DRAUGHT

TECHNICAL GUIDANCE ON DISPENSING - 2007

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Brewers Association of Canada

INTRODUCTION

A licensee is often known and rated by the quality of the draught beer that it serves. Is it brilliantly clear with a crown of thick foam or, is it flat like apple juice? A customer's draught experience will often influence where their decision to come back another time for a pint or recommend the establishment to a friend. A licensee's draught system is judged on its slowest moving keg. For this reason, the system needs to be able to deliver the last glass from the keg as well as the first glass.

Three things that guided the thought process in developing this document:

1) Presentation of the product;
2) Constant clear flow at the appropriate flow rate;
3) Having the last glass drawn from the keg pour as well as the first.

Draught beer systems are relatively simple and if set up and maintained properly, can provide many years of top quality draught beer. Key system design features and procedures which affect temperature, foam and sanitation are all covered.

With the expanding interest and understanding of beer styles and the adventure that they bring to the consumer, there has been a growth in the demand for increased draught beer selection. Rarely do you find only two or three draught lines at a licensee. Now, it is not uncommon to have 10, 20 or 50+ draught lines in one location. And remember, your system will always be judged on the slowest moving keg. For this reason, the system must be capable of delivering the last glass of beer from the slowest moving keg as well as the first glass. These guidelines will give you the knowledge of how that can be done.

If the draught is too foamy, a lot of beer is wasted in spillage, and customer service suffers. If the beer is flat, beer is lost in overfill & refreshment and customer satisfaction disappears. Either way, beer costs rise, customers vanish, and profits are reduced. This document provides insights and answers to draught dispensing problems that lead to lost sales and profits.

One word of advice beyond draught dispensing: over 90% of consumer draught complaints are the result of unclean glasses or dirty draught lines. Routine line cleaning and a tuned up glass washer are critical to serving the perfect pint.

Flow Rate:

The desired flow rate is 128 fluid ounces (3.785 litres) per minute. The design of the draught line and any restriction on the system should be installed in a way that makes it possible to achieve and maintain this target.

Gas for Dispense:

The ideal gas will be the one that maintains the desired level of carbonation in the beer being poured. Using the appropriate gas helps to ensure the beer does not go flat or become over-carbonated (and thus too foamy). It also ensures that the beer will not become oxygenated or nitrogenated nor add off-flavors or contribute to microbiological instability.

CO_2 will form a portion of the gas mixture in all draught systems. The goal is to maintain the ideal gas pressure on the keg for the CO_2 level in the beer.

CO_2 level is critical to pouring draught. Pressure that is too high (for a given temperature) can over-carbonate the beer and cause a foamy pour. Pressure that is too low will allow the beer to go flat.

Compressed air systems are not appropriate for draught systems and leads to lost product and lower sales. These systems allow oxygen to introduce unwanted oxidation flavours, make the beer go flat and create a condition where aerobic bacteria can multiply.

CO_2 leaks in a draught system will result in excess CO_2 purchases and thus higher costs. They are also a potential safety issue. One way to detect a leak is by observing a drop in pressure from the main regulator when all valves are turned off (i.e., pressurize the system from the gas source and then shut off the supply. Watch the gauge and see if the gas pressure holds or dissipates quickly. If the pressure drops quickly, the system must be checked for leaks or open valves. Follow the system through and listen for gas leaks. If small, a solution of detergent and water can be brushed on the suspected point. If bubbling commences, a leak has been found).

The three recommended systems for draught are as follows:

Canadian Beer:

1) For lines under 30 feet (9 meters), use CO_2 only;
2) For lines greater than 30 feet there are two options:
   - Use mixed gas blends (N_2 and CO_2) from a blender box or pre-mixed cylinders;
   - Use CO_2 and a beer pump on each line.

Imported Beer:

3) Imported beer with Nitrogen (i.e., Guinness Pub Draught, Caffery's or Boddingtons), use mixed gas with purchased gas cylinders of 30% CO_2 and 70% N_2 or a gas blender box.

Table 1. Recommended Gas for Various Draught Systems			
GAS SYSTEM	**ADVANTAGES**	**DISADVANTAGES**	**RECOMMENDATION**
Compressed Air	Low cost on a per keg basis	Negative effect on flavour; flat beer; provides oxygen to aerobic bacteria if present.	This system is not recommended and should be replaced.
Compressed Air with CO_2 Blender	Carbonation of beer will be superior to a compressed air system on its own. (See above: Compressed Air)	Negative effect on flavour; flat beer; provides oxygen to aerobic bacteria if present.	This system is not recommended and should be replaced. Carbonation level can be maintained if a high enough percentage of CO_2 at the right pressure is used.
CO_2	CO_2 is naturally present in beer. This system will help maintain the correct carbonation level and also no oxygen is present to deteriorate the beer.	Upfront operational costs higher than compressed air. However, this cost is likely to be recouped by greater customer satisfaction and reduced draught beer loses.	This system is recommended for domestic draught beer.
N_2/CO_2 Blends i) Beer Gas: 70% N_2 / 30% CO_2 ii) 50/50 Blend: 50% N_2 / 50% CO_2	On lines of 30 feet (9 meters) or more, the 50/50 blend allows for sufficient pressure in system to maintain flow-rate without adversely affecting the CO_2 equilibrium. In general, N_2/CO_2 blend help to maintain the carbonation on other beers; Oxygen cannot deteriorate the beer; and mixures can be adapted to the conditions required –	N_2/CO_2 Blends are higher cost than CO_2 only systems. Beer gas nitrogenates and causes non-nitrogen beers to go flat and be less refreshing. 50/50 blend is not widely available in a premixed form.	Not recommended for non-nitrogen beers on lines of 30 feet (9 meters) or less. 70/30 blend is not recommended for domestic beer if throughput is less than one keg per week. This blend is good for nitrogenated beer products only. 50/50 blend is recommended for domestic product on lines that are greater than 30 feet (9 meters).

Table 1. Recommended Gas for Various Draught Systems			
GAS SYSTEM	**ADVANTAGES**	**DISADVANTAGES**	**RECOMMENDATION**
	allows for higher pressure for dispensing with no beer pumps. Gas blenders and nitrogen generators can reduce overall gas costs.		
N_2/ CO_2 blenders and nitrogen generators with blenders	Single and dual blenders available for different types of beer. If a nitrogen generator used, there is no need to order N_2 cylinders. Safety concerns around handling cylinders eliminated. Nitrogen generator also lower cost than premixed gas.	Nitrogen generators have to be purchased or leased, resulting in higher setup costs.	Recommended for draught lines greater than 30 feet (9 meters). McDantim blender can be set for nitrogenated beers or domestic beer. www.mcdantim.com

When should a blended gas be considered?

When the line is being used for a nitrogen beer (i.e., Guinness Pub Draught, Boddingtons, Caffery's, etc. - usually 70% N_2 / 30% CO_2) or long remote systems (i.e. greater than 30 feet (9 meters)) or with high vertical rises from keg to draught tap, where the keg pressure may need to be higher to ensure the proper flow-rate.

Note: The extra costs of the proper draught systems will be partially or completely offset by reduced beer loses due to flat or over carbonated beer. Also, the potential of lost customers or draught sales due to inferior draught beer quality should be factored into the lower costs of improper system installation. Quality draught presentation will enhance customer satisfaction and have a positive effect on sales.

Table 2. Recommended Gas Suppliers			
Company	**Contact Details**	**Product**	**Description**
Praxair	www.praxair.com	CO_2 1013 Beer Gas	Beverage CO_2 70% N_2 / 30% CO_2
BOC Gas	www.boc-gases.com	CO_2 100102 K Beer Gas 100911 K Beer Gas Stout 100893 K	Beverage CO_2 50% N_2 / 50% CO_2 70% N_2 / 30% CO_2
Camcarb	www.camcarb.com	CO_2 Grey 20 or 50 lbs Beer Gas Beer Gas	Beverage CO_2 50% N_2 / 50% CO_2 70% N_2 / 30% CO_2
Air Liquide	www.airliquide.com	CO_2 Gasalgbev37 Beer Ale Gas algale44 Beer Lager Gas alglag44	Beverage CO_2 70% N_2 / 30% CO_2 50% N_2 / 50% CO_2

Basically, 70/30 gas blends provide the wrong mixture for domestic beer delivery. Blenders should then be used to deliver blends with a minimum of 50% CO_2 for use in long delivery line situations.

The best solution to the problem of having the wrong gas for domestic draught beer dispensing is to use CO_2 only, provided that beer pumps accompany this gas in lines greater than 30 feet (9 meters).

The best design of a draught dispense system is one with the installation of secondary gas pressure regulators on all individual lines, beer fob for keg changovers to minimize losses and installation of a beer pump for long lines. This allows the keg to be treated with CO_2 at ideal gas pressure and then the pump will deal with the long beer line delivery issue with the increased flow to the tap. Flojet pumps are recommended (www.flojet.com).

Temperature for Beer Dispense:

The beer in the cold room and at the tap should be from 1-5ºC. Higher temperatures on the kegs in storage or at the tap result in beer being foamy due to the CO_2 breaking out of solution at these higher temperatures. Colder temperatures could freeze the beer and damage the keg. Having the beer too cold takes away the flavor and makes it very difficult to pour with a proper foam head which reduces the enjoyment of the beer and profits for the licensee.

Keg Rotation

Keg rotation in the field is extremely important for the proper handling of the keg beer. The FIFO (first-in is first-out) principle should always be used. The oldest keg should always be the first one put on tap.

Kegs in Series

Beer is often handled in two or three keg series for ease of use in a busy operation but it is critical that the system is set up properly and thorough training is provided to assure trouble free operation.

It is recommended that in a series of kegs, all kegs be emptied within one week. A single keg hook up should be used if a keg is not typically rotated in a week.

However, if it is deemed necessary to have kegs in a series, the rotation of kegs through the series is critically important for maintaining beer quality. The gas keg is the keg nearest the gas supply while the faucet keg is the keg nearest the faucet delivery line. The partial keg must always become the gas keg while the oldest dated full keg should always become the faucet keg. This ensures that the kegs are rotated on a first-in first-out basis according to their date codes. If three kegs were in series and two kegs are empty with one partial keg still in the series, then the partial keg moves to the gas keg position and two new kegs are put into the two empty places.

Note: when using series kegs the partial keg always becomes the gas keg (i.e. the keg furthest from the tap). This is necessary to avoid foaming as beer is pushed from one keg to the next.

However in doing so, the concept of oldest beer to the tap first is violated and older beer is pushed into a keg of fresher beer with a fresher date code and no one can determine how old that beer really is.

When this beer finally reaches the tap, the customer will not be pleased and that can have a negative effect on draught sales. To minimize this problem, whenever kegs are set up in series, it is recommended that a program be in place that ensures the series is completely emptied on a regular short-term basis.

Keg Storage:

Keg storage must be done in the cold storage facility at the distributor at less than 5ºC. Kegs should be distributed cold. Kegs should be stored at the licensee in the cold storage room at less than 5ºC. Draught beer should be immediately stored in a refrigerated walk-in cold room cooler or refrigerated cabinet. Kegs stored warm are subject to pressure build up and possible microbial action which could lead to deterioration of the keg beer. Freshly delivered kegs generally need to settle overnight for optimal dispense. Warm kegs require a 24 hour cool-down in the cold room for proper dispense. Keg storage and dispensing areas should be kept clean to prevent any possible contamination of the draught products. A thermometer should be kept in the cold storage room for a continuous monitoring of temperature. Keep the cooler door closed as much as possible to avoid temperature fluctuations. Regular maintenance of refrigeration equipment is recommended.

Draught Equipment

Keg Coupler:

The keg coupler is used to release the beer from the keg and deliver dispense gas (e.g. CO_2) to the keg to pressurize the keg for beer removal and to maintain the desired carbonation level. Standard keg couplers are the new Micromatic and Perlick type handles. The older style have a metal seal against the valve gasket where as the newer version have a gasket on the coupler which makes a rubber to rubber seal to the keg and so it is much more forgiving if there should be small cuts or nicks in the valve seal. This better seal can significantly reduce 'foaming' keg issues due to slightly damaged valve seals.

Keg couplers should be disassembled, inspected and cleaned on the standard 4 week cycle. These should be inspected for any worn body washers, probe o-rings, CO_2 check valve and check ball, seals, safety relief and CO_2 back pressure vent. All should be inspected on the 4 week cleaning cycle and repairs or replacements made as necessary.

Beer Faucets:

The beer faucet is an important feature in the beer flow. This is the unit that dispenses product in to the glass. The vents are important for draining of the tap. These are generally very similar for the different beer faucets (e.g. the Perlick or the OKR units which are acceptable for use). Since the faucet is used in each pour they do show more wear than other parts. The vents are the tiny drain holes internal to the faucet to drain beer from the faucet plunger out the faucet at the last of the pour. These vents are critical for beer draining and must be cleaned weekly. The faucet should be cleaned and checked at least monthly for wear as part of the regular cleaning cycles.

Tower temperature is important to maintaining the temperature of beer right to the faucet. In air cooled systems the cool air flow must be maintained to the tower head. If glycol is used, it should be brought to the shank (which is where the faucet is screwed into) to cool right to the faucet. Cooling must be directed to the shank for proper temperature control regardless of the cooling medium. Shanks should be the standard threaded or the bent tube variety.

Beer Line:

Beer line transports beer from the keg to the faucet. Its sizing is used to control the beer flow. Approved beer line does not impart any flavour or taste into the beer. CO_2 lines and beer lines should be clear so that inspection and troubleshooting is easy. Approved beer line for use can be either a vinyl or barrier type tubing. For a quality installation, barrier type tubing should always be used and is typically used in any trunk line application of greater than 25 feet (7.62 meters) in length. Vinyl is typically used in the cold room from the tap to the beer line. In any warm situations, barrier tubing must be used. Cleaning will be more effective and gases will not permeate the tubing. These lines must be of a 'food grade' material. Recommended suppliers of the vinyl and barrier (generally premade trunk lines) beer lines include AJEX, Perlick and Micromatic.

Approved draught beer or CO_2 line is clear .1875" (4.7625 mm), .25" (6.35 mm), .3125" (7.9375 mm) .375" (9.525 mm) in size depending on the application. Choker line near the keg and near the faucet is always .1875" in diameter. All line hose unions and tail pieces (hose connection on the coupler) are to be stainless and avoid using hose unions or tail pieces that are less than .25" (6.35) inches in diameter as they may cause foaming problems. Clamps must be the step-less ear clamps as they provide a narrow band for compression, prevent hose damage and provide a light weight, strong, low clearance, tamper evident closure.

Beer lines, if treated properly, can be maintained in good condition for many years with replacement likely required due to wear only after 5 years.

Gas Regulators (CO_2 or mixed gases):

The primary regulator is attached to the gas supply cylinder (e.g. CO_2 tank) and has an on/off switch with a high pressure gauge for measuring tank pressure and a low pressure gauge for measuring beer flow. These are available for Micro Matic, NADS, Norgren, Tap-Rite, Cornelious and Perlick.

A relief is required for safety reasons, Regulators must comply with ANSI and ASME standards for draught beer dispense systems.

In-line secondary regulators should be used on each draught line. This is especially important when the desired pressure on kegs in the system is different. If one desires to have one beer at 16 psi and another at 14 psi, a secondary regulator set to 14 psi from the system can be obtained. This should be installed in the gas (e.g. CO_2) supply line just past the distributor and the direction of flow on the regulator should be noted during installation.

Secondary regulators can compensate for slightly different lengths of beer line or different faucet design to maintain the proper flow of beer into the glass from the faucet.

Fobs (Line gas breaks):

Fobs may be used to eliminate or reduce keg changeover beer loss. They detect empty kegs and keep the beer line filled with beer. This eliminates waste beer and lost profits. For cleaning, they should be handled as part of the beer delivery line and must be cleaned as part of routine cleaning.

Fobs are especially useful on long beer trunk lines as there will be a considerable reduction in beer loss by only having to push foam out of a few feet of line from the keg to the fob versus the very many meters of line to the faucet.

Beer Pumps:

Beer pumps should be used as part of the beer delivery system if the system requires a pressure on the keg that is above the equilibrium point of CO_2 in the beer being dispensed.

Example:

a) if pressure in excess of 14.5 PSI of CO_2 is required to deliver beer from a 3ºC keg with a normally carbonated beer keg;

b) if pressure is in excess of 26 PSI of beer gas on a nitrogenated beer at 3ºC. Flowjet pumps are recommended (Model G56 Series).

Cooling systems:

Generally cooling systems used are a glycol bath that is used for circulation of the beer lines to maintain 1-3ºC for beer dispense with the associated freon cooling of the glycol bath.

There are also freon cooling systems which circulate the freon around the lines to control the beer line cooling and these are not recommended because it is more likely to freeze the beer. Lines can not be easily changed with the Freon systems. As long as beer is being delivered at storage temperature, this is not an issue.

Line Cleaning:

Line cleaning is done to prevent the growth of some bacteria, yeast and mould in beer dispense systems. Important features of line cleaning are the contact time, and/or mechanical action of the fluid in the line to remove debris on the internal line surfaces.

Regular draught system cleaning should include:

1) Breaking down the faucet assembly and cleaning and inspecting the vents;

2) Beer line cleaning;

3) Tap assembly inspection and cleaning.

Recommended cleaning cycles are:

a) self contained systems	- every month to six weeks
b) remote systems with chilled trunk lines	- every three to four weeks

Systems below are not recommended as they are difficult to clean.

a) flash chiller sytems	- weekly
b) cold plates	- rinse daily, clean daily / weekly

Cycle of Line Flushing and a Full Cleaning in Place:

This should be done at the recommended chemical concentration of an approved line cleaner. The best cleaning cycle should be six step cycle as follows:

1) Water rinse;
2) Alkaline soak;
3) Alkaline cleaning;
4) Water rinse until the pH is the same as the city water;
5) Acid clean;
6) Final water rinse until the pH is the same as the city water.

If the six steps are not possible then cleaning should be done 2 times with an alkaline or a caustic cleaner and then one time with an acid treatment for beerstone (Ca_2CO_4) removal. Water is always used as the final rinse to eliminate all cleaning compounds prior to beer delivery.

Two types of line cleaning: Static/Soak Method vs. Active Circulation method:

Static cleaning should be done following these steps:

1) Rinse cycle;
2) Three 10 minute soak sessions, using fresh cleaning solution each time;
3) Final fresh water rinse.

Active cleaning includes a pump circulating the cleaning solution and should include the six step cycle above.

If time is critical, and caustic and acid cycles cannot be done on every cleaning, an alternative would be to clean with a caustic based cleaner for two months and an acid cleaning cycle every third month.

Note: Cleaning dates should be documented and recorded.

Suggested Line cleaners:

Dibac (hypochlorite sanitizer) and BRC presently used by Draft Service .
LC-1 (Alkaline) and LC-2 (Acid) from Ajex USA 800 394-7416
2X Dream Draft Clean 1 & 2 from Banner Equip Co 800 621 4625
DAC (Alkaline) and ALC (Acid) from National Chemical 800 533 0027

All cleaning chemicals must be approved for such use by Health Canada and suppliers need to be able to show proof of this or at a minimum we should ensure that all these have the appropriate letter of no objection.

Draught Dispense Trouble Shooting