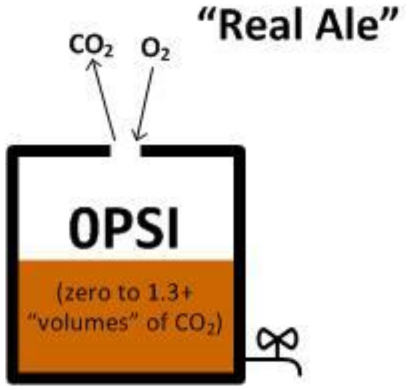
“Cask Conditioned” Home Brew

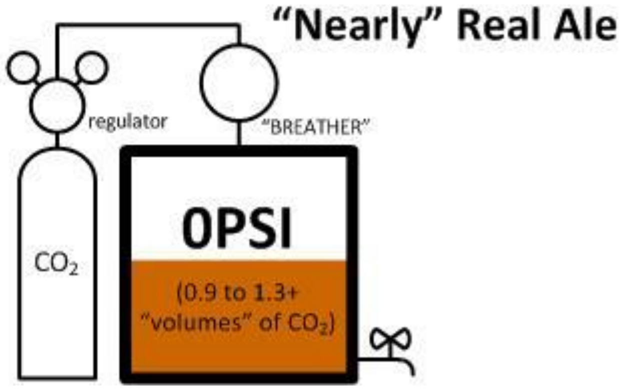
Reasoning

“Real Ale” style beer is something of a challenge to those home-brewers that want it. Some very dedicated souls have arrived at solutions, but they often need plenty of dedication to maintain them too. How can you arrive at a “Real Ale” style with the (“keg”) equipment in common use by home brewers? Meanwhile along came the “craft beer” movement stirring up a need amongst UK home-brewers to construct “kegerators”, install involved CO_2 systems, manage stainless steel kegs, build complex breweries incorporating the latest HERMS and RIMS ideas, and so on. But the “craft beer” movement is very much “new world” driven so there’s been no significant effort towards the “Real Ale” style (“flat and warm” being a common misconception about traditional British beer).

So the idea of “Real Ale” (“cask conditioned”) style Home Brewed beer is on a hiding to nothing? Well not necessarily, surely something can be done with this wealth of new equipment, motivation and techniques established by the so-called “craft beer” movement?

Let’s start by looking at commercial practices used presently and what might be made of them.





“Real Ale” is the ultimate aim. It is cask conditioned, served without assistance from extraneous CO_2, at very low carbonation rates and at “cellar” temperature; 12-14°C. As beer is served from the cask air takes its place. It may be gravity delivered into a drinking vessel or pumped using a “beer engine” (“hand pump”). Conditioning includes some carbonation from fermenting sugars remaining in the beer or added to it (“priming”) resulting in perhaps 1.2-1.5 “volumes” of CO_2 dissolved in the beer (a “volume”, can be written as “v/v”, describes when a volume of liquid has an equal volume of gas dissolved in it). The beer is never filtered, but may be “fined”, “isinglass” being a common clearing, or fining, agent. As the beer is open to the air the dissolved CO_2 will, over several days, dissipate and oxygen gets absorbed into the beer. Spoilage organisms may also access and eventually sour the beer or otherwise cause it to go off: Sounds grim, but it’s not kept that long.

CAMRA (Campaign for Real Ale) successfully championed this traditional style as a result of it almost dying out in the 1960-70s due to unchecked commercialism. They also coined the term “Real Ale”.

Because the beer could go off after 2-3 days, admitting air is replaced by some publicans with CO_2 at atmospheric pressure using a device called a “breather”. The claim is that the beer will keep a few days longer, but some vendors of “breathers” may stipulate that this extension is only a day. CAMRA

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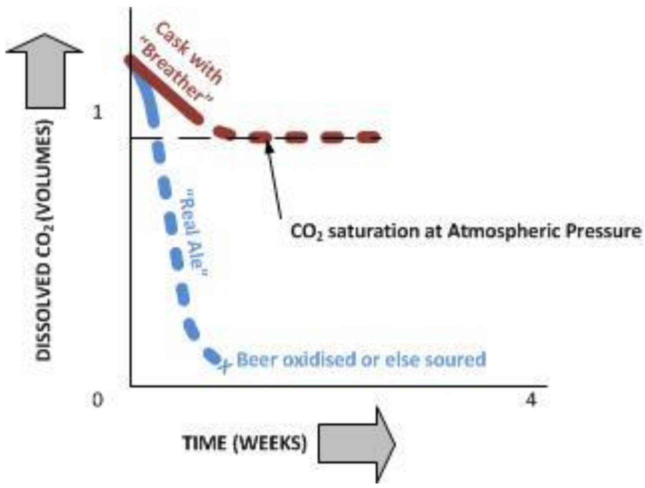
don't really approve of "breathers". They controversially argued that oxygen in the air initially has beneficially flavour impact. That may well be, but there is also a suggestion that the use of "breathers" may indicate shoddy practices elsewhere having a dire impact on the beer's quality.

Arguments aside, from a home brewing perspective "breathers" can look attractive. Home brewers can't open their beer to the air because it will go off. Replacing beer being drawn off with CO_2 at only atmospheric pressure sounds ideal; but why the suggestions of only short life extension? The beer isn't going off? We need to take a more detailed look at what is going on.



Looking at two casks of identical beer: After conditioning they are "vented" for a few hours ahead of serving using a gas permeable plug ("soft spile") to release built up pressure because drinkers don't really want a glass of froth! But even after "venting" the beer will still contain dissolved CO_2 from the conditioning; about 1.1-1.2 "volumes". One cask is fitted with a "breather", the other isn't ("Real Ale"). And then… This is going to be "techie", I'll keep it within the next four paragraphs…

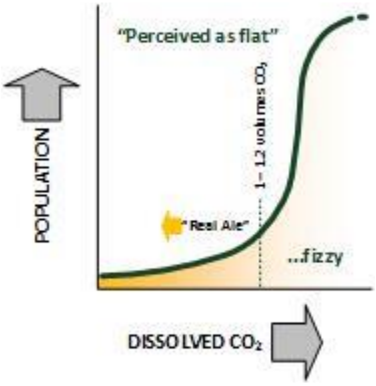
The cask of "Real Ale" remains open to the atmosphere; as beer is served air takes its place diluting the CO_2 in the cask (air only contains about 400ppm of CO_2). Dissolved CO_2 continues to disperse, and the rate of dispersal accelerates as more air dilutes the remaining CO_2 in the cask (this happens because the "partial pressure" of CO_2 in the cask gets less... err, "partial…" what? I think we can skip past this). A gas impermeable plug ("hard spile") may be used when not serving to slow this process.

The cask with the "breather" contains beer continually surrounded by CO_2 so the beer still gives up excess CO_2 but stops when it contains the maximum CO_2 it can hold at atmospheric pressure; in this case "equilibrium" will leave the beer "saturated" in CO_2 (about 0.9 "volumes" at 14°C).

Take an arbitrary figure of one "volume" of CO_2; a cask of "Real Ale" will reach that level quicker than a cask fitted with a "breather": Think of a bucket of water, drill a hole half way up the side and water starts streaming out; drill the same sized hole near the bottom of the bucket and the water streams out of this hole very much faster.

Compared to the "Real Ale", beer in a cask with a "breather" loses carbonation more slowly but then retains much of it too. So it stays drinkable indefinitely? Well not exactly. As carbonation gets less it eventually passes a point where the majority of people perceive the beer as "flat". This statement will be lost on many drinkers of highly carbonated beverages to whom "cask conditioned" beer starts out "flat". The point at which a drinker perceives beer to be flat is very subjective, hence vendors of “breathers” put out varying figures for how long their product “extends” the life of beer and why some home brewers swear by “breathers” as a way of getting “Real Ale” style beer from their home-brew and others say using “breathers” does nothing for their beer. But all home-brewers will agree, let air have its way with their beer and it will be undrinkable in a matter of days.

“Perceived as flat”? Well there’s “flat”, no CO_2 present at all, and “perceived as flat”, such as the perception drinkers of highly carbonated drinks have of “Real Ale”. The concept is pretty elusive, based on expectation, experiences, desires, fashion, etc. (a bit like “opinion polls”!). If pushed you can “train” your perception of “flatness”; like most kids hate Brussel Sprouts, but some adults can’t get enough of them. Such a tentative concept can’t possibly be drawn as a “cumulative distribution curve”; so that’s what I’ll do then!



The thing to extract from this is there will be a level of carbonation that “Real Ale” drinkers find acceptable (not flat and not fizzy). It may vary from one person to the next but for the sake of this article, let’s say 1.1 “volumes” of CO_2 (about equivalent to 2PSI of CO_2 at 14°C). And from that you can conclude that a “Real Ale” style does *not* mean it has to be truly flat. This is an important concept behind some of the upcoming recommendations. Coincidentally some CAMRA literature puts 1.1 volumes down as optimum cask beer condition, but certainly doesn’t suggest “2PSI of CO_2”!

In 50-60 years of home-brewing (in the UK it sprang into being when Reginald Maudling removed duty from home brewed alcohol in 1963) not a lot has changed in its serving methods: There was bottling of course and then along came plastic “pressure barrels”. Those after something closer to draft “Real Ale” always had “polypins”; collapsible bags that once contained sherry in the local off-license. Gas injection for pressure barrels came about making it possible to get the beer out at any time (without loosening the cap!), and eventually even pressure dials.

There was, and is still, always a small gang of enthusiasts who will use “real” pub tackle like casks (wooden casks even), spiles, taps that work together with “keystones”, and so forth.

Pressure barrels have improved quite a bit since the earlier days, but their use with CO_2 is usually a bit adhoc. They are often over-primed and over-pressured, with a good squirt of CO_2 added now and again. Careful management of the CO_2 isn’t generally the case with them.

Some very acceptable “cask conditioned” style home brewed beer can be served from “polypins”, but they are far from ideal: When conditioning the bags expand alarmingly and as they deflate the

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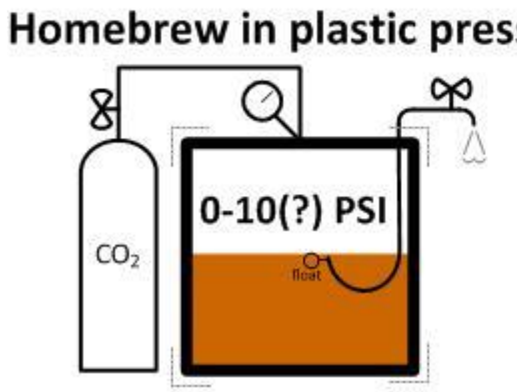
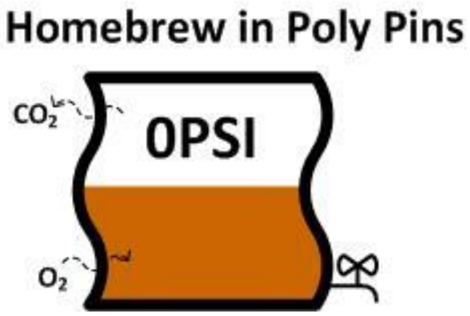
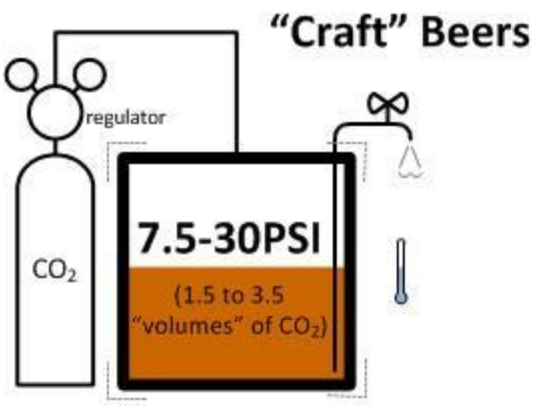
dissolved CO_2 slowly dissipates until the beer contains less than 1 “volume” of dissolved CO_2 and the beer may well be “perceived as flat”. They are also slightly permeable to gases so CO_2 levels are free to drop even lower and the beer can also oxidise (four to six weeks is about the maximum keeping time). If priming is managed carefully some of these problems can be got around. They are also now available in smaller sizes making them more physically manageable (a box helps handling but is often not used). Finally, there are other systems such as the “bag-in-box”, or “BIB”, that are not troubled by oxidation, but are often “one-shot” (not particularly expensive though). I don’t dismiss “polypins” and recommend keeping an eye on advances, but I don’t consider them suitable for the scenario being pursued here because they can be so tricky to operate well.

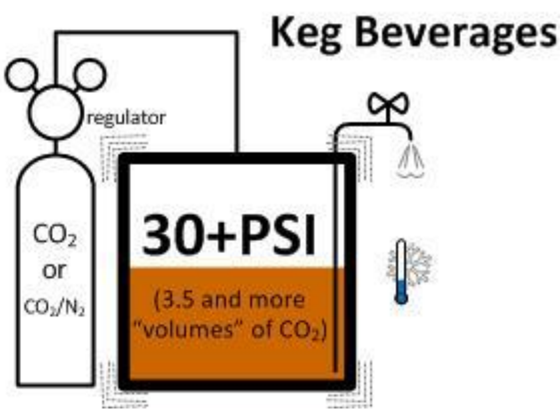




About twenty years ago the “craft brewing” movement kicked off and with it big changes to the American home brewing scene. Gradually more equipment, ingredients and techniques began to filter through to UK home brewing. Today home-brewers are comfortable with big CO_2 cylinders, carbonation measured in “volumes of CO_2”, CO_2 regulators, even “kegerators” and “keezers”. Techniques like HERMS and RIMS became the new “wants”. Stainless steel “kegs” came onto the market (“Cornelius” kegs ex- “Coca Cola”, etc., and more recently designed-for-purpose kegs) and these kegs began replacing the old plastic pressure barrel. But, apart from some very intrepid souls, those wanting “cask conditioned” type beer are still left with those old stalwarts, the “polypins”.

And what of “craft brewing”? In its commonly (mis-)understood sense it strongly influences UK home brewing as mentioned. But it’s an invention of the American Brewers Association and it truly means something no better than 20th century British “keg beer”. Be cautious how you use the term.

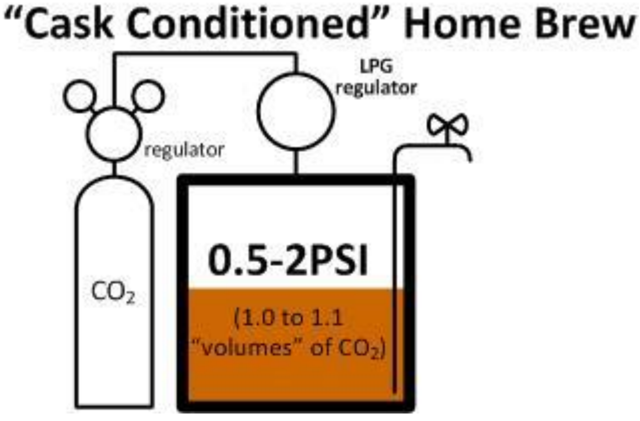




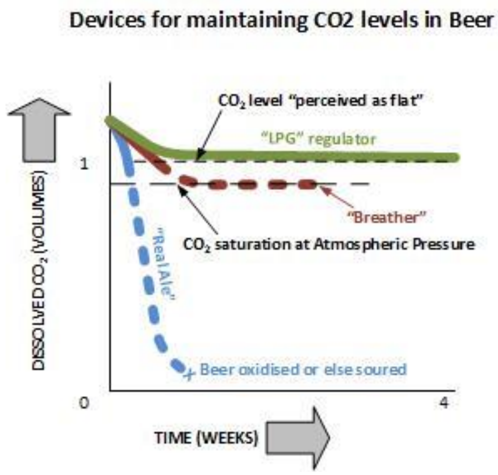
Keg "beers" are what was being imposed on the British public in the 1960-70s until CAMRA hit back. Chilled, filtered, pasteurised and force carbonated at very high pressure, they don't deserve any further description here. "Craft" beer is also "keg" but *can be* (not "*is*") considerably more subtle: Not necessarily as cold, sometimes not filtered or pasteurised and possibly not force carbonated (relying on natural secondary fermentation as well as extraneous CO_2). UK home brewing now commonly uses these "craft brewing" techniques, though fortunately in the afore mentioned "deluded" sense. The styles fit with bottling and also the influx of "Cornelius" keg type serving containers.

Having explored some of the parameters of "cask conditioned" beer I can start laying out what's needed to "emulate" a "cask conditioned" beer with our home brew. The obvious one is condition the beer in the cask as opposed to force carbonating cleared ("bright") beer. Conditioning in the cask is responsible for all sorts of subtle flavour enhancements (contains a lot of "live" yeast for a start); it's also not difficult to achieve since most of us have little choice but to do just that (condition in the cask). Maintaining "cellar temperature" (12-14°C) need not be a big deal, there is usually a room (garage) that is a bit cooler than others; hot weather can cause problems, be very aware that warmer beer will hold less carbonation at a given pressure (above 16°C the beer won't hold on to any appreciable carbonation at 2PSI). There's also lots of other mechanisms that provide subtle flavour enhancements, like contact with air, but these can all be ignored for now so providing the scope for mucking about in future should it take your fancy. The "biggy" is getting the serving pressure down; a simple idea but fairly difficult in reality.

Assuming you have upright containers (like the ubiquitous "Corny" keg) and regulated CO_2 distribution systems, the main problem is that the commonly used regulators are crude and will not reliably follow a low pressure setting; they tend to stick. Even the more specialist regulators can be quite iffy controlling pressures of 5PSI or lower. But there are relatively low cost regulators that can work at very low pressures… LPG or propane regulators. There is nothing new about using LPG regulators for home brew, they just haven't widely caught on. In the UK the "fixed" sort regulate at 37mbar (about 0.5PSI) and the variable ones 50-150mbar (about 0.75 to 2.0PSI). Most are fitted with standard couplers ("POL") which are inconvenient, but you can get them with "plain" BSP threads. They work using a "diaphragm", not a "cylinder", and don't stick at low pressure. The diaphragm gives them a "flying saucer" appearance! I can't recommend 37mbar ones unless using a hand-pump, because 37mbar isn't enough puff to move *any* beer out of a half empty "Corny" keg. Actually for many of us 37mbar maintains a level of carbonation well below personal "perceived as flat" level.



Beer is primed as normal to generate 1.1 to 1.3 "volumes" of CO_2 (2-5PSI at cellar temperatures). Fit the LPG regulator when the beer is ready for serving, but delay fitting if the beer has got itself enormously over pressured and threatens to fill the regulator with beer. As dissolved CO_2 in the beer dissipates the regulator is set to prevent pressure dropping past a level that keeps carbonation content from being "perceived as flat". Super-imposing this on the graph used earlier gives:



As soon as beer is drawn out the dissolved "volumes" of CO_2 starts fading away in the remaining beer; a LPG regulator keeps the beer with sufficient dissolved CO_2 to never be regarded as "flat". As a side effect, the slight positive pressure means the lids on a "Corny" keg can stay sealed. Another useful side-effect is if the beer is ever exposed to warmer temperatures (14°C plus) when its cooled again the beer reabsorbs CO_2 restoring the "condition" it lost.

It should be made clear that commercial systems of holding back the inevitable decline of beer in a cask have usually met with, often justified, hostility amongst drinkers and the CAMRA organisation. Okay, home brew so treated cannot be "Real Ale" in the strictest sense, but it's a lot closer than many home brewers (me included!) assumed possible! Oh, and before folk get unnecessarily excited; there *is* a difference between "Real Ale" (as defined by CAMRA) and real ale.

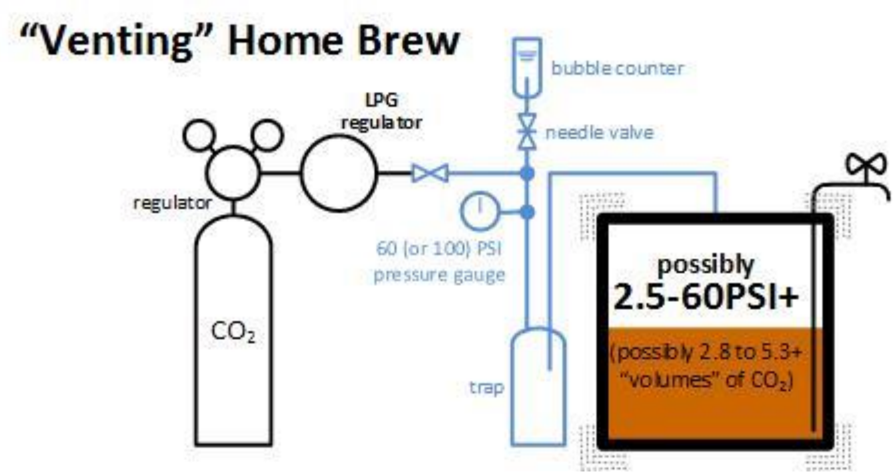
"Venting"

"Venting" is a traditional process of reducing the pressure that has accumulated in a cask of beer after a few days of conditioning. It involves plugging the cask with a gas porous peg which allows excess CO_2 to escape (the peg is called a spile, and is cut from an open grained, fibrous, soft wood, or bamboo). This can be a messy procedure for lively beers as much spray and foam can be generated by so-called "gushers" (even more spectacular if the cask is "tapped" for serving before it is properly vented). The process must not only reduce the gas pressure in the head-space above the beer, but also reduce the CO_2 dissolved in the beer which is a much slower process. Casks might be vented for 24+ hours. The ideal result (for a "cask-conditioned" beer, or "Real Ale") is to end up with beer containing about 1.1 volumes of CO_2 and zero pressure in the casks' head-space (at cellar temperature of around 12-14°C).

Recently there has been a trend towards only allowing “just enough” carbonation (the result of dumbing down cellarmanship or more “precision” in brewing?) whereas previously beer might have been casked a little too early or been a little over primed with sugar (“slightly over-done”). But a good cellarman was well able to deal with the resulting “gushers”. Some lament the passing of “gushers” claiming the extra cask fermentation has a flavour benefit. I’m not decided either way, but if doing the “slightly over-done” method you need a way to deal with over-carbonated beer. If doing the “just enough” method, you don’t have to be too concerned about under doing it because the methods described here don’t depend on judging conditioning just right; the use of regulators and extraneous CO_2 sees to that. However, the “just enough” method will sooner or later end up with an over-carbonated beer anyway, so it is best to be prepared with the necessary additional kit. Note that not all “gushers” are down to over conditioning; some can be caused by contamination and poor control of temperature.

A process for home-brewing might emulate this practice of “venting” but does throw up some special requirements: The pressure in the head-space must not drop to zero or the seal on the lid may break (if using “Corny” kegs that is) and a CO_2 pressure of 0.5 to 2 PSI will need to be retained to keep the desired amount of CO_2 dissolved in the beer (not a problem commercially where the beer is drunk in a matter of days, hours even, so the dissolved CO_2 doesn’t have time to all drift away; but home-brew may not all be drunk for a few weeks). Finally, a home-brewer might be faced with “venting” just a handful of times in a year whereas a publican can expect the job 4 or 5 times a week or more: Hardly provides a home-brewer the time to develop the skills involved and skill is what “venting” needs. So for us home-brewers, if “venting” needs doing, the process needs de-skilling.

To this end we need a little extra equipment, but you can forget about “spiles”:



Looks horribly complicated, but be assured, it isn’t. The arrangement can be put together using “off-the-shelf” low cost fish aquarium components along with a few components to join it all up. The most expensive item by far will be the pressure gauge (about £7-8).

Instead of connecting the LPG regulator directly to the keg (and potentially filling the regulator with beer) the keg is connected to the trap (make sure the needle valve is closed and the LPG regulator and CO_2 bottle isn’t connected at this time). The pressure gauge will straight away indicate by how much the keg is over-pressured. Start opening the needle valve to bleed off the excess CO_2; this is where the bubble counter comes in so you have an idea how fast the excess CO_2 is venting (say 4 or 5 bubbles a second for starters).

Once you are happy the LPG regulator can handle the remaining over-pressure, and there is no sign of beer being forced into the trap, connect up the LPG regulator and gas bottle. Yes this does means if the pressure drops below what the LPG regulator is set to (0.5-2.0PSI) the setup will continue to vent CO_2 directly from the CO_2 bottle but the rate will be very small and the amount of gas lost tiny (as long as you don't connect it up and then go on holiday for a week).

If using the "just enough" method of carbonating the beer this venting process may all be over in an hour, that's if you even suspected some venting was needed (you might manage without). Using the "slightly over-done" method you can expect a long drawn-out session.

Using a needle valve and bubble counter provides very fine control over the speed of venting. It should be possible after an hour to judge how long "venting" might take. If the over-pressure came in at 10PSI or more, adjust the needle valve so that the process will take 24-36 hours. Don't hurry it, remember you are also venting gas that's already in solution and this takes time. If the process is hurried, you might end "venting" early when the pressure has dropped to say 2PSI, and a few hours later find the pressure has crept back up again as more CO_2 comes out of solution. Hurrying the process may also disturb the sediment so you'll have murky beer to look forward to.

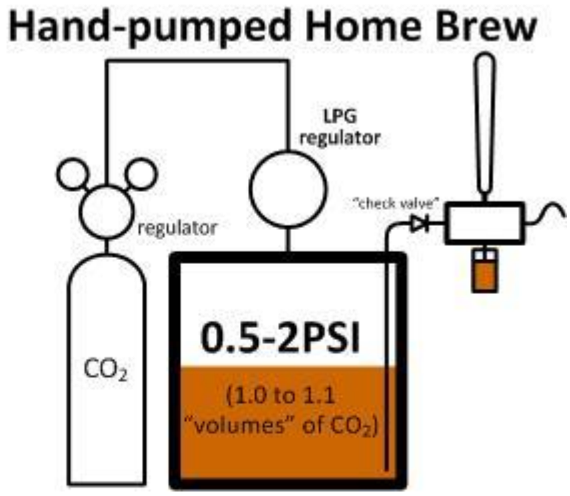
Once you are happy venting is complete and pressure stabilised, close the CO_2 cylinder, disconnect the trap from the keg, disconnect the LPG regulator from the venting paraphernalia, connect the LPG regulator directly to the keg, open the CO_2 cylinder and pour yourself a drink!

The problem I've found with "venting" this way is that some beers continue to condition. After a week the pressure in the keg has built up again and the "apparatus" has to be reattached and the beer vented again. This can become a bit of a pain in the neck. But bubble counters and needle valves are not expensive, and I've begun building these items into the gas lines so that they are ready to do a bit of adhoc "venting" whenever is convenient.

Hand Pumps

A hand pump isn't just for show, it's a major element in producing a great pint! Hand pumps (or "beer engines") are the ideal partner to a cask conditioned beer. The effect a hand pump has on cask conditioned beers is not trivial, perhaps due to the manner in which a hand pump "drags" beer out of the cask causing quite a lot of turbulence and forcing air to mix with the beer as it pours into the drinking glass. Whether or not this is the explanation, the beer takes on and emphasises subtle flavours (such as "woodiness"), seems "smoother" (or "creamier") and develops a frothy head, all of which might be absent if the beer is just gravity delivered.

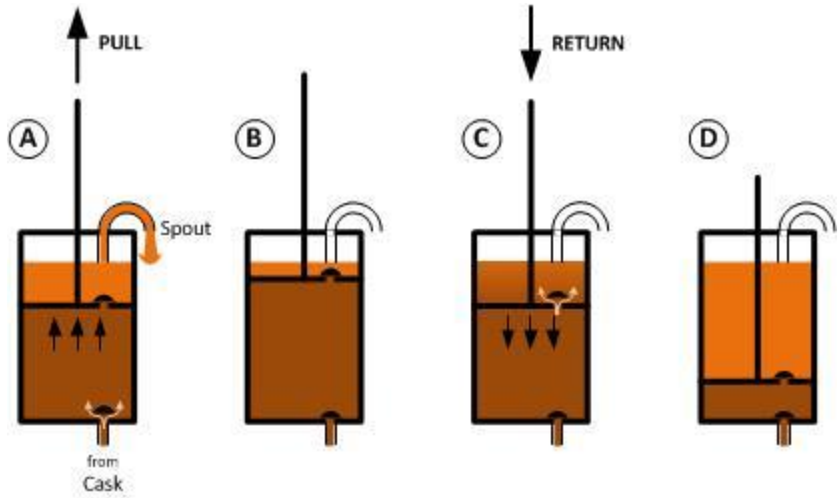
To further emphasis this effect you might try a "southern pour" nozzle, which unlike the "northern pour" or "swan neck" nozzle can't be pushed to the bottom of the glass below the surface of the poured beer. Some beers it works for, some it doesn't, hence the division developed. What you must be careful of is attaching a "sparkler" which forces the beer through fine holes: They create terrific creamy heads, but risks damaging flavour and mouth-feel leaving the beer tasting and feeling positively “watery” (try it if you don’t believe me… in fact ALWAYS try it before subjecting a beer to one). Again, some beers handle sparklers, but many can’t; and some can for a while and then can’t. Sparklers are always submerged at the bottom of the glass and require “northern pour” nozzles.



Using the same “cask conditioning” regime previously described simply replace the tap with the pump. You should fit a hand pump “check valve” into the beer-line between cask and pump. The “check-valve” (it’s actually a “demand-valve”, but might have been a true check valve, or one-way valve, in the past) allows beer to pass only if the pump tries to draw it and so will prevent beer, which in this system has been mildly pressurised, being pushed continually through the pump. As discussed earlier, if the pump is higher than the cask’s pressure can lift the beer a “demand valve” isn’t essential: A pump in good condition should prevent beer syphoning from a drinking glass to the cask, and also prevents gravity pulling beer in the beer-lines back into the cask.

Just be aware that the hand-pump, and associated pump cylinder, is open to the air and any beer in it will eventually spoil (within a day or two). It is prudent to leave the pump handle forward so you don’t lose an entire cylinder full of beer to spoilage. Even then throwing away the first 30-50ml pumped in any day may be a good idea and fairly frequently (bi-weekly?) flush the pump innards with beer-line cleaner and water. Using ¼pint cylinders instead of ½pint may also save beer.

CAUTION! When buying a hand pump not all are what they seem. Some have no pump cylinder but a damper provides resistance; they are effectively “keg” taps masquerading as a true hand pumps.



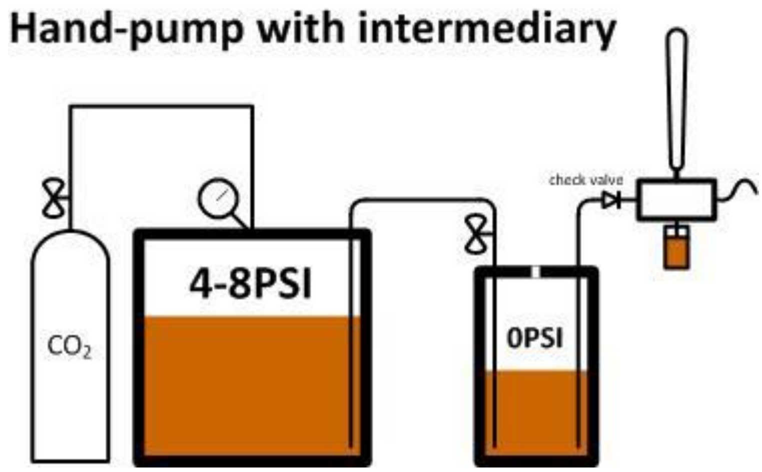
A beer hand-pump operates like an old fashioned water pump. When the handle is pulled beer is forced out of the spout from the pump cylinder, but at the same time beer is drawn from the cask to enter the cylinder, but underneath the piston (A). After a session the pump is often left in this position (B) with the cylinder full of beer hopefully sealed from the air by the one-way valves.

When the handle is returned beer moves nowhere, but a valve in the piston opens so the beer underneath the piston finds itself on top of the piston (C). The handle is now in the upright position awaiting the next stroke (D). In this position the beer in the cylinder is open to the air (via the spout) hence it isn't recommended to leave the pump in this position for more than a few hours because of the risk of spoilage to the entire cylinder full of beer. Leaving the handle forward reduces the risk to the beer in the cylinder, but doesn't guarantee its safe storage so try not to leave a pump with stagnating beer in it for more than a couple of days. The handy might work in a one-way check valve to the spout (not a hand-pump "check valve") or adapt a sparkler so it can be used to seal the spout at the end of a session in an attempt to stop beer de-gassing or spoiling in the cylinder. Beer will spoil in some pumps quicker than others: I have Angram CO models and the more recent CQ models and beer quickly spoils in the CQ. My CQs also have a stubby "southern pour" spouts not the looping "northern pour" swan-neck spouts like the COs, and this may have something to do with it.

The seals on the cylinder's one-way valves will leak after some time due to wear. For this reason, it is probably a good idea to fit a "check-valve" (demand valve) between pump and cask in every circumstance to prevent potentially infected beer running back into the cask.

Beer is obviously subject to considerable turbulence as it passes through the cylinder, far more than gravity delivery or a "free-flow" keg tap, and it is this that may be responsible for many beneficial flavour enhancements. The fast speed of delivery into the drinking vessel also incorporates a lot of air, and therefore oxygen, to good effect (like "breathing" a red wine before serving) but this requires the spout not to be submerged in the glass and not to be fitted with a "sparkler".

Practical reasons prevent home brew being served in the most desirable (according to CAMRA) manner. Or does it? We can certainly get closer by employing "intermediary" serving vessels.



The main cask is conditioned as normal. Quantities are then transferred to the much smaller "intermediary" vessel, the exact quantity being what is judged as what will be consumed in the next 48 hours. It is difficult to avoid the use of CO_2 here, to help push the beer between vessels and maintain the condition in the main vessel, but the CO_2 injection can be done manually watching a pressure dial, regulators are not necessary. It could be possible to eliminate CO_2 by using "bag in a keg" type solutions; compressed air (from a bike pump?) can be used to push beer to the "intermediary" while keeping some light pressure on the remaining beer in the main cask.

The "intermediary" vessel is open to the air, although a "breather" (or poor-man's alternative; a 37mbar propane regulator) could be used if the beer might stay in the intermediary for several days. If opening to the air a septic filter (such as used in hospital breathing apparatus) could be worked in to help keep spoilage organisms out of the intermediary and avoid having to repeatedly sterilise the vessel between charges.

Spoilage need not be all bad, as long as beer isn't left long enough to be truly spoiled. CAMRA insisted air should be allowed access to the beer for the day or two that it tapped, a policy that seems very counter-intuitive. After three or four days, such a policy can result in the beer losing condition, oxidising and even souring, which certainly is bad and avoiding it has been the subject of this article. But the transient state of "sub-spoiled" can actually be an enhancement to beer.

"Intermediary" vessels as discussed provide one "controllable" mechanism for attaining this "sub-spoiled" state. Another mechanism comes from the hand-pump itself, though not as easily controlled. Oxygen and spoilage organisms have access to the upper section of the pump's cylinder, hence it has been recommended to leave the pump handle forward and flush the pump fairly regularly. But as long as flushing isn't done too diligently there will be periods when the beer takes on subtle flavour changes. It is transient, if the pump is left too long without flushing the beer won't be enhanced by interesting nuances of "sub-spoilage" but will instead be victim to true spoilage.

"Sub-spoiled" is an interesting side-effect to look out for, but not one you'll have much control over. The advantage will be being able to experience these changes without risking the entire batch of home brew.

Tweaks

Customise to taste! The concept that will need tweaking most is “perceived as flat”. Although I’ve been presenting this concept as a per person “fixed” preference, it should really be seen as something more “fluid”. The carbonation level of a cask-conditioned “Real-Ale” will actually depend on many factors, the most influential one being how effective “venting” has been carried out. The regulators I recommend are capable of maintaining 2PSI of CO_2, but there are many times I’ve sampled “Real-Ales” that have far more carbonation than can be attributed to “2PSI” – these beers just haven’t been vented very effectively. The likes of “bitters” are usually high turn-over and can be expected to have a higher carbonation than a strong beer that is low turn-over and has the alcohol strength to withstand sitting around for a week in a tapped cask.

I’ve already suggested “perceived as flat” is dependent on personal experience, one of those being “expectation”. You might well find a preference for lower carbonation in stronger beers.

And you might also prefer to steadily decrease the carbonation with time to emulate what happens to a cask in a pub (in a much shorter length of time). But one thing you can’t do is emulate what happens to a cask of “Real Ale” after a day or two – i.e. that carbonation falls below about 0.9 volumes of CO_2 (saturation at 0PSI). This can’t be achieved with a “breather” device either (which maintains a blanket of 100% CO_2). In the pub, it occurs because air dilutes the CO_2 blanketing the beer, which will eventually destroy the remaining beer if left undrunk long enough.

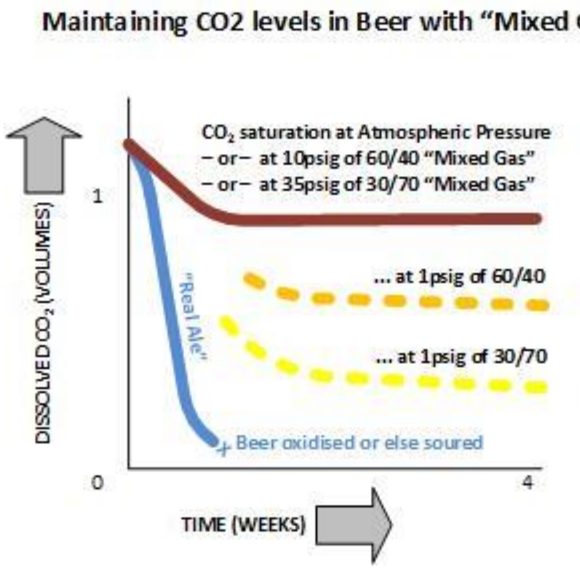
So, is it unachievable in home brew? This is entering a realm I have no personal experience of, or any idea if it’s worth pursuing; I just find the possibilities intriguing. So how could it be done? Not content with having committed a grievous sin in suggesting CO_2 is necessary to achieve a “Real Ale” home brew style, I now suggest… mixed gas!

A lot of hokum is written about “mixed gas”. It really is just that, a blend of gases. Here it’s nitrogen and carbon dioxide and nothing more mysterious. We are using the “Laws of Physics”, in this case “partial pressure”, to achieve the required end result – very low carbonation with no spoilage elements. Readily available gas blends are suggested. Using a blend of 30/70 (30% CO_2) will not mysteriously create shaving foam heads, like on “Guinness” or some other “Nitro-Keg” product – for that you also need frigid temperatures, eye-wateringly high pressures, and probably a special tap that includes a “sparkler… on steroids” (a “restrictor plate”).

There is even confusion about how the “shaving foam” head is formed: Is it the difficult to dissolve Nitrogen displacing the CO_2 in solution as pressure drops, or is it the Nitrogen coming out of solution in naturally tiny bubbles, and being difficult to come out of solution continues to do so for a very long time thus maintaining the head? Or is it both?

Earlier I avoided describing “partial pressure”, but I’ll do it now. As Physics goes, the basic concept is surprisingly simple: Take a mixture of 50% Nitrogen and 50% Carbon Dioxide and apply it with 2PSI and it will be the same as applying carbon dioxide only at 1PSI (2PSI x 50%). At these temperatures and low pressures the Nitrogen is virtually inert as far as the beer is concerned and doesn’t dissolve either. Easy… err, except (this is Physics, there’s got to be an “except”). We don’t actually measure pressure as "PSI", we really use "PSIG" (G=gauge) which ignores the weight of the atmosphere pressing down on us; about 14.7PSI, or let's say 15PSI for convenience. So, if we have our 50/50 "mixed gas" at 2PSIG that will be 2+15PSI, and a partial pressure of CO_2 of (2+15) x 50%, or 8.5PSI (i.e. less than atmospheric pressure). Now we're getting somewhere.

You don't easily get mixed gas as a 50/50 mix, 60/40 is more normal (60% CO_2 in nitrogen, you can also get 30/70, 30% CO_2, "for stout"). A LPG regulator may not be suitable (2PSIG is the highest it can go), but you might expect ordinary primary regulators to get roughly down to 10PSIG (partial pressure equivalence of 0PSIG of CO_2) and some common secondary regulators will go lower.



WARNING: Cylinders of mixed gas will require special primary regulators to handle the very high pressures: Mixed gas must be supplied as a compressed gas as it doesn't conveniently form into a liquid as straight CO_2 does, the connectors are different too which helps to avoid mistakes. Secondary regulators downstream of the primary (like the LPG regulators used here) are fine.

The position of the "mixed gas" lines in the graph are intentionally vague. Would the beer be "primed" and conditioned with CO_2 (there doesn't seem much point)? Would the cask be purged with mixed gas at filling time (and so begin the decay of CO_2 content from "saturation" levels)? Would the cask continue to be purged at regular periods ahead of the cask being tapped (to continue the decay of CO_2 content)? Would *anybody* be bothered with all this? Probably a better approach is to just connect the "mixed gas" (60/40 or 30/70) and allow the carbonation to very slowly decay as the beer is consumed (it's the very steadily increasing dilution of CO_2 in the headspace with Nitrogen that's driving the decay of carbonation in this case, not decreasing pressure). The beer will change subtly with time, but that's what "Real Ale" is all about isn't it?