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Draft Beer Using Soda Kegs
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Home Brewers discovered years ago that the cylindrical, five-gallon kegs used to dispense flavoring syrups for soft drinks made excellent draft beer kegs.

Not only do these kegs match our normal batch size, unlike regular beer kegs, but maintaining them requires only a few common tools, rather than the specialized tools needed for beer kegs.

Soda Kegs are often called “Cornelius” Kegs, that being the name of one of the best-known manufacturers, but they are also made by other companies.

The Soda Keg Hardware

A. Five gallon Soda Keg
B. Carbon Dioxide (CO2) Cylinder (full)
C. CO2 Regulator
D. Thumb-tap “Cobra Head” Spigot
E. Four feet of 3/16” i.d. Dispensing Hose
F. Black (beverage side) Quick-disconnect Fitting with a _” hose barb
G. Gas side _” i.d. Hose to reach from the Regulator to the gas side Fitting on top of the Keg
H. Grey (gas side) Quick-disconnect Fitting with a _” hose barb
I. Four Screw-clamps
J. Spare Refrigerator (or two)

Tools Needed for Assembly or Maintainance

A. Crescent Wrench (or similar)
B. Deep Socket Wrench (to fit the keg's quick-disconnect posts)
C. Screwdriver (standard)

Assembly

1. If your Regulator doesn't have a built-in gasket inside the coupling nut, insert a carbon or plastic gasket, and attach the Regulator to the CO2 Cylinder, tightening with a wrench. If your Regulator has a shutoff valve, it should be in the closed position. The Regulator's adjustment screw should be turned as far counter-clockwise as possible.

2. Attach the 1/4" i.d. Gas Hose to your Regulator, securing it with a Hose Clamp.

3. Attach a gas-side Quick-disconnect Fitting to the other end of the Gas Hose, securing it with a Hose Clamp.

4. Open the valve on the CO2 cylinder, adjusting the shutoff valve to the open position

5. With a screwdriver, turn the regulator adjusting screw clockwise until the low pressure gauge matches the pressure level you want.

6. Vent the keg, and attach this gas-side Fitting to the Keg's "in" side Quick-disconnect Post. Note that some old Kegs do not have "in" or "out" clearly marked. If you look inside the keg, the "in" side will have only a very short down-tube, but the tube on the "out" or "beverage" side will go all the way to the bottom.

Also, on "ball type" kegs, the flange on the side of the beverage side Post is slightly larger than the one on the "in" side Post.

On "pin type" kegs, the number of pins on the Posts matches the number of slots on the appropriate Fitting.

7. Attach a four foot length of 3/16" i.d. Beverage Hose to the Spigot, securing them with a Hose Clamp. Note that you will probably need to soften the end of the Hose in boiling water so you can jam it onto the tapered barb of the Spigot.

8. Attach a beverage-side Quick-disconnect Fitting to the other end of the Hose, securing it with a Hose Clamp. Soften the Hose in hot water if necessary.

9. Attach this beverage-side Fitting to the Keg's "out" side Quick-disconnect Post.

10. With everything connected, open the shutoff valve on the Regulator, and examine the system for any gas leaks. Use soapy water to check connections for gas leaks.

Kegging Your Beer

As soon as your beer has finished lagering, or settling in "secondary," it is ready to be kegged. As always, all surfaces that touch the beer must be sanitized.

Fill the keg at least half full of water, adding an appropriate amount of Iodophor Sanitizer (one tablespoon/five gallons). Never use chlorine, which corrodes (and destroys) stainless steel. Put the lid on the keg.

Lay the keg on its side, and after at least two minutes, turn it over so the iodophor reaches all surfaces.

Stand the keg up, and with the C02 connected, open the Thumb-tap, allowing the sanitizing solution to drain out.

Depressurize the Keg, remove the lid, siphon in your beer, and reseal the Keg.

Carbonation

Home brewers normally carbonate their beer in soda kegs using one of two methods. The first is "keg priming." The second is "force carbonation."

Keg Priming Theory

Keg Priming is simply treating your keg like a big bottle, adding Priming Sugar to the beer and sealing it up. As the yeast works on the sugar, the beer becomes "naturally carbonated." The process usually takes about two or three weeks, during which time the beer should be stored as close to 60-70 Degrees F. as possible.

Keg Priming Process

1. Dissolve 1/3 to _ cup of Corn Sugar in about a cup of Water, and heat to boiling. This will dissolve the sugar into a syrup.
2. Pour the syrup into a sanitized keg.
3. Siphon your beer into the keg. If it has been two weeks or more since fermentation ended, make sure you get a little bit of yeast along from the sediment.
4. Put on the lid, hook up your CO2, and pressurize the keg to 10-15 lbs. to help seat the O-Rings.

5. Disconnect the CO2, and leave the beer in storage until carbonated.
6. Chill as desired, and serve.

Force Carbonation Theory and Practice

If you store beer under CO2 pressure, it will gradually absorb the carbon dioxide gas until a state of equilibrium has been reached.

The absorption of CO2 into the beer is affected by three factors: temperature, pressure, and surface area. That means there are three things you can do to help get CO2 dissolved when carbonating your beer:

1. Drop the temperature of the beer. Get it down as close to freezing as possible. Most beers will freeze at about 28 degrees F., so 30 degrees is nearly ideal for absorption.

2. The higher the CO2 pressure the beer is under, the more easily CO2 dissolves into the beer.

3. The larger the surface interface between the beer and the CO2, the more absorption there will be. There will be more about this later.

In the brewing world, the amount of carbonation in a beer is expressed in terms of "volumes of CO2 per volume of beer." That means the volume the CO2 in a beer would occupy at one atmospheric pressure and 32 degrees F.

In other words, if a beer was carbonated to 2.5 volumes, the CO2 in it would take up 2.5 pints of space for every pint of beer under those conditions.

Different styles of beer are carbonated at different levels.

British Ales – 1.8-2.4 volumes
Most Lagers – 2.4-2.8 volumes
American Lager Beers – 2.8-2.85 volumes
Most Wheat Beers – 2.95-3.00 (or so) volumes

Using these general guidelines, you can give any beer the carbonation level you want it to have. The following chart illustrates the solubility of CO2 in beer at a number of temperature and pressure combinations.

CO2 Volume Chart

Moving down the left side of the chart, temperatures are given in ascending order. Moving across the chart from left to right, you see increasing "pounds per square inch" pressure levels (PSI).

The numbers in the middle show the volumes of CO2 that will be absorbed into the beer when equilibrium is reached at the temperature/pressure combination given.

In other words, if your beer is at 40 degrees F., and you put it under 15 PSI, 2.75 volumes of CO2 will be dissolved into the beer when equilibrium is reached.

Note that 2.75 volumes would be within the normal range for most lager beers.

Note also that, the warmer the beer, the more CO2 pressure is required to reach equilibrium.

There are also two things to note that could work in theory, but which are impractical:

First, if you simply set the regulator to the desired PSI, and hook up the keg, the beer should eventually carbonate, but it would probably take a very long time.

Most home brewers, therefore, will increase the rate of gas absorption by vigorously rocking the keg back and forth to increase the surface contact between the beer and the CO2. To do this, the beverage side fitting is attached to the gas hose, so the gas will bubble through the beer from the bottom up. This will increase the surface exposure of the gas to the beer, and will consequently give you the best absorption possible

Second, equilibrium charts for CO2 generally go as high as 60 degrees F., but in practice, it is far better to have your beer at 40 degrees or below when trying to force carbonate it, and the colder the better.

Carbon Dioxide behaves much better at 30 degrees than at 35, and better at 35 than at 40. Above 40, it can become a chore to handle.

For example, a beer stored in the 30-35 degree range will only have to be rocked for three or four minutes, and put back into cold storage for three or four days. However, a beer being carbonated at 40 degrees or so will need to be rocked for as much as 10 minutes, and stored cold for 10 days or so.

If you can't get your beer down to 40 degrees F. or colder, it may be best to use keg priming to carbonate your beer rather than force carbonation.

Speeding Up the Process

Some people like to speed up the process of carbonation by putting extra high pressure on the keg. Rocking your keg with the low pressure guage set at 30 PSI may get the beer carbonated in one day.

This may also, however, cause you to end up with over-carbonated beer, which can be a hassle. Should this happen, stand the keg upright and disconnected, and pull the relief valve on the lid periodically to release some of the pressure. Eventually, enough CO2 will come out of solution that the amount in the beer should normalize. In extreme situations, attach a Gas-side Quick Disconnect Fitting with no hose, and let the keg vent its CO2 for several minutes. Check and repeat as necessary.

A better solution for speeding up carbonation would be to use a Carbonating Stone. This is actually a piece of stainless steel, perforated throughout with a huge number or one or two micron holes.

The "Stone" sits inside the keg near the bottom. A hose barb attaches it to a length of tubing which is affixed to the short downtube under the "in" or "gas side" post.

When the CO2 is connected, it sends a tremendous number of gas bubbles out through the beer. The miniscule bubbles create a huge amount of surface area to help absorb CO2 rapidly into the beer.

This is actually a miniature version of a device used by commercial breweries everywhere. Carbonation should be virtually instantaneous, though the manufacturer recommends carbonating your beer a few hours before serving.

<u>Serving Your Draft Beer (Theory)</u>

It is generally desirable to serve beer with a reasonably proportioned head of foam. You don't want the beer rushing from keg to glass so rapidly that foam is all you get. Neither do you want it trickling into the glass so slowly that it ends up completely flat.

The trick is to have your system in balance, with just enough gas pressure to cause the beer to flow.

To make this all seem a bit mysterious, CO2 behaves differently at very low pressures than at higher levels.

Below a certain concentration (and especially at warmer temperatures) CO2 tends to rush out of the beer, given the opportunity. At a higher level of pressure, it tends to stay in.

That seems counter-intuitive, and home brewers sometimes create problems for themselves by trying to dispense with too little pressure. Because dispensing your beer with too little pressure on the keg can cause rushing beer and excessive foam, just as too much pressure can, it is best to set up a balanced system with about 12 psi built into the keg line, and then to push the beer out with 12-14 psi, allowing from zero up to two psi for the tap itself.

Most people don't think about it much, but liquid flowing through a length of hose will be resisted by a small amount of friction as the liquid flows past the inner surface of the beverage hose.

This friction, or "flow resistance" will vary, most importantly, with the length and diameter of your hose. The material from which the hose is made is important as well, and the degree of bend or curve, can be a minor factor.

There is also more resistance if the liquid is being pushed to a higher level.

Serving Your Draft Beer (Practice)

With all that information behind you, you are ready to set up your dispensing system.

The Quick Disconnect Fittings used by most home brewers have _" hose barbs, which means that _" i.d. hose will be easiest to attach to them, and that's what most home brewers use on the gas side of their systems.

However, _" hose is impractical on the beverage side because it doesn't provide much resistance (only .85 pounds per foot of vinyl Hose). That means it would take over 14 feet to reach the desired 12 pound level. Polyethylene Hose has only .5 pounds of resistance per foot, and would require a 24 foot length.

The problem is solved by using 3/16" hose on the beverage side. In that size, vinyl hose has three pounds of resistance per foot, so four feet provides exactly the desired amount. Polyethylene would require about 5.5 feet, as the pound per foot rating is only 2.2.

Fortunately, vinyl hose can easily be attached to the standard _" hose barbs on the Quick Disconnect Fittings for soda kegs, simply by softening the hose ends with hot water before pushing them onto the barbs.

Taps range from zero pounds resistance for the popular "cobra-head thumb-tap, up to about two pounds for some others.

When setting up your system, set the CO2 at about 14 psi, and adjust it slightly downward after a bit if you want to slow the flow. It is probably best not to fine-tune things too tightly, though, so you don't end up having to make endless adjustments.

Keg Tips

A new keg simply needs to be rinsed out and sanitized with iodophor. Fill the keg at least half-full with the appropriate amount of iodophor solution, put the lid on, lay the keg on its side, and turn it over after two minutes so the iodine contacts all surfaces. Never use chlorine on kegs or metal parts to avoid damaging them.

Attach a Quick Disconnect Fitting to the "out" side of the keg, and your CO2 to the "in" side, forcing the solution up through the long down tube and out of the keg.

Many soda kegs are acquired used, which requires a thorough cleaning, and a change of O-Rings. At least the large, O-Ring on the lid should be replaced, and possibly the ones between the Posts and the tops of both the beverage and gas down tubes. Check the condition of the ones on the outside of the Posts, and replace if necessary.

A deep-socket ratchet wrench can be used to remove the Posts on most ball-lock type kegs. Soak, as needed, with a cleaner like TDC to clean, and rinse thoroughly before sanitizing.

Not everyone goes to the trouble, but obviously, disassembling the kegs between uses is the most thorough way to keep them in ideal condition.

When you fill your keg with beer, it should be filled no higher than an inch from the top. Affix the lid, and attach the gas line to the "in" side of the keg. Turn the gas on and off at low pressure (5-10 psi). Vent the keg. Turn on the gas again, and repeat the sequence four or five times.

Each time the keg is vented this way, you reduce the oxygen content of the airspace by half, and then by half again. After you've done it several times, you will have a relatively pure CO2 atmosphere.

If pushing beer to an elevation higher than the keg, allow one additional pound for every two feet of height differential, measuring from mid-keg to the bottom of the tap.

Note that you should always vent a keg just before hooking it up to your CO2. That will help you balance your system with reasonable accuracy, and without driving yourself crazy with fine-tuning. It will also keep beer from being forced accidentally back up into (and ruining) your regulator.

When the keg's lid is put in place, it should be centered as much as possible. It is a good idea to grease the large O-Ring with a food grade lubricant to help it seat. Pressurize the keg to 10 psi or so, and check for leaks visually, and with soapy water if necessary.

If you have trouble seating an O-Ring, you can raise the pressure up to 40 psi (if your low-pressure gauge goes that high). Let the keg stand for a couple of minutes, and then reduce the pressure. Don't put beer in storage at these high pressures or it may become over-carbonated.

If a lid still won't seal, take the lid off, examine and replace the O-Ring if necessary, and replace the lid. Sometimes just a minor shift in position will allow it to seal.

You should always look and listen for leaks whenever a keg is hooked up, or when a Quick-Disconnect Fitting is taken off the keg. Sometimes, a poppet gets misaligned, and needs to be depressed slightly with a "popsickle stick," or something similar. and shifted a bit to help it seal.

Soda kegs do make superb draft beer systems for home brewers. However, a couple of dangers should be noted.

Because they are highly pressurized, a gas cylinder could become a highly dangerous flying object if the valve were ever

knocked off somehow. The cylinders should always be secured by chains, ropes, or bungee cords, to keep them from falling over and damaging the valve. You never want a cylinder to become airborne.

Also, do check your system for leaks. Be aware that a CO2 leak in an inadequately ventilated space could lead to asphyxiation by forcing all the oxygen out of the room.

With reasonable care, however, Soda Kegs do give home brewers a wonderful draft beer system with which to dispense their beers, and (as most beer drinkers know) fresh draft beer is beer at its very best.