure to the beer, pushing it the longer distance to the faucet. The gas driving the pump does not come in direct contact with the beer, eliminating the risk of overcarbonation.

Beer pumps are ideal for very long draught systems (200 feet or more).

NO AIR COMPRESSORS, PLEASE!

Systems that use compressed air as a dispensing gas expose beer to oxygen, which produces paper- or cardboard-like aromas and flavors in the beer. Brewers go to great lengths to keep oxygen out of beer to avoid these undesirable stale characteristics. Air compressors also push contaminants from the outside atmosphere into the keg, increasing the chance of bacterial spoilage and off-flavors. For these reasons, compressed air should never be used in direct contact with beer.

DRAUGHT SAFETY

The exhaust CO_2 gas from a beer pump must be vented outside the walk-in cooler or building to avoid CO_2 buildup and asphyxiation.

Gas Leak Detectors

Gas leaks in a draught system not only cost money in lost gas but may also cause pressure drops that can lead to foamy beer. In enclosed spaces large CO_2 leaks can be extremely dangerous, even deadly. Gas leak detectors are available that are plumbed directly into

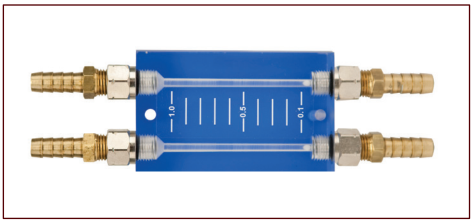


Figure 8. In-line gas leak detector.

the gas supply line to the draught system. When no beer is being poured, a float inside the device will rise if gas is leaking.

EQUIPMENT

Stainless Steel

Many draught system fittings and equipment are made of chrome-plated brass. Despite their functionality, they should be avoided if possible because the plating can wear off and expose the brass, which can impart a metallic off-flavor to the beer. In addition, brass parts are more susceptible to bacterial growth.

Wherever possible, stainless steel parts should be used (fig. 9). The use of stainless steel should also include faucets, splicers, and shanks. You will notice a huge flavor advantage and so will your customers.

Figure 9. Stainless steel faucets.

Foam on Beer Detector (FOB)/Beer Saver

A foam on beer detector (FOB) is a device that is installed on a keg coupler or the cooler wall and shuts off the flow of beer when a keg empties, reducing the amount of beer lost (fig. 10). FOBs prevent the waste associated with changing kegs.

While they are very effective, FOBs also have the potential to harbor beer-spoiling bacteria. FOBs should be cleaned every two weeks during regular line cleaning. Additionally, FOBs should be completely disassembled and hand detailed every six months. ■

Figure 10. Foam on beer detectors (FOBs) can be plastic (*left* and *middle*) or stainless steel (*right*).

Photo © Getty/jostrand

PROPER OPERATION OF YOUR DRAUGHT SYSTEM

SYSTEM DISTANCE

When it comes to draught system length, shorter is usually better. Shorter draught systems have a number of benefits:

- Less overall draught line surface means less overall buildup in the lines, making cleaning easier and less expensive.
- Overall cost of equipment and installation is usually less expensive with shorter systems.
- Line replacement costs are less with shorter systems, especially systems short enough for direct-draw or forced-air cooling systems.
- Less beer is contained in the lines due to the shorter line length and the fact that smaller diameter tubing can be used. This means less beer is lost during line cleaning, lowering the costs of system maintenance.
- Shorter systems do not require beer pumps or FOBs, both of which can introduce quality-related issues.

FRESHNESS

Beer is like liquid bread—the fresher the better. Focusing on freshness is key to serving great draught beer. Retailers can ensure they always dispense fresh beer by keeping their inventory sized appropriately, rotating their stock, and buying brewery-fresh beer from their wholesaler partners.

Time and temperature are the two major enemies of beer flavor. Oxidation begins the day the beer is packaged, so flavor suffers as time marches on. Higher temperatures rapidly accelerate oxidation, damaging beer flavor faster still.

TIME

All beer brands have a recommended freshness window, past which the brewery has determined the beer no longer represents the intended flavors. When a beer is older than the freshness window, oxidation significantly alters the flavor, aroma, and appearance of the beer. Every beer brand is different, so the freshness window might vary by weeks or months.

Breweries communicate freshness information in many ways. Most beer brands are marked with a "packaged-on" date, a "best before" or "pull" date, or another coding system (fig. 11). Manage your inventory to finish your draught beer well within the freshness window. If needed, contact your beer suppliers to determine the shelf life of each beer brand you carry.

Figure 11. Examples of "best before" (*left*) and "packaged on" (*right*) dating.

TEMPERATURE

In order to avoid dispensing problems, every keg must be at or below 38°F when being served. To help ensure that your kegs are properly chilled before serving, table 3 provides a guide to the approximate time needed to properly chill a keg to 38°F from a given starting temperature. Note that even kegs that "feel cold" (e.g., 44°F) may need to chill overnight in order to ensure proper dispense.

Most breweries require constant refrigeration of their draught beers. For the freshest, most flavorful, and easy dispensing beer it is recommended that draught beer kegs be refrigerated at all times. Large-scale domestic breweries and most craft breweries do not pasteurize draught beer. At retail, increases of even a few degrees above 38°F can create pouring problems, especially excessive foaming. Ideally, all draught beer delivered to retail will be stored cold until served. Contact your beer suppliers for recommended storage and serving temperatures.

TABLE 3. TIME REQUIRED TO CHILL A KEG TO 38°F FROM VARIOUS STARTING TEMPERATURES

Starting temp.	Hours to reach 38°F
50°F	25.0
48°F	23.5
46°F	21.0
44°F	18.0
40°F	7.0
38°F	0

KEGS IN SERIES

Busy accounts may connect kegs in a series to meet peak capacity demands. Chaining two or three kegs of the same product together allows all of the chained kegs to be emptied before beer stops flowing.

To prevent quality issues and foaming, series kegs should be chained as illustrated in figure 12.

When pressurized and pouring, beer flows from the first keg to the second and on to the third before it travels to the faucet. Chaining kegs in this manner is necessary to prevent the system from foaming; however, because older beer is being pushed into fresher kegs, this practice is in opposition to a traditional first-in-first-out rotation.

Because series kegs are inherently out of rotation, all kegs in the series need to be completely emptied on a weekly basis. This may necessitate the use of a FOB on some systems. Failure to empty the series completely leaves old beer in the system. **Never rotate the last keg in a chain onto the front of a new chain of kegs.**

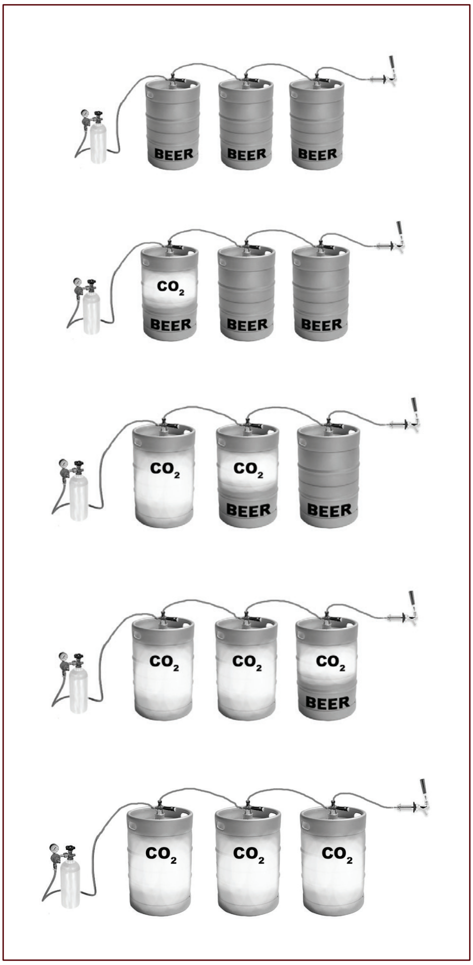


Figure 12. Kegs linked in a series. Kegs should be chained so that the keg closest to the faucet empties last.

GLASSWARE

Glassware is an important and often overlooked component of the draught beer ritual. Clean, cool (but never frozen) glassware will increase the presentation value of the beer you serve and enhance the consumer's enjoyment of their favorite style or brand. Glassware varies from run-of-the-mill shaker pints to more traditional nonic pints to shapely half-liters and diminutive snifters, with every possible shape and size in between.

These glasses all contain features designed for specific beer styles, exhibiting functionality, tradition, or both. Choosing the proper glassware style will enhance a consumer's experience and lead to repeat sales.

Figure 13. Common examples of the many types of glassware that are used to serve craft beer.

Glassware Cleanliness

A perfectly poured beer requires a properly cleaned, or "beer-clean," glass. A freshly cleaned glass should be used for every pour. As a starting point, glassware must be free of visible soil and marks. A beer-clean glass is also free of foam-killing residues and lingering aromas from cleaners or sanitizers.

Beer glassware should always be washed in sinks or dishwashing equipment that are only used for glassware. Sinks and dishwashers used for food dishes will transfer grease onto beer glassware, which destroys beer foam.

Choose detergents specifically intended to clean beer glassware and which are not fat or oil based.

Figure 14. A beer poured into properly cleaned glassware (*right*) and improperly cleaned glassware (*left*) will be visually different.

Allow glasses to completely air dry, allowing any sanitizer to sufficiently evaporate and not leave residual odors. Drying glasses with a towel can leave lint and may transmit germs and odors.

Two systems deliver effective beer glass cleaning:

Manual cleaning in a 3-tub sink

1. Ensure that sink and work area is clean.
2. Ensure that residual beer is poured into a drain, not the cleaning water.
3. First tub: This tub contains hot water and detergent. Always use the recommended rate of detergent for the size of sink. For example, detergents often provide instructions for 5-gallon sinks, whereas many three-tub systems (fig. 15) have sinks 3.5 gallons in size.
4. Scrub the glass in the first tub with the in-situ brush to remove film, lipstick, and other residue.
5. Second tub: Contains fresh cold water. Rinse the glass, heel-in-heel-out, in the cold water.
6. Third tub: Contains solution of water and appropriate sanitizer. Sanitize the rinsed glass, heel-in-heel-out, in water and sanitizer solution. Consult sanitizer manufacturer's recommendation for water temperature.

Figure 15. Typical three-tub sink setup.

Automatic Glass-Washing Machine

1. Dedicate a machine to cleaning bar and beer glassware only.
2. Use the correct detergent, sanitizer, and rinse agents according to the manufacturer's instructions.
3. In detergent-based machines, use water temperatures of 130–140°F. High-temperature machines that operate at 180°F can be used without additional chemical sanitizers.
4. Ensure the machine is maintained and serviced regularly.

DRAUGHT SAFETY

Know the correct dilution for your sink volume—excess sanitizer does not do a better job and may be unhealthy for staff and customers. Low-foam detergents can be caustic. Use care when dispensing detergents and sanitizers. Personal protective equipment (PPE) is recommended. Keep safety data sheets (SDSs) nearby.

Testing Glassware Is "Beer-Clean"

Beer poured into a beer-clean glass

- forms and maintains a proper head,
- does not have bubbles clinging to the sides of the glass,
- creates residual lacing as the beer is consumed.

After cleaning, you can test your glasses are beer-clean using three different techniques: sheeting, the salt test, and lacing (fig. 16).

- ***Sheeting Test:*** Dip the glass in water. If the glass is clean, water evenly coats the glass when lifted out of the water. If the glass still has an invisible greasy film, water will break up into droplets on the inside surface.
- ***Salt Test:*** Salt sprinkled on the interior of a wet glass will adhere evenly to the clean surface but will not adhere to the parts that still contain a greasy film. Poorly cleaned glasses show an uneven distribution of salt.
- ***Lacing Test:*** Fill the glass with beer. If the glass is clean, foam will adhere to the inside of the glass in parallel rings after each sip, forming a lacing pattern. If not properly cleaned, foam will adhere in a random pattern or may not adhere at all.

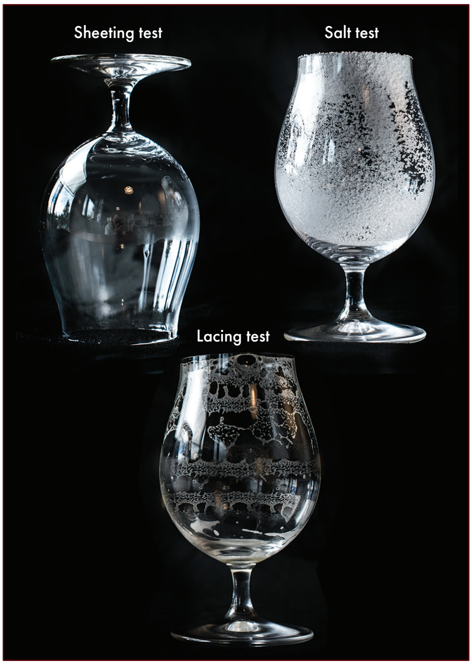


Figure 16. Three properly cleaned glasses used to show the three methods for testing beer-clean glassware.

Storing Glassware

- Air-dry glassware. Drying glasses with a towel can leave lint and may transmit germs and odors.
- Stainless steel wire baskets, deeply corrugated bar mats, or ¼-inch drainage tile should be used to dry and store glassware to provide maximum air circulation and avoid trapping moisture in the glassware.
- Do not dry or store glassware on a towel, rubber drain pad, or other smooth surface, as these can transfer odors to the glass and slow the drying process.
- Do not stack glassware, especially when wet.
- Store glassware in an area free of odors, smoke, grease, or dust.
- Store dry, clean beer glasses at room temperature, or in a separate, dedicated chiller between 36°F and 40°F.

Glassware Temperature

- Room temperature glassware is preferred for most craft beer styles.
- Chilled glassware may be preferred for some beer styles (e.g., domestic lagers), but they should be DRY before chilling.
- **Do not freeze beer glassware**. Frozen glasses will create foaming due to a sheet of ice being formed when the beer is introduced into the glass, which causes a rapid release of CO_2 from the product. Beer served at near-freezing temperatures retains more CO_2, resulting in a more filling experience for the consumer; it also results in a blander tasting experience. Frozen glassware can transmit sanitizer aromas and flavors to beer if frozen when wet with sanitizer.
- Water-rinsing devices may be used to pre-wet or chill the glass interior prior to filling. The water used should be filtered and free of aromas.

POURING DRAUGHT BEER

Proper serving of draught beer is intended to create a "controlled" release of carbonation, resulting in a better tasting beer and a more complete sensory experience. The evolution of CO_2 gas during pouring builds the foam head and releases desirable flavors and aromas.

Benefits of a One-Inch Foam Head

A proper head on a draught beer, that is, a one-inch collar of foam, improves the consumer's experience in several ways:

- The beer has greater visual appeal.
- The beer releases more aromatic volatiles.
- The palate-cleansing effects of carbonation are enhanced.
- The beer presents better overall textural and sensorial qualities to the consumer.

Pouring Technique

As illustrated in figure 17, properly pouring draught beer is a four-step process:

1. Hold the glass at a 45-degree angle, grip handle at its BASE, and open the faucet FULLY and QUICKLY (fig. 17, top left).* Pour beer down the side of the glass initially (fig. 17, top right).
2. Gradually tilt the glass upright once beer has roughly reached half-way up the glass (fig. 17, bottom left).

---

* Beer pours best from a fully open faucet. Holding the handle at its base helps control the faucet during operation. Partially open faucets cause turbulent flow, excessive foaming, and wasted beer.

† Nozzles can cause glassware to break and can transfer contamination from dried beer to glassware. Nozzles dipped in beer become a breeding ground for microorganisms.

Figure 17. Properly pouring beer is a four-step process.

3. Pour beer straight down into the glass, working the glass to form a one-inch collar of foam (the head; fig. 17, bottom left). In no instance should the faucet nozzle touch the glass or become immersed in the consumer's beer.†
4. Close the faucet QUICKLY to avoid wasteful overflow.

Growlers and Other To-Go Packages

Changes in legislation in some US states now allow retailers to fill and sell growlers and other to-go packages. Growlers are reusable, sustainable packages used to take draught beer home from breweries, taverns, supermarkets, and even gas stations and convenience stores. The galvanized pail of the early 1900s has evolved into 32- to 64-ounce, pressure-rated, sealed containers made of glass, ceramic, stainless steel, or other material. Aluminum "Crowler® cans" are a relatively new type of take-home draught beer package that has recently become very popular. Like other cans, they require a specialized seamer to seal the can after filling. Seamers are typically small to medium-sized tabletop machines that are specifically designed to seam one can at a time. These cans are single use only and not meant to be refilled.

Growlers and other to-go containers are filled in many ways, most commonly by attaching a tube to a draught beer faucet. The tube is then inserted to the bottom of the container and the faucet is opened completely, filling the growler from the bottom up. When the beer reaches the proper fill height the faucet is turned off and the container is disengaged from the tube. The container should be capped or seamed immediately, then sealed and labeled according to state law. Typically, consumption is recommended within 72 hours of filling. Brewery studies show that draught beer quality begins to suffer almost immediately after filling. Within 24 hours carbonation, mouthfeel, and the hallmark flavors of the beer begin to degrade, and within 72 hours stale flavors become obvious.

To-go containers are increasingly popular, but the decision to sell them introduces significant quality, safety, and hygiene issues. Tips for managing these issues include:

- Rinse containers with cool water immediately prior to filling.
- Purge the container with CO_2 prior to filling.
- Sanitize the fill tube between each use.
- **Fill and sell only pressure-rated containers.** Ask your supplier to confirm the containers are suitable for storing carbonated beer.
- Never overfill a glass growler. Always leave 5% headspace or fill to the manufacturer's recommended level.
- Never etch or scratch glass growlers, as this weakens them.
- Keep filled containers cold at all times and remind customers to do the same. The pressure in a warming container can increase enough to cause the vessel to explode.
- If the container is to be refilled, clean immediately after emptying, and allow to drip dry upside down and uncapped.

TABLE 4. GROWLER PRESSURE CHANGE AS FUNCTION OF TEMPERATURE

	Temperature	psig	barg
Refrigerated	38	13.1	0.90
Cool	50	20.3	1.40
Room temp.	68	32.4	2.23
Hot day	100	57.5	3.96
Car interior	120	74.2	5.12

Note: Values assume sealed growler filled to 95% capacity with beer at 2.7 volumes CO_2, 5% ABV. psig, pounds per square inch, gauge; barg, bar gauge pressure

PROTECT YOUR INVESTMENT AND MAXIMIZE YOUR PROFITS

Presenting draught beer to your customers in a bar or restaurant setting is far more complicated than the days of purchasing a keg, putting it on ice, and tapping with a hand pump. Paying attention to time, temperature, and proper dispense gas will protect your investment in beer, and a properly maintained dispense system will help minimize waste and maximize profit.

Many industry leaders compare a draught system to a vehicle: a "profit engine," if you will. This modern marvel made of stainless steel and special polymers will deliver maximum profits when maintained to brewery and draught equipment manufacturer recommendations.

Frequently checking on the beer and system components is very important to maintaining your draught beer system. Use the following Draught Beer System Checklist to assist you in evaluating your draught beer system.

DRAUGHT BEER SYSTEM CHECKLIST

TEMPERATURE
Beer temperature in keg cooler and at point of dispense: between 36°F and 38°F
DRAUGHT LINE AGE
Vinyl tubing: less than two years old
Barrier tubing: less than 10 years old
DRAUGHT LINE VISUAL
Use clear draught tubing for easy visual inspection
Tubing is free of sediment
Tubing should not be cloudy or discolored (when filled with clear water)
DRAUGHT LINE CLEANING LOG
Between 7- and 14-day cleaning cycle (see local ordinances concerning frequency)
Gaps in service of more than 21 days require special attention
Seasonal accounts require special attention to protect beer lines during off season
GAS SOURCE
Beverage grade CO_2 for ales and lagers: 12–15 psig (gauge pressure) (direct-draw systems)
Blended CO_2, rich blend for ales and lagers on long-draw systems. 60% CO_2: 29–34 psig, 70% CO_2: 23–27 psig, 80% CO_2: 18–22 psig **Note:** Recommended applied gauge pressure (psig) will vary in relation to temperature and elevation.
Pre-mix (25% CO_2/75% N_2) for nitrogenized beers ONLY
Compressed air should never be used to dispense draught beer
FAUCETS AND DRIP TRAY
Rinsed free of beer
No physical buildup of beer soils or mold present
COOLER INSPECTION
Dedicated beer coolers are recommended
Ensure all food products are stored away from kegs and beer lines

DRAUGHT SYSTEM CLEANING AND MAINTENANCE

System Maintenance

In addition to alcohol and CO_2, finished beer contains proteins, carbohydrates, and hundreds of other organic compounds. Yeast and bacteria routinely enter draught systems, where they feed on beer and attach to draught lines (fig. 18). Minerals also precipitate from beer, leaving deposits in lines and fixtures.

Within days of installing a brand-new draught system, biofilm deposits

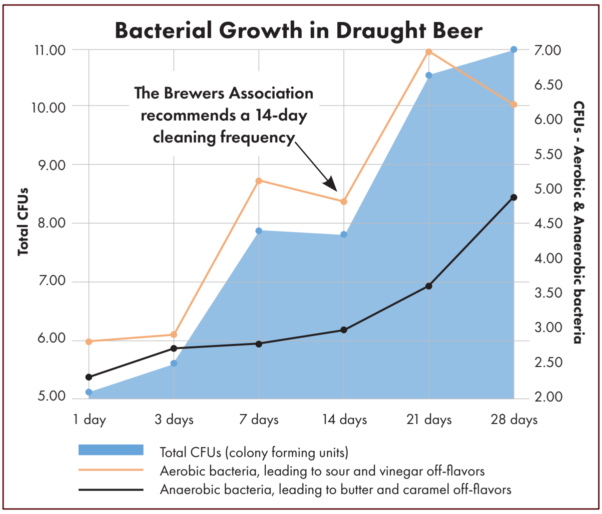


Figure 18. Bacteria can grow exponentially in uncleaned draught lines.
Graph adapted from E. Storgårds, "Microbiological Quality of Draught Beer—Is There Reason for Concern?" in *Proceedings of the European Brewing Convention Symposium Draught Beer, Packaging and Dispense*, EBC Monograph vol. 25 (Nürnberg: Fachverlag Hans Carl), 92–103.

begin to build up on the surfaces that come into contact with beer. Without proper cleaning, these deposits soon affect beer flavor and undermine the system's ability to dispense quality beer.

When performed properly, line cleaning prevents the buildup of organic material and mineral deposits while eliminating flavor-changing microbes. Thus, a well-designed and diligently executed maintenance plan ensures trouble-free draught system operation and fresh, flavorful beer.

Clearly posted documentation of line cleaning and servicing records is recommended in all keg coolers (visit https://www.brewersassociation.org/educational-publications/draught-beer-line-cleaning-log/ for a printable line cleaning log).

In order to ensure your draught beer tastes as the brewer intended, the following procedures must be followed.

Draught Systems Cleaned and Serviced Every Two Weeks (14 Days) Minimum

Minimum every two weeks (14 days)—clean and service as follows:

1. Push beer from lines with warm water.
2. Clean lines with **2% caustic solution** for routine cleaning of well-maintained lines, or with **3% caustic solution** for older or more problematic lines. Contact your chemical manufacturer to determine how much chemical is needed to achieve these recommended concentrations. If you use non-caustic-based cleaners, such as acid- or silicate-based cleaners, be sure to use the cleaning concentrations recommended by the manufacturer. For best results, **maintain the solution temperature between 80°F and 110°F** during the cleaning process.
3. Using an electric pump, caustic solution should be **circulated through the lines for a minimum of 15 minutes** at a steady flow rate that ideally exceeds the flow rate of the beer. If a pressurized cleaning canister is used (though not recommended), the solution needs to be left standing in the lines for **no less than 20 minutes** before purging with clean water.
4. Disassemble, service, and hand-clean faucets; hand-clean couplers.
5. After cleaning, **flush lines with cool fresh water** until pH matches that of your tap water and no visible debris is being carried from the lines.
6. Repack beer lines with beer only after rinsing lines with water.

Acid Clean Every Three Months (Quarterly)

Acid cleanings should be in addition to caustic cleanings, not as a replacement.

Every three months (quarterly)—perform acid clean as follows:

1. Push beer or caustic cleaner from lines with warm water.
2. Clean lines with acid line-cleaner chemical mixed to manufacturer's guidelines. **Maintain the solution temperature between 80°F and 110°F.**
3. Circulate the acid solution through the lines for **15 minutes** at a steady flow rate that ideally exceeds the flow rate of the beer.
4. After acid cleaning, flush lines with cool fresh water until the pH matches that of your tap water and no visible debris is being carried from the lines.
5. Repack beer lines with beer only after rinsing lines with water.

Hardware Cleaned and Serviced Every Six Months (Semiannual)

Every six months (semiannually)—clean and service hardware as follows:

- Disassemble, service, and hand-clean all FOBs (a.k.a. beer savers, or foam detectors).
- Disassemble, service, and hand-clean all couplers.

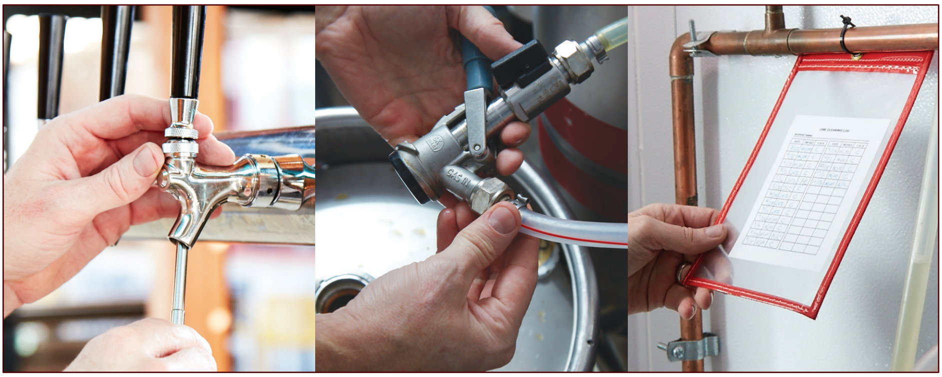


Figure 19. Faucets and couplers should be inspected visually to ensure that proper line-cleaning frequency and procedure is being followed. Straws can be used to look for soil inside faucets. Line cleaning logs should be maintained.

Visually Inspect for Cleanliness

It is important for retailers to understand the services being provided by professional draught technicians. Visually inspecting a draught system for cleanliness is a good indicator of the health of the draught system (fig. 19).

The following visual checks should be completed at minimum on a weekly basis:

- **Cleaning log:** It is recommended that all draught system cleaners keep a cleaning log that is clearly visible to the retailer, the wholesaler, and the brewer. An example log is shown on page 79 of the Brewers Association *Draught Beer Quality Manual.* The cleaning log should show the last cleaning having occurred within the last two weeks and an overall two-week line-cleaning cycle.
- **Faucets:** Visibly inspect the inside, outside, and vent holes of each faucet. The interior of a faucet can be scraped with the hard edge of a bar straw. Vinegar or butter aromas indicate a bacterial infection.
- **Couplers:** Visibly inspect the exterior of the coupler. Kegs can be untapped to allow the entire coupler to be inspected. Vinegar or butter aromas indicate a bacterial infection.

Figure 20. Faucets should be cleaned every time beer lines are cleaned.

Figure 21. Ensure that cleaning solution is added to the correct strength.

Figure 22. Electric pumps.

- **FOBs:** Visually inspect sight glass, vent, and FOB stop. All components, inside and out, should be free of visible build-up. Sight glass should not have any haze and should be completely clear.
- **Jumper lines:** Visually inspect the flexible tubing in the draught system cooler. The exterior of the tubing should be free of any visible build-up. The tubing should be clear and free of color staining. Vinyl jumper lines should be replaced every one to two years.
- **Spill trays:** Visually inspect the grate and body of the spill tray. The entire spill tray should be free of any visible build-up. Vinegar or butter aromas indicate a bacterial infection.

Figure 23. Recirculation pump equipment.

Electric Recirculating Pump Cleaning: The Recommended Cleaning Procedure

Because every draught beer system is different, there is no definitive procedure for cleaning them. There are, however, certain principles that apply to cleaning every system. To be effective, cleaning solutions need to reach every inch of beer line and every nook and cranny of the connectors and hardware. You can hand-clean some items, like couplers and faucets, but most of the system must be reached by fluid flowing through the beer lines. The industry currently uses two cleaning procedures for beer lines: recirculation by electric pump and static pressurized canister cleaning, also known as pressure pot cleaning.

Electric recirculating pump cleaning is recommended as the preferred method for nearly all systems. Recirculating pump cleaning uses a combination of chemical cleaning and mechanical action to effectively clean a draught system by increasing the normal flow rate through the beer lines during the cleaning process.

While cleaning with a pressurized canister is an alternative, it is significantly less efficient and effective and is only recommended when cleaning by recirculation is not possible. Pressure pot cleaning requires additional time (usually a minimum of 20 minutes) and steps to ensure that the cleaning solutions have the right contact time in the line, which makes up for the lack of mechanical force. Pressurized cleaning canisters may also require a higher concentration of cleaner, because the CO_2 pressurizing the canister can neutralize or reduce the effectiveness of the caustic chemical.

For more detailed descriptions and complete step-by-step procedures, refer to chapter 7 of the *Draught Beer Quality Manual.*

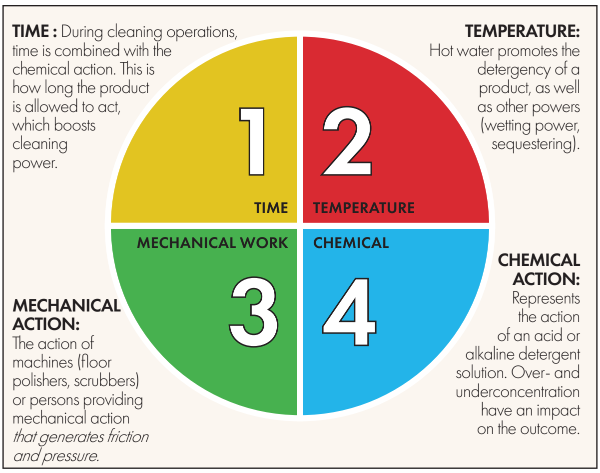


Figure 24. Effective draught system cleaning depends on four interdependent factors, arranged here as the "Sinner's Circle."

Photo © Aaron Colussi

PROFITABILITY CASE STUDIES AND ECONOMICS OF LINE CLEANING

PROFITABILITY

Draught beer is one of the greatest profit generators for bars/restaurants, offering profit margins of 80% or more. Draught dispense can be environmentally friendly because kegs save the equivalent of 165 twelve-ounce bottles or cans with each turn and they are typically reused. The simple case study explorations that follow illuminate draught beer's profitability.

Case Study I: Total profit in a ½ barrel of beer retailed at $6.00/glass
Cost of ½ bbl. of beer = $175.00
Number of 16 fl. oz. glass servings with ¾" of foam and 15 fl. oz. of beer = 132
Retail price = $6.00
Total gross profit = $792.00 Total net profit = $792.00 – $175.00 = $617.00 net profit
Return on each $1.00 invested = $3.52
The formula for profit margin is net profit divided by gross profit. In the above case of a single keg, that is $617/$792, or 78%. Therefore, $0.78 per $1.00 in sales is profit. The remainder is the serving cost. In this example the serving cost would be $0.22 per $1.00 in sales, or 22% serving cost.

Case Study II: Cost to maintain a 10-faucet draught system
10 draught lines × $10.00 per draught line cleaning and maintenance Investment = $100.00
Servings per week from Case Study I above = 1,320 × 2 weeks = 2,640 servings in 14 days
Let's take the $100.00 investment in cleaning and maintenance and divide by the 2,640 servings. You will see each serving of draught beer requires $0.04 to protect its flavor and integrity.

Case Study III: Yearly profit from draught beer at a retail account with 10 draught beer lines
Here is what a case study looks like when you dig a little deeper into the draught beer numbers:
Number of draught Lines = 10
Number of ½ barrels sold each week = 10
Weekly net profit (see Case Study I) at 10 kegs per week = $6,170.00
52 weeks × $6,170.00 = $320,840.00 total profit per year from draught beer
In the above example the cost of cleaning for 10 dispense lines, cleaned once every two weeks, is $100 per system clean at 26 cleans per year, which is $2,600 annually. Proper cleaning as recommended by the Brewers Association consumes only 0.8% of net profits—this is the cost of draught quality.

Case Study IV: How much beer is in each line of a 10-faucet system?	
3/8" vinyl line (jumper line) holds ¾ fl. oz. beer per foot 6' of line contains 4.5 fl. oz. beer	
Assume 50' run from cooler to taps: 5/16" barrier tubing holds ½ fl. oz. beer per foot 50' of line contains 25 fl. oz. beer	
¼" stainless holds ⅙ fl. oz. beer per foot 3' of line contains ½ fl. oz. beer	
Total beer per draught line = 30 fl. oz.	
Total beer across 10 draught lines = 300 fl. oz.	
$175.00 keg cost divided by 1,984 fl. oz. = $0.09 per fl. oz. beer	
Cost of beer in the entire draught system	= 300 × $0.09 = $27.00

ECONOMICS OF BEER LINE CLEANING

Retail confidence in draught beer is growing. According to the Beer Institute, US draught beer volume grew by over 3% from 2009 to 2013. This 3% growth equaled an additional 1,246,000 kegs, or 623,000 barrels.

The study, "The Economic Benefits of Line Cleaning" by the Draught Beer Quality Subcommittee, used Wisconsin industry data to show that a line cleaning cycle drove a 4% higher growth rate than locations not using the two-week cycle. This built on an earlier industry study (David Quain: "Draught Beer Quality – Challenges and Opportunities*), which showed similar draught sales gains (2%) from systems cleaned weekly. Quain's study also found that retail locations that only cleaned their lines every five to eight weeks saw a 7% decline in draught beer sales. Unsurprisingly, this would represent a significant loss of revenue, as shown in Case Study V.

Case Study V: Infrequent draught line cleaning impact on revenue
15 ½ bbl. kegs sold per week = 780 ½ bbl. kegs per year sold
7% decline in sales = 55 fewer ½ bbl. kegs per year
Net profit from a $175 ½ bbl. keg sold at $6.00 per pint = $617.00
55 ½ bbl. kegs × $617.00 = $33,935.00 Going to a 5 to 8 week cleaning frequency would result in $33,935 in lost revenue
Brewers in the US report similar experiences with various retail accounts. Draught beer can and will deliver sales and profits, but only when equipment is properly maintained.

* David Quain, "Draught Beer Quality- Challenges and Opportunities," CiteSeerX, accessed February 15, 2022, http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.604.6134.

DRAUGHT BEER PROFIT WORKSHEET

Calculate your cost of beer line cleaning as a percentage of yearly gross profits from draught beer sales	
NUMBER OF DRAUGHT LINES	
AMOUNT OF BEER IN LINES (FL. OZ.) Use example from Case Study IV	
COST PER OUNCE OF BEER Keg cost/ ounces in keg	
COST OF BEER IN LINES Number of draught lines x amount of beer in lines (fl. oz.) x cost per fl. oz. of beer	
LINE CLEANING COST This will vary depending on your line length and design of your system	
TOTAL COST OF LINE CLEANING Cost of beer in lines plus line cleaning cost	
YEARLY CLEANING INVESTMENT Total cost of line cleaning × 26	
YEARLY PROFITS FROM DRAUGHT BEER SALES	
LINE CLEANING COST AS A % OF PROFITS Line cleaning cost/ yearly profits	

NOTES

NOTES

DRAUGHT BEER QUALITY FOR RETAILERS

Delicious draught beer is a true delight, but the key challenge is ensuring that the beer arrives to the consumer with all the freshness and flavor the brewer intended. *Draught Beer Quality for Retailers* contains the basic knowledge necessary to understand how draught beer systems work and are maintained. Easy to read and presented in a clear and simple format, this publication also serves as an introduction to concepts explored in more detail in the *Draught Beer Quality Manual*, which takes a deeper dive into the complex nuances of serving draught beer.

Draught Beer Quality for Retailers and the *Draught Beer Quality Manual* are prepared by the Technical Committee and the Draught Beer Quality Subcommittee of the Brewers Association. These groups began their focus on draught beer quality at retail in 2007 when the brewing community came together to develop a set of best practices and standards to help brewers, wholesalers, retailers, and draught system installers improve and maintain the quality of draught beer. The best practice recommendations in these two publications continue to evolve through collaborative efforts within the brewing community.

BREWERS ASSOCIATION®
BrewersAssociation.org

BREWERS PUBLICATIONS®
BrewersPublications.com