

Closed System Pressurized Fermentation

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The best home brewing system is the simplest to use. The less complicated your technique, the more you can concentrate on the joy of the **art** of home brewing. Many homebrewers spend more time brewing one batch of beer than a professional microbrewer would per batch. And they worry about their beer more (and they should be relaxing) because their equipment is jerry-rigged, not sanitary by design, or is not easy to work with.

After I began to brew professionally in 1989, I began to think about how some of the fermentation techniques used in a microbrewery could be adapted for home-brewing use. One of the wonderful pieces of equipment in the brewpubs that I have worked for, are the pressurized fermentation tanks. Once fermentation has begun, the system is "closed" from that point forward; the beer is never exposed to the air again until it is served into your glass. The tank can be held under pressure, so that the beer is naturally carbonated from the primary fermentation.

The advantages to this system are that you no longer need to prime, rack, or bottle the beer, or clean bottles and the beer is ready to drink sooner!

Fermentation at Steelhead Brewery

The wort from our kettle is chilled to yeast pitching temperature and transferred to a fermenter and then the yeast is pitched. As fermentation begins, the CO₂ created is allowed to escape out of a hose attached to the top of the fermenter with the other end in a bucket of bleach water. This is essentially an air lock. (A fermenting beer creates much more CO₂ than that which is needed to carbonate the beer.) As the beer ferments, the gravity is falling in direct proportion to the amount of alcohol being produced. When the gravity has fallen almost all the way to the beer's predicted final gravity (usually two to three days after pitching), the hose is removed and a pressure-relief device and a PSI gauge are attached instead. The CO₂ produced by any further fermentation is trapped, and this becomes the natural carbonation and head on the beer. The pressure will build to about 15 to 18 PSI. No need to prime the beer with more wort or corn sugar, and the beer has been sealed in a closed system.

Because we have no secondary fermenters or conditioning tanks, the beer is conditioned in the fermenters for another week or two. At that point the beer is chilled to near freezing temperatures. Chilling forces most of the yeast to fall or flocculate out. After being chilled for 1 to 2 days, the beer is filtered and transferred (still under pressure) to a serving vessel, where it is tapped. This transfer is done via a closed system and the beer is not exposed to the atmosphere. The total elapsed time from brew day to drinking day is about 10 to 14 days. Darker and more alcoholic beers may take 3 to 4 weeks total.

Special Equipment Needed

- 2 - five-gallon Cornelius containers, either pin (Coke) or ball-lock(Pepsi).
- 1 - CO₂ Tank full of CO₂.
- 12 - ft. of 1/4 inch ID FDA food grade vinyl hose.
- 3 - "IN" or gas Cornelius quick-disconnects. (Preferably 1/4 Male FLare (MFL) fitting instead of hose barb fitting - then you can swap out parts easier.)
- 3 - "OUT" or liquid Cornelius quick disconnects. (Also 1/4 MFL.)
- 6 - 1/4 inch Female FLare (FFL) x 1/4-inch hose barb.
- 1 - Single Gauge Regulator with on/off toggle. (Can use Twin Gauge but single is cheaper.)
- 1 - 0-30 PSI Gauge. (Can be small size.)
- 1 - 1/4 inch Female Pipe Thread (FPT) x 1/4-inch hose barb.
- 1 - 1/4 inch Male Pipe Thread (MPT) x 1/4-inch hose barb.
- 1 - 1/4 inch hose barb tee.
- 1 - 1/4-inch mini ball valve.
- 1 - Cobra head tap or other tapping device for serving.
- 13 - Small worm screw clamps. (Optional.)
- 1 - Roll of 1/2 inch Teflon tape (plumber's pipe tape).

Other Equipment Needed to Build:

- Hacksaw
- Small dowel (optional)
- Screwdriver or Nut driver
- Hot Water
- Medium and Large Crescent Wrenches

How to Build the System

CO₂ Tank and Regulator

Cut two feet of vinyl hose. The regulator should have a hose barb attachment beneath it. If not, you will probably need another 1/4 FPT x 1/4 hose barb, which you will connect to the regulator with Teflon tape. Take one Cornelius "IN" quick disconnect. Wrap some Teflon tape around the Male FLare (MFL) fitting, taking care not to cover the flared part or the hole. Attach one 1/4 FFL x 1/4 hose barb, and tighten with wrenches. Dip one end of the vinyl hose in hot water, and push firmly onto the regulator hose barb as far as it will go. Slip two worm clamps onto the hose. Dip the other end of the vinyl hose in hot water. Push on to the "IN" quick disconnect. Clamp the hose over the hose barbs by tightening the worm screw clamps with the screwdriver or nut driver.

The Cornelius Canisters

If the Corneliuses are old, take them apart and clean them. Don't forget that the long tube goes in the OUT. If these Corneliuses have not yet been pressure tested, close up lid, and attach regulator "IN" quick disconnect. Turn CO₂ pressure to 30 PSI and open regulator toggle. If Cornelius leaks, disconnect CO₂; bleed off pressure (either through a pressure relief valve in the center of the lid, or with an unattached "IN" quick disconnect.) Try reseating the lid. If you can't get the Cornelius to stop leaking, it is probably very old. Get one that doesn't leak.

After pressure testing, remove the long OUT tube from one of the Corneliuses. This Cornelius will be your fermenter. Carefully cut about two inches off the bottom of this tube with the hacksaw. To avoid squashing the tube while cutting it, stick the dowel in the end to support it. The other Cornelius will be your serving tank.

Fermentation Blow-off Tube

Cut three feet of vinyl hose. Take a Cornelius "IN" quick disconnect. Wrap some Teflon tape around the MFL fitting as described above, taking care not to cover the flared part or the hole. Attach a 1/4 FFL x 1/4 hose barb, and tighten with wrenches. Dip one end of the vinyl hose in hot water, and push firmly onto the hose barb. No need to use a worm clamp on this one as hose will never be under pressure.

Pressure Gauge and Bleed-Off

Cut three pieces of vinyl hose the following lengths:

3 inches

3 inches

1 foot

Take a Cornelius "IN" quick disconnect, wrap with some Teflon tape and attach a 1/4 FFL x 1/4 hose barb. Take the 0-30 PSI gauge and wrap with some Teflon tape. Attach the 1/4 Female Pipe Thread x 1/4 hose barb. Take the 1/4 Male Pipe Thread x 1/4 hose barb and wrap with Teflon tape. Attach the mini ball valve.

Take a 3-inch piece of vinyl hose and dip one end in hot water. Push onto the Cornelius "IN" quick disconnect. Slip two worm clamps on the hose. Dip the other end of the hose in hot water and push onto one arm of the hose barb tee.

Take the other 3-inch piece of hose and dip in hot water. Push onto the stem of the hose barb tee. Slip two worm clamps on the hose. Dip the other end in hot water and push onto the mini ball valve hose barb.

Take the foot-long vinyl hose and dip one end in hot water. Push onto the other arm of the hose barb tee. Slip two worm clamps on the hose. Dip the other end of the hose in hot water and push onto the 0-30 PSI gauge hose barb.

Attach the Cornelius "IN" quick disconnect to the Cornelius canister. Twist the hoses of the apparatus if necessary to point the mini ball valve down, and the face of the gauge up or to the side. Tighten all worm clamps.

Fermenter to Server Transfer Hose

Cut 1.5 feet of vinyl hose. Take two Cornelius "OUT" quick disconnects. Wrap some Teflon tape around the MFL fittings on each as described above. Attach a 1/4 FFL x 1/4 hose barb fitting to each and tighten. Dip one end of the vinyl hose in hot water, and push onto one hose barb. Slip two worm clamps onto the hose. Dip the other end of the vinyl hose in hot water and push onto the other hose barb. Tighten the worm clamps.

Serving Tap Hose

Cut three feet of vinyl hose. Take a Cornelius "OUT" quick disconnect. Wrap the MFL fitting with Teflon and attach a 1/4 FFL x 1/4 hose barb, and tighten. Dip one end of the vinyl hose in hot water, and push firmly onto the hose barb. Slip one worm clamp on the hose. Dip the other end of the hose in hot water and push onto the faucet head. Tighten the worm clamp around the Cornelius "OUT" hose barb.

Closed System Pressurized Fermentation at Home

Although I no longer brew at home, I enlisted one of our chefs, Chris Rossi, to test this method. He had never homebrewed before, but seems to enjoy this method's simplicity and speed of conditioning.

Sanitize the Cornelius with the shorter "OUT" stem. This is your fermenter. If boiling the whole quantity of wort, start at about 5.5 gallons instead of 6 and boil down to about 4.5 to 4.75. After brewing your beer, chill it to yeast pitching temperature. You could chill the wort by putting the Cornelius into a clean garbage pail or bathtub filled with ice water and then transferring the hot wort. Fill the Cornelius to about 3-4 inches from the top. Pitch your yeast when the wort is cooled. If you have a wort chiller (lucky you), pitch the yeast directly into the sanitized Cornelius and siphon the cooled wort right over the yeast. Splash the wort down the sides of the Cornelius to aerate it, filling to 3-4 inches from the top. If you end up with too little wort, add some pre-boiled water. (It is always best to add pre-boiled water to top up, for sanitation reasons and for best flavor.)

Attach the Cornelius lid tightly, and attach the Fermentation Blow-Off Tube to the "IN" connection. Put the other end of the hose into a small bucket filled with water and a splash of bleach. If the beer is in a place where you can't get the floor dirty, put the small bucket inside of a 5-gallon pail because it could overflow with foam and scum.

With any luck, within 24 hours (and hopefully within 12) you should see bubble-action in the bucket. Approximately 36 hours after pitching the yeast, the bubble-action should be slowing down a bit. Detach the Blow-Off Tube and attach the Pressure Gauge and Bleed-Off hose. (We call this "Capping the Beer".) Make sure the mini ball valve is closed. If you want to dry-hop the beer, now is the time. Open the Cornelius lid before you cap the beer and add your hops. Close the lid and "cap the beer" as described above.

Clean the Fermentation Blow-Off Tube.

Within 24 more hours you should notice a pressure reading on the PSI gauge. Cornelius canisters can take up to 130 PSI, and unless you capped the beer too early, you should never get close to this amount of pressure in the fermenter. The pressure should eventually reach 15-18 PSI. It can get up to 20 PSI and still be OK. If it never gets to 15 PSI you will want to top it off with some CO₂ from your tank so it can carbonate properly. If it is above 18 PSI it could become over-carbonated and fizzy. Just open the mini ball valve a crack and bleed off the excess pressure. Lift the gauge higher than the ball valve when you do this so that foam does not get up into your 0-30 PSI gauge.

The beer is done fermenting in about seven days but you can leave it another week to condition and settle if you want. After seven days or so you could chill it if you have a refrigerator. Do not chill on its side. Chill standing up.

Closed System Transfer to Serving Tank

Sanitize the Cornelius with the longer "OUT" stem. This is your serving tank. Attach the lid tightly and pressurize with your CO₂ tank. Bleed off some of the air either through the pressure relief valve in the center of the lid, or disconnect your CO₂ tank, let the CO₂ settle a little (CO₂ is heavier than air), and bleed off some air with your Fermentation Blow-Off Tube. Pressurize serving Cornelius to the same pressure as that showing on the fermenting Cornelius gauge. Disconnect CO₂. Bleed off just a little pressure from the serving Cornelius. Sanitize and connect the Fermenter to Server Transfer Hose from "OUT" to "OUT". The pressure on the fermenter should now read about 15 PSI. If it is higher than that, use the Blow-Off Tube to bleed off a little pressure from the server. This will allow some of the beer to be transferred over and will relieve some of the pressure in the fermenter.

Set the regulator pressure on the CO₂ tank to 20 PSI. The CO₂ tank should be about 5 lbs higher than the pressure in the fermenter. Disconnect the Pressure Gauge and Bleed-Off apparatus. Open the toggle below the regulator before attaching to the "IN" on the fermenter. Bleed off pressure from the server a little at a time using either the pressure relief valve in the center of the lid or your Fermentation Blow-Off Tube. Keep bleeding off the server slowly until you see gas in the Fermenter to Server Transfer hose.

Disconnect the Fermenter Blow-Off hose from the server if you were using it to bleed pressure. Disconnect the Transfer Hose. Disconnect the CO₂ tank and turn it off. Bleed off all the pressure from your fermenter before taking the lid off for cleaning. Don't inhale the CO₂ still inside of it.

If the beer is not cold, chill it. If it is cold and you are thirsty, attach the Serving Tap Hose and pour yourself a beer. The first beer may be a little fizzy. Once you have poured a couple of beers and the beer is pouring slower, set your CO₂ regulator to 15 PSI, open the toggle, attach to the serving Cornelius, and congratulate yourself on your **Closed System Pressurized Fermentation and Serving System**. Now we're having some fun!

If your brewing system is easy to use, you'll have more time to sit around and enjoy your beer. No (nerve) racking, no priming, no bottle washing or filling. Simple, easy to use, and fun too.

Postscript: Republishing this article online in 2010 is a favor to my beloved homebrewer friends as apparently the search engines have been searching for years for it but not finding it! I've told you what I know. Now you make the magic work for you.

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*** THE END ***