Further reading

Cantwell, Allen, and Forhan. Beer from the Stainless: Brewing Techniques Nov/Dec 1993

Timothy O'Rourke, Live Ale. The New Brewer March/April 1996

BarleyCorn Nov 1996

CAMRA. Cellarmanship, Caring for Real Ale (Campaign for Real Ale 230 Hatfield Road St. Albans, Herts. AL1 4LW. Great Britain)

Andrew Hepworth, Live Beers in a Bottle. The Brewer April 1996

Mark Dorber, Cellarmanship. All About Beer. July 1997

CASK CONDITIONING

Terminology

Alginate
Auxilary fining agent to aid in clarification of the beer in the cask.

Beer engine
Hand operated suction pump designed to pull the beer from the cask and dispense it into the glass.

Cask
Container for cask conditioned beer.

Cask Breather
Device that allows CO_2 to flow into the cask as beer is removed.

Firkin
A 9 imperial gallon, or 10.8 U.S. gallon cask**.**

Isinglass
Solution of collagen protein extracted from the swim bladder of the sturgeon, it aids the sedimentation of yeast on the bottom of the cask.

Keystone
Bung that seals the cask at the end through which the tap is hammered.

Priming
Addition of fermentable sugar to the beer in the cask to feed the secondary fermentation.

Racking
Filling the cask.

Reracking
Filling a cask with cleared, or settled beer from another cask.

Shive
Bung that seals the cask, at the side opening, through which the cask is vented.

Spile Hard/Soft
Wooden or bamboo peg used to vent the cask.

Stillage
Rack for setting up casks for settling and serving.

Tap
The valve that is driven through the keystone for beer dispense, or connected to the keg to allow beer to be dispensed

Tut
The plug in the middle of the shive through which the spile is driven.

Flavour differences.
There is no doubt that the softer carbonation and the warmer serving temperature affect the flavour of cask conditioned beer. Both carbonation and low temperatures can interfere with the perception of flavour and aroma. The additional time spent with the yeast results in a greater complexity of flavours, and fining rather than filtration means that less flavour is "filtered out" by the brewer. Dry hopping produces flavours and aromas that change as the beer ages. The higher fermentation temperatures will tend to result in more estery beers and open fermentation and the increased presence of oxygen throughout the process will result in more oxidised flavour components. It is usual to find higher levels of bacteria associated with cask conditioned beers but micro-organism character is rarely seen as a positive factor in beers prepared in this way.

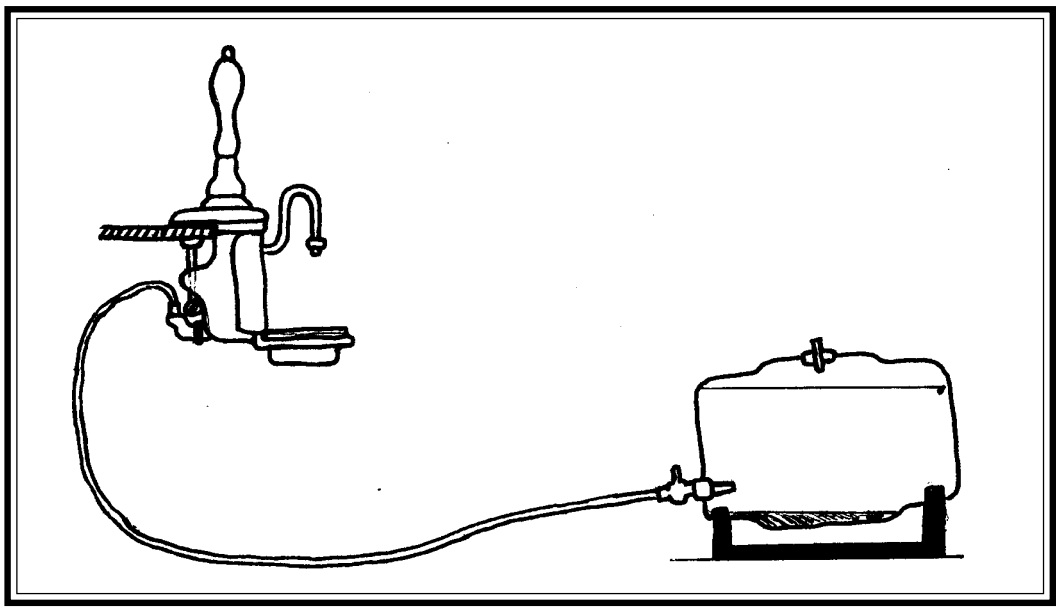
Summary
Some brewers claim that cask conditioned beer will never take off in this country, because there is not enough knowledge out there amongst the distributors, bartenders and beer drinking public. Other brewers insist that they are willing to learn what to do, and are enthusiastic about learning the traditional skills. Technology for serving the beer in accounts that aren't ideally set up for it came from Great Britain and was made necessary by the huge number of bars that requested "real ale" once CAMRA achieved their aims. The Campaign for Real Ale is one of the most successful consumer advocacy groups in history. Formed by four beer enthusiasts in the early 1970's, CAMRA lobbied the brewers of Great Britain to once again produce true cask conditioned beers. Disappearance of the old style of beer led to a loss of expertise in the pubs, but extensive education and training programs introduced by the brewers, and by CAMRA, have increased the knowledge level ensuring that beer is served in good condition.

Remember that when you decide to serve beer in cask conditioned form you are gambling somewhat. The reward is that you can present a beer that is at its peak of flavor and freshness, and those customers that crave a truly unique drinking experience will thank you. The risk you take is that you waste a few gallons of beer, and some investment in equipment, that has a second hand value. It is true that the public in the USA has limited knowledge and understanding of the product You have to consider whether you will scare regular customers away with extravagant experimentation, but I feel that America has more than its fair share of beer drinkers who are very adventurous and crave the unusual.

CASK CONDITIONING

Gravity
The easiest way to serve cask conditioned beer is to hammer a tap through the keystone and pour the beer directly into the glass from the tap. The cask needs to be set up behind the bar, and the bartenders trained in pouring techniques. The beer will tend to pour without much head with this method .

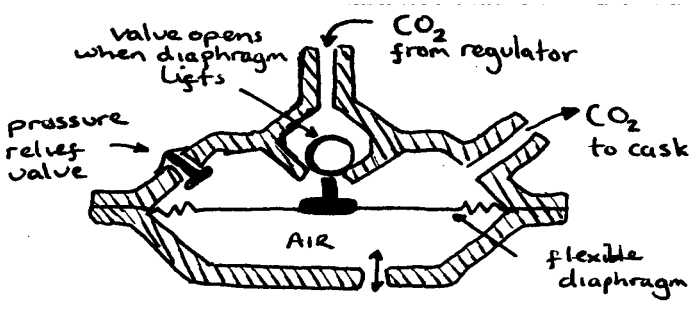
Beer engine
It is more likely that the beer will be stored away from the bar and delivered to the customers glass via a beer engine or hand pump. The beer engine is mounted on or through the bar and is basically a simple piston pump, that pulls a measured amount of beer from the cask and delivers it to the glass with a single pull. Usually they are sized to deliver 10 oz of beer per pull. They are fitted with a non return valve to prevent beer flowing back into the cask, but nothing to stop beer flowing through the pump if the cask develops enough of a pressure to push the beer. The line should be as short as possible and insulated. Since cask conditioned beers contain a significant amount of live yeast the lines must be thoroughly cleaned on a regular basis. They should not really be left overnight with beer in them and it certainly adds to the work involved in keeping cask beer to have to run water through the lines every night. Modern beer engines dispense the beer through a “swan-neck” spout, often with a sparkler attachment. In some parts of England customers demand a tight creamy head on their beer, and the sparkler is designed to force the small amount of condition in the beer into the head. Other beers benefit from being poured with a small head, and some require no head at all. In the USA cask beer is often associated with the tight creamy head so a sparkler is advisable. A company in California manufactures a device called a fizz-buster, that decarbonates regular keg beer to allow it to be dispensed via a beer engine.



leather washer and a strainer to trap hop leaves and large particles. When using a keg the first couple of pulls on the handpump may draw some sediment but after that the beer will be clear.

Dispense

As beer is removed from the cask or the keg then something must flow into the container to replace it. Traditionally that was just air from the room, and the problems with that are obvious. The beer will quickly lose what carbonation it does have, and be prone to infection from growth of beer spoilage micro-organisms in the air, and already present in the beer. It is possible to filter the air entering the cask, but that will not help with carbonation. Traditionally pubs would just serve from a size of container that could be emptied in 1-2 days. English brewers would **not** offer a price discount for larger cask deliveries to discourage ordering too much beer. If the air is replaced with CO_2 then carbonation can be maintained and the detrimental effects of air in the cask eliminated. The problem is in allowing enough CO_2 to enter the cask or keg without creating a pressure in the container. The cask breather was developed to allow CO_2 into the cask to replace beer that has been removed and at the same time allow excess CO_2 to be vented. The Campaign for Real Ale (CAMRA) opposes the use of any device that allows CO_2 to be added to a cask and insists that well maintained beer, sold fresh and in prime condition does not need the extra protection of added CO_2. This is undoubtably true, however, the cask breather allows customers to enjoy something very close, arguably identical beer in an account that may not have high enough sales, to rely on the traditional method. In this country it is prudent to use a cask breather until turnover reaches a level at which the bar can guarantee that it will drain a cask in a day.

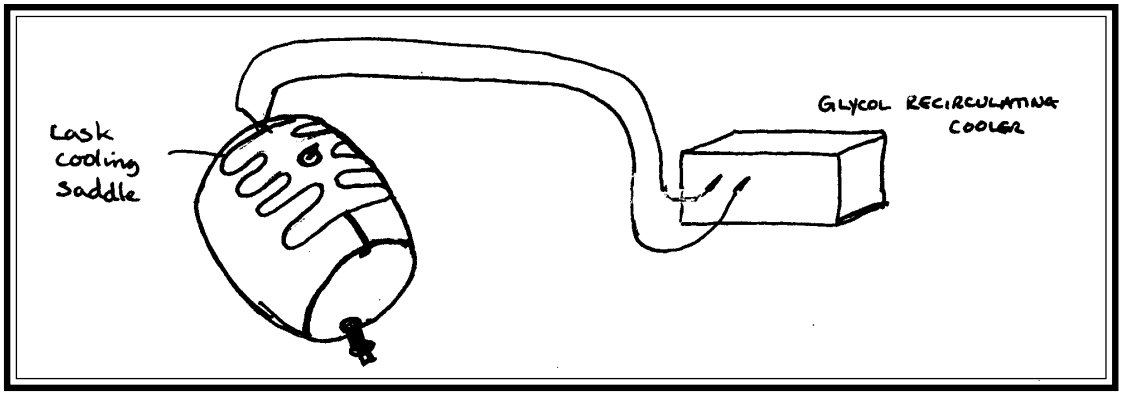


cask breather Cellarmanship Caring for Real Ale CAMRA

with strong beers, for peak flavour development, but the beer is more often considered ready to serve once it is cleared.

Temperature control

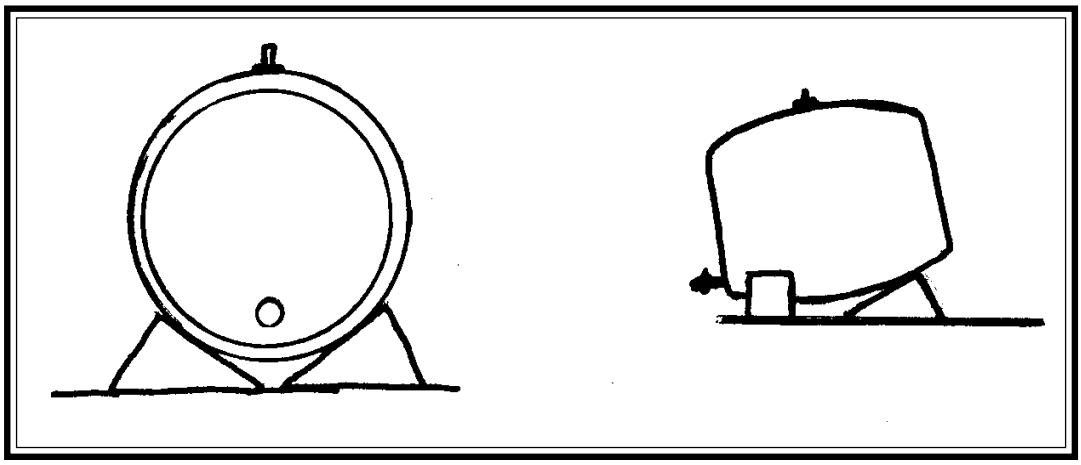
The ideal serving temperature is "cellar temperature" or around 55ºF. It is unusual to find a cellar that is maintained at that temperature in this country , so it is necassary to find some way to cool the cask to the correct temperature. Walk in coolers are too cold, and at that temperature beer is unlikely to clear and will look flat and cloudy when poured. The low temperature will prevent the subtler flavours and aromas from being enjoyed. Traditional evaporative cooling methods may work if the beer can be served quickly. A hessian sack is layed over the cask and kept wet. Water evaporating from the sack cools the cask underneath. Some English brewers experimented with a foot shaped probe that was inserted into the shive hole of a cask, and has ice cold water pumping through it, but that method carries with it the obvious risks of introducing some contamination to the beer. A better method is the saddle shaped cooling coil that sits on top of the cask and is covered by a decorated plastic cover. Cooling solution can be pumped around the coils using a regular beer cooler readily available in this country, and several casks can be set up in series. Some brewpubs serve beer out of bulk tanks using handpumps and they will divide the cellar with a plastic curtain so that it has two different temperature zones. A number of bars have devoted one of their under bar coolers to cask ale, but space is often a limitation inside the cooler.



Tapping

Once the beer has finished working and been given at least 24 hours to clarify then it is ready to be tapped. Most English cellarmasters are capable of hammering in the tap without disturbing the settled yeast and finings, so tapping can wait until just before the beer is needed to be served, but tapping can disturb the sediment however, so it is advisable to tap a few hours before the cask is needed, to allow the sediment to resettle if necessary. The brass, stainless steel, or plastic tap should be cracked open slightly, held against the keystone then hammered into the cask with one sharp hit from a rubber or wooden mallet. The first half glass poured from the cask will be cloudy but the beer will soon be crystal bright. The line to the pump can then be threaded onto the tap, using a

more fully. The stillage may be shaped to hold a cask or may have a flat surface, which means the cask must be supported on wooden wedges called “scotches” or “chocks.” They should be placed with the largest side face down and 2 should be placed at the front of the cask to prevent rolling, and 1 at the rear to adjust the tilt angle. The cask should rest on the chocks and not on the surface of the stillage



Preparation for sale

Once the beer is stillaged it should be allowed to settle for a while to recover from the violent shaking of the delivery, the beer must then be vented to allow excess pressure to escape from the cask

Venting

First a solid wooden peg or hard spile is hammered gently through the tut in the middle of the shive. There will be a sudden escape of gas from inside the cask as pressure escapes. This peg is immediately replaced with a soft spile usually made from porous bamboo. (The soft spile is usually too short or soft to be hammered through the tut.) The beer will then fob, or “work” through the porous peg evolving excess CO_2 from the beer and settling down to equilibrium conditions for the given pressure (in this case atmospheric) and temperature conditions. If the cask is pressurised at all then the beer cannot be dispensed. When an American keg is used the pressure should be released through the gas inlet with the non return portion removed. This should be done regularly and completely until the beer stops producing any more gas. The beer cannot be served until it stops working. When the beer has been dry hopped or contains a lot of yeast then sometimes the porous peg can become blocked with material from inside the cask. It may be necessary to replace the spile several times during the venting phase. Once equilibrium is reached and the soft peg stops producing foam, or the gas vent stops releasing gas when it is opened, then the container should be closed up to prevent too much carbonation being lost. In a cask the soft peg should be replaced with a hard spile twisted in hand tight while the finings get a chance to clarify the beer further. With a keg you should just close up the gas valve and leave it closed. Some cellarmen will allow the beer to undergoe a further period of conditioning at this point, sometimes a few weeks

Auxiliary finings
Sometimes the beer will not drop sufficiently bright with just isinglass and so an additional fining agent may be used. This auxiliary fining agent may be derived from alginate, seawead, or silicates, and is negatively charged. It is capable of aiding the removal of positively charged colloidal particles from beer. Many English brewers add them on a routine basis to beer just as it goes into the cask. They cannot be added at the same time as isinglass because the opposite charges will cancel each other out. Measure the rate of usage in the same way that the rate of isinglass was determined. Most brewers use them at a rate of 3 - 1 that of isinglass.

Dry Hopping
Some brewers will add whole hops to the beer in the cask to impart some hop aroma to the beer. The conditions in the cask favour the extraction of some of the essential oil component of the hop but not the α acids, so there should be no risk of imparting any additional bitterness through dry hopping. 7-1 oz of whole hops are added per cask, depending on the style often in the form of hop plugs, as the cask is filled. Pellets cannot be used because they cannot then be seperated from the beer when it is to be dispensed. Although many people profess to love the hop they are not particularly welcome floating in your glass. Finings will not cause them to settle but they will tend to sink to the bottom of the cask, or float on the surface of the beer, and the line connecting the cask to the beer engine will have a strainer installed in it. Whole hops present a problem when using kegs since they can interfere with dispense through a spear, and the tapping apparatus. One brewer in Oregon places whole hops in a small bag inside the keg then staples the bag to the inside of the bung that is hammered into the side of the keg.

Delivery, Distribution and Stillaging
The beer should be sold as soon as possible after it has been fined, which is why self distribution is preferred. A beer can use up a lot of it's life sitting on a distributors warehouse floor. Storage temperature is even more important with cask beer than with keg beer, as the flavour and the fining action can quickly deteriorate at elevated temperatures. Storing the beer at too low a temperature may cause it to become a little overcarbonated. The beer should not be moved too many times or it will not clear. As soon as the beer is delivered to the bar it should be stillaged. If there is no room to stillage the cask immediately, then store the cask orientated in it's serving position, on it's side until a space becomes available, then gently lift it into position on the stillage without disturbing the sediment too much. If this cannot be done without disturbing the sediment then it is better to roll the cask to thoroughly remix the yeast and finings, and allow the cask to settle again. The cask should be stillaged horizontally, not tilted forward or backwards to ensure that the yeast settles into the belly of the cask, not around the keystone. It can always be tilted slightly forward later, to allow the cask to be emptied

The beer will then be fined just before it is shipped from the brewery.

Fining

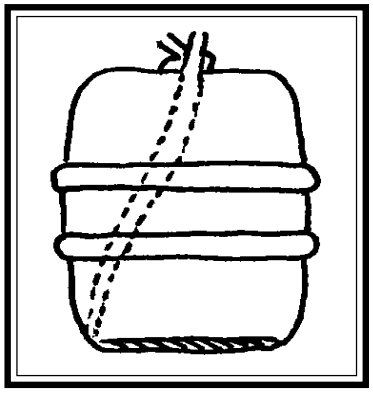
Isinglass

Finings are added to speed up the rate at which the yeast will settle on the bottom of the cask. They will not work on a beer that is still fermenting, so care must be taken to ensure that the secondary fermentation has ceased before finings are added. This substance is extracted from the swim bladder of the sturgeon, and some other tropical or sub tropical fish. It is prepared by soaking in a mixture of acids for many weeks. The colourless, viscous liquid produced by this treatment is rich in collagen, with a net positive electrical charge. The structure is like that of a large net, that when mixed with beer falls through the beer attracting and binding the negatively charged yeast cells, some proteins, lipids, and some antifoaming agents. The particles form large flocs that rapidly sink to the bottom of the tank or vessel. It is most often used in the UK but many micro breweries and brewpubs in the U.S.A. use it rather than filtering the beer. Used in conjunction with a silica based auxillary fining agent, isinglass can significantly reduce the yeast in suspension in beer. Isinglass does not work too well with high yeast counts ie over 4 million cells/ml and works best if the temperature is allowed to rise a little. Since it is a protein extracted from fish it is denatured at relatively cool temperatures (hence the extract from tropical fish) and should never be allowed to rise above 68 F. even in storage. Preparations are available that are already activated by acid and are then dessicated for storage. These preparations still require careful rehydration however, so instructions should be followed accurately. [NB.Commercial preparations have a sulpher based preservative added to them which will result in a slight increase in sulphites in the beer.]

Determining rate of usage

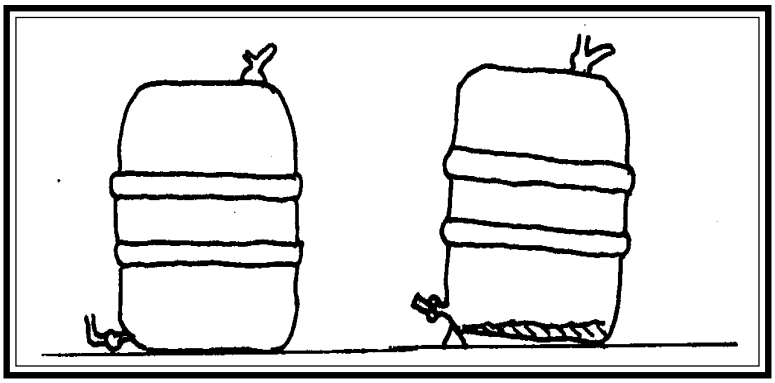
Prepare the finings according to the suppliers instructions. Use 4 tall glass cylinders and put 500 ml of the same beer that was racked into the cask in each. Add 2ml to one and mix thouroughly, add 4 ml to another and mix, try 6 ml and then 8 ml. Place them all out at room temperature and observe how much settles out at 12 hours and at 24 hours. Choose the rate that worked the best giving the most stable deposit in the quickest time, then when it is time to fine the beer calculate how much to add to the cask by multiplying the ml of isinglass in the test by 82 for an English firkin, and by 117 for an American 15.5 gallon keg.

When finings are added to the cask it is vital that they are well mixed. In the UK they are injected through the tut hole in the shive and the tut replaced by one of a different colour (to indicate that the cask has been fined , avoiding accidental double fining or shipping unfined beer). The beer is then loaded onto a truck soon after and shipped where it is hoped that the shaking during the truck journey will mix the finings and prevent the yeast settling out. Finings will only cause a beer to clear 4-5 times, so if the beer is moved too many times and allowed to stand in one place for too long then some of these “settlings” can be used up before the beer reaches the bar.



Golden gate

Once again these kegs are being replaced by brewers with the Sankey keg and there are a lot of them available at a low price. These kegs are different in that they have no spear. There is a vent in the top and a fitting for a tap in the bottom of the keg. If the keg is placed tilting away from the tap then the tap could be above the sedimented yeast. A small block could be welded to the keg once the correct angle is established. Beer could be served by gravity from these kegs if required.



Cask filling techniques

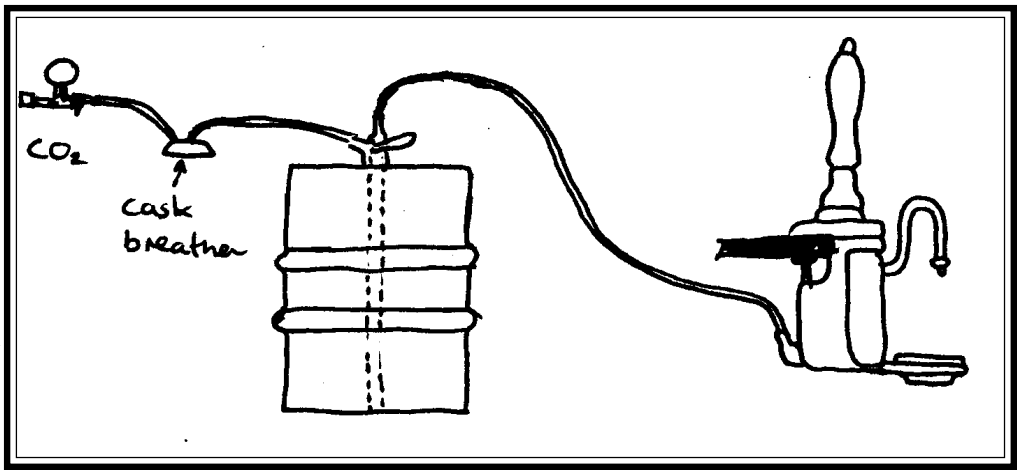
It is possible to fill casks directly from the fermenter, but if an entire fermenter is to be used then there is the risk that early filled casks will have higher yeast counts than those filled at the end. It is usual to fill casks out of a seperate racking tank. Any additions to be made to the beer can be added at his point (ie primings or auxillary finings) where they will blend well. Most American breweries will just fill a couple of casks from the primary fermenter after 7-14 days, just prior to chilling and filtration. The additions can then be made directly to the cask prior to filling to ensure adequate mixing.

The beer will then be sealed up and conditioned at around 50-55ºF. for a few days while the yeast ferments the residual sugars, the flavour matures, and the beer "comes into condition" Excess carbonation produced during maturation may need to be vented from the cask occasionally

US alternatives

Sankey Keg

This is a single entry keg with a spear that removes beer from a small well in the bottom of the keg. That means that if beer were keg conditioned in such a keg then the sediment will mostly be drawn off with the first few pints, which would be unservable. The remaining beer will be clearer but will will not undergoe any further maturation. The beer will have to be removed with a hand pump connected to the outlet of the tapping device. Air can be allowed into the keg through the gas inlet valve, or a small CO_2 "blanket pressure" can be applied. Some brewers may consider removing a portion of the spear, about 1 to 1 inch to attempt to draw beer off from above the sediment. Unless the sediment is very firm however, the pumping action can still draw sediment up the spear, and there will always be some beer left behind in the barrel.



Hoff Stevens.

This is an older style of keg on it's way out of favour with both brewers and distributors. They are readily available at a low price. These kegs are similar to Sankey kegs in that they have a spear, but the spear is made of plastic and is much thinner. It also runs down the inside of the keg wall and not into a well. They also have a bung hole in the side that makes filling easier. Since it is unlikely that a brewer will need the keg again for regular beers, modifications can be made to the spear. With this method most of the yeast remains with the beer until the keg is emptied. The keg still needs to be stored standing on it's flat bottom and the beer removed via a hand pump. Unless the sediment is firm then cloudy beer can still be pulled up the spear by the suction pressure of the pump. One brewer in Pennsylvania is producing and distributing all of their beer conditioned in this manner.

report that they had good results using actively fermenting wort as a priming agent, but very few English brewers use this method. Malt extract presents similar problems.

Maltose Syrup.

Many English brewers have success using this material which is less sweet and increases mouthfeel, but it is very difficult to find in this country. Corn syrup can be used instead.

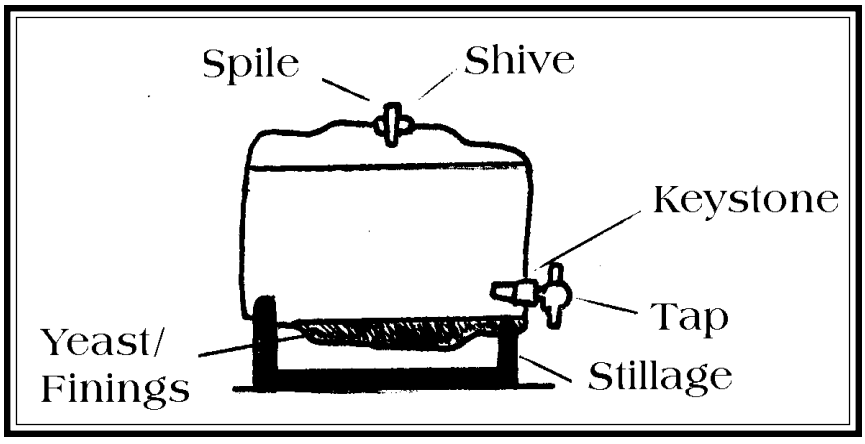
Anatomy of a cask

Traditionally casks were made from wood but now stainless steel is mostly used. Some brewers use lined aluminium casks, but the usual cleaning chemicals cannot be used. Casks come in a variety of sizes with traditional names

	Imp.Gallons	U.S. gallons
Pin	41	5.4
Firkin	9	10.8
Kilderkin	18	21.6
Barrel	36	43.4
Hogshead	54	64.8

(these sizes are not approved for sale in all States)

They are the traditional round bellied barrel shape with a hole for filling, and venting the cask halfway down the side. On the flat end toward the edge of the cask is a hole for the tap. The casks are stored and served from on their sides with the vent hole facing up and the tap hole facing down. The filling hole is plugged with a wooden or plastic plug called a shive. It has a hole drilled part of the way through to allow a vent peg to be hammered through, or it may be drilled all the way through and then plugged back up with a plastic "tut". The wooden or plastic bung for the tap hole is called the keystone. It is turned to be weaker in the middle to allow a dispense tap to be hammered through. When the cask is in serving position the excess pressure can be vented off through the shive, and the tap is hammered into the keystone. The yeast sediments into the belly of the cask and clear beer can be drawn off through the tap above the level of the yeast.



before falling back in, so must be collected at the right time. Some brewers skim this layer off the top leaving a layer 2-3 inches thick on top, and save it for subsequent repitching, others drop the beer out from under the yeast to a settling vessel for maturation at that point. Either way the beer will throw a final head of thick yeast about 2 inches thick that will form a crust protecting the beer underneath, while the fermentation continues to the terminal gravity. Brewers sometimes chill the beer at skimming time to 45-50^{o}F, to arrest fermentation to leave some residual extract, and hold it there for a further 3-4 days. Others wait until the beer reaches the attenuation limit before chilling. Chilling and skimming help to sediment out the yeast, leaving enough in suspension to carry out the required secondary fermentation in the cask.

Maturation of beer

The beer must be prepared for cask conditioning to ensure consistency. It is important to ensure that an even consistent yeast count be achieved before racking. It is difficult enough to control the fermentation occuring in the cask as it is, so care should be taken to ensure consistency in the parameters that can be controlled. If the yeast behaves well and always leaves behind the right amount no matter how much you pitch, how much growth occurs, when you skim, how much you skim, when you chill, and how long the beer sits before racking then don't worry. If you have a normal brewery, however, then be prepared to make some adjustments. Some brewers will filter beer then add back a measured count of yeast, others will fine the beer and do the same. Most will aim for consistency in their fermentation practises and if a batch shows a problem with yeast count, either wait until it is right, or blend it off. The correct yeast count at racking should be between 1 and 3 x 10^{6} cells/ml based on the yeast strain and the yeast should be viable and healthy. There should be between 1^{o} and 2^{o} Plato present in the beer for secondary fermentation. If fermentable extract needs to be added in the form of primings then it is normally added in to the bulk beer just prior to racking. The beer should be transfered to a racking back prior to racking to ensure an even distribution of yeast and fermentable material throughout the beer. Brewers have a variety of options when it comes to sources of extract for secondary fermentation, and the brewer should experiment to discover which method works the best.

Options are:

Sucrose

When it ferments fully it ferments very quickly but leaves a dry taste. If it does not ferment fully it will leave a sweet taste in the beer.

Dextrose

Ferments at a moderate pace but can leave a "honey" sweetness if not fully fermented out. It is the most commonly used priming sugar in the USA due to it's availability

Wort and Krausening

Too much needs to be added and there is often a problem with adding wort. You are adding more dextrins, and more proteins from the wort to already fermented beer. The krausening step in lager maturation is followed by a long period of ageing and chill stabilization, wheras with ales the ageing process is shorter and the inevitable hazes can be a problem. Fal Allen, Dick Cantwell, and Kevin Forham at Pikes Brewing in Seattle

CASK CONDITIONING

In this lecture I will be talking about a subject dear to my English heart…. Cask conditioned beer. I think it might be useful to start with a definition of what I am talking about when I say "authentic" cask conditioned beer. The Oxford English Dictionary definition of Real Ale is…. "A name for draft (or bottled) beer brewed from traditional ingredients, matured by secondary fermentation in the container from which it is dispensed, and served without the use of extraneous carbon dioxide." A kind of English Rheinheitsgebot, and similar in that it need not be taken literally in order to produce a great product. "Real ales" can be produced using modern ingredients, reracked into a second container for serving, and, certainly, can be dispensed using a protective layer of carbon dioxide. So, is it enough to pour your regular beer into a keg, warm it up, hook it up to a hand pump and pour it into customer's glasses claiming that it's cask conditioned, a tactic frequently employed in brewpubs across America? To me that is like paying lip service to the notion that all that most beer drinkers notice about English beer is that it's warm and flat. Cask conditioning allows a beer to be presented in a form that emphasizes the subtle nuances of a beer, a well-balanced beer will shine in this environment allowing the palette to separate, enjoy and, at the same time, appreciate the balance of a well-brewed creation. Given that, and realizing that most brewpubs are not going to be producing all of your beers this way, exactly what are the factors that you can replicate, and where will compromises have to be made?

I have frequently read, and heard it said, that to produce authentic English beer you need to use authentic English malt. This is probably true and refers to the fact that English malt has a lower protein content and so it is easier to clarify beer made from it. The malt in Britain is also kilned to a lower moisture content and so has a slightly darker color and richer flavor. However, most of you are going to be filling a few casks from a fermenter destined to be filtered, carbonated and served in the regular way. You will be using good old American two-row malt for your regular brews because, it's cheaper, it's more convenient, it works and it makes damn fine beer. I wouldn't necessarily insist on English hops either, since not all traditional English cask conditioned beers are dry-hopped, and many British brewers are using large numbers of American hops in their brews.

The topic of this article is producing cask conditioned beer but in order to fully address the subject we need to pay some attention to serving it.

First lets look at fermentation.

Fermentation

Fermentation is carried out in the same way as it would be for any other ale. The beer will be fermented using a top cropping ale yeast at temperatures ranging from 65 to 75ºF. The fermenter will usually be open but it may have a lid. The temperature may be allowed to rise a few degrees during the fermentation and that rise will be controlled. The primary fermentation will take 3-4 days until the the terminal gravity is reached. The first foam head will appear after 8-12 hours of fermentation and will be white with a lacing of brown in it. A second fluffy yeast head will start to appear after 18-24 hours and the brown solids in the first head will be pushed to the side of the tank and form a ring round the tank. As the gravity reaches 1.014 - 1.010 the main crop of yeast will rise to the surface and will be thick and golden coloured. This will remain for only a few hours