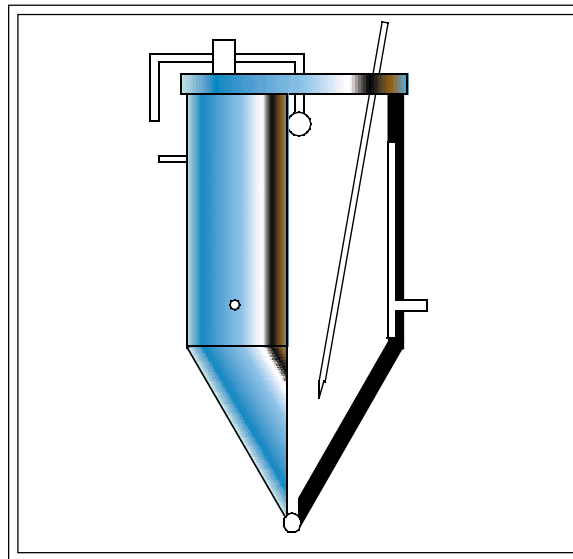




PRACTICAL YEAST MANAGEMENT IN THE BREWPUB

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YEAST

As a brewer, you will keep yeast in the brewery, reuse it, and expect a controlled mutation. Unfortunately, yeast, like all biological systems, follows the rules of chaos theory, and is inherently difficult to control. By applying some basic principles of yeast management you can make your yeast healthy and somewhat predictable.

YEAST STORAGE

In many ways, yeast storage conditions are as important as yeast propagation. Storage of yeast leads to loss of growth factors, and the amount of this loss depends on the conditions of storage. Degeneration of the yeast is increased at higher temperatures, and in general, the yeast must be kept cold and free from oxygen and bacteria (if yeast is pressed first it can withstand higher temperatures and oxygen exposure). Alcohol in high concentrations is also toxic to yeast, so storage in beer may result in reduced performance. If the yeast is stored under CO₂ saturation conditions it, may develop CO₂ toxicity.

Cone Storage

Cone storage is very common in many brewpubs. It is important to get the yeast out as quickly as possible to avoid yeast autolysis characters in the beer.

- Can have: High alcohol, CO₂ and pressure
- Low oxygen conditions
- May be high temperature due to insulating qualities of yeast (This can be reduced by cone cooling jackets on the fermentor)
- Fairly free from bacteria

Yeast Brink

Use of a dedicated yeast brink has several major advantages over cone storage. The major difference between a yeast brink and a propagator is that a propagator should have variable temperature control while a yeast brink, which is intended for harvesting, pitching and storage, may simply be placed in a cold room for storage.

Yeast brinks may come in many forms, from buckets to kegs or soda cans all the way up to dedicated tanks. In a brewpub setting, the best option is probably the soda can because of its availability and versatility (see section on soda can propagators). In general, yeast brinks are a good storage because the temperature can be kept low (by placing in a walk-in cooler), and is possible to achieve low oxygen levels. A yeast brink also has advantages over cone storage because it allows for better pitching (see section on propagation) and does not have the yeast autolysis problems found in cone storage. A yeast brink may also be a good place to wash the yeast prior to pitching.



YEAST PROPAGATION

BREWPUB OPERATIONS

In a brewpub, the options for propagation are much more modest than a commercial brewery or even a microbrewery. Small brewpubs may not even have any means of yeast propagation other than the use of the cone of a cylindroconical fermentors. In reality, there are several viable options for even the smallest brewpub to allow more control over yeast propagation without spending a fortune.

The main options for yeast propagation employed in brewpubs are:

- No propagation
- Propagation from purchased or “borrowed” slurry
- Propagation from slant preserved colony

No Propagation

If you choose to avoid propagation in the brewery, you can get your yeast from another brewery or from a yeast laboratory. Getting the yeast from a laboratory can be expensive if you want to get a full pitching quantity, but it may be the safest option. It is important to keep in mind that laboratories are not fool proof, and that you should check the quality control record of the laboratory that you choose to get your yeast from.

Getting a full pitching quantity of yeast from another brewery can be inexpensive, but also has risks. You will inherit any microbial spoilage problems the other brewery may have, and your brewing schedule will be partially tied to the schedule of the other brewery. Be sure that you trust the propagation and brewing practices of the brewery that you are dealing with and have other options available in case of an emergency. Washing of the yeast when re-pitching may be a good option to keep down the bacterial contamination you may inherit from another brewery.

Propagation From Purchased or Borrowed Culture

The simplest method of propagation is to purchase or borrow a small culture, perhaps a one liter starter slurry and grow this culture up into a pitch-able quantity of yeast. If you are planning on purchasing from a laboratory, this is a much more economical method than purchasing a full pitching quantity.

To grow up the yeast from this starter slurry, you will need a propagation system, although it may be as rudimentary as a homebrew fermentor. You will also need clean hopped wort for growing up the culture.



YEAST MANAGEMENT IN THE BREWPUB

By assuming some of the risks of propagation, you will decrease your costs and increase your control over the propagation. If there are any problems with the yeast, you may notice them before you actually have to pitch a full batch. However, you may also cause problems during your propagation as well.

Generally speaking, a one-liter pitch of yeast is fairly inexpensive from a yeast laboratory, and the capital expense depends on the type of propagator you choose to purchase. It may take from 2-3 days to propagate up a pitching quantity of yeast from this starter culture, but you may want to allow 4-5 days for better yeast health (it is better for the yeast to complete fermentation and go into the stationary phase before re-pitching).

Propagation from Slant Preserved Colony

Full propagation from a slant preserved colony requires more time and knowledge than simpler methods, but it also grants you full control over the propagation. You will need some basic laboratory equipment in addition to a propagator.

The cost of full propagation is mainly in the capital costs of the lab equipment and propagation system, since the initial culture will be relatively cheap. Full propagation requires much more planning than other methods, since it may take from 10-15 days before the yeast will be ready for pitching from the start of the propagation.

One of the main requirements for successful propagation is a working knowledge of microbiology and sterile transfer technique.

PROPAGATION VESSELS

Various propagation vessels include:

- Cyindroconical fermentor cone
- Bucket
- Soda Keg (Cornelius Cannister)
- Keg (with adaptations)
- Dedicated propagator

Bucket

Although a five gallon bucket is not the most elegant solution to the propagation question, it is a popular one that can work. Using plastic food grade buckets has its risks since scars on the interior of the bucket can harbor bacteria. You can use disposable food grade liners for better sanitation, but you still must pitch the yeast through the door of the fermentor rather than in-line with the wort. Also, there are little or no temperature control options with bucket propagation. However, storing the yeast in a walk-in cooler will allow you to preserve the yeast after it is harvest or propagated.



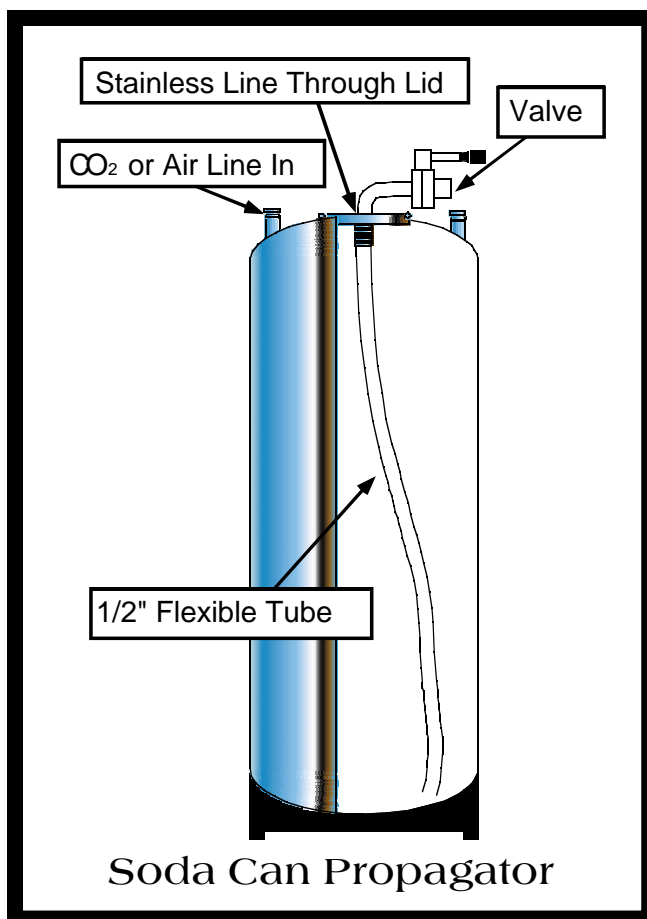
YEAST MANAGEMENT IN THE BREWPUB

Soda Can

By adapting a Cornelius soda cannister with more sanitary fittings, a brewer can create a relatively cheap yeast storage, pitching and propagation system. Because the quick connects are prone to contamination and may be too small to allow flow of a thick yeast slurry, it is important to install a larger line that penetrates the lid of the “Corny can”. Inside the can you can install a hose barb and attach a flexible 1/2” hose to the barb for dispensing the yeast. The inlet quick connect can still be employed for forcing pressure into the can to push out the yeast. You can also force air into the downspout to help with yeast growth during propagation, but this may be difficult due to foaming. Even if you have properly adapted the soda can, it may still be difficult to sanitize because of the small fittings. The best option is to fill the soda can with a no-rinse sanitizer after cleaning and leave it stored in this fashion for the next filling. You should also consider buying your soda can new (around \$90) to avoid risk of off flavors caused by soda flavorings. At a minimum, it is best to should replace all of the gaskets on a used soda can.

One of the biggest problems with a soda can is its small volume which may not allow for enough yeast growth to pitch a 15 bbl. batch. In many ways, an adapted soda can is better for yeast storage and pitching than it is for actual propagation.

Another advantage of a soda can is its use as a pitching device. By placing the yeast filled soda can on a scale and hooking it up in-line with the cooled wort flow into the fermentor, you can accurately weigh the amount of yeast being pitched. Pitching by weight is a useful technique for estimating pitch rate. A good rule of thumb is $1\text{lb}_{\text{yeast}}/\text{bbl}_{\text{beer}}$ for a thick slurry and a average gravity beer. If you are using a haemocytometer to count cell concentration, you can pitch either by weight or volume depending on your dilution technique.





YEAST MANAGEMENT IN THE BREWPUB

Keg

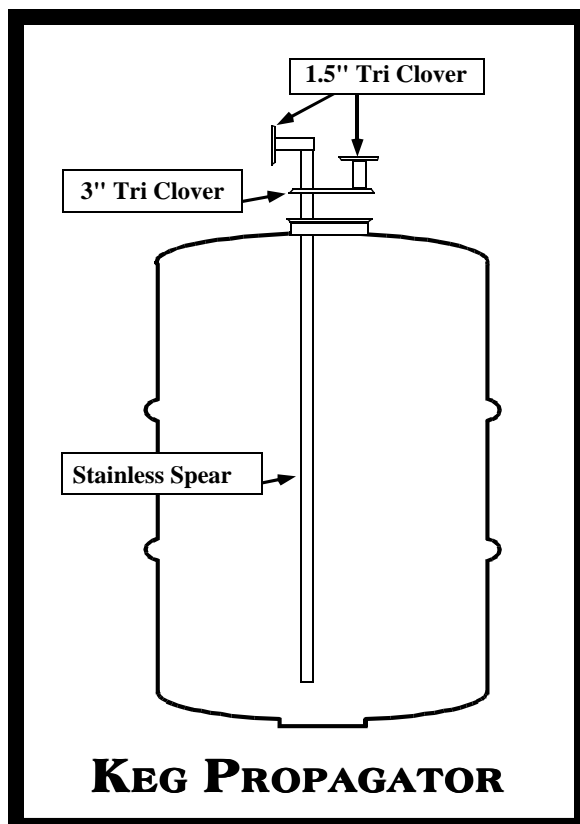
Adapting a regular straight-walled Sankey keg with a large sanitary fitting on the top, and inflow and outflow lines, (see diagram) is relatively inexpensive. The keg provides greater capacity than a soda can. The keg size is better for propagation and is generally easier to clean than a soda can. You can even sterilize the wort for propagation use by placing the keg on a stove and boiling the wort.

An important adaptation for all of these propagation systems is a sterile air filter to allow you to push air into the propagator during the propagation. This would also be important after sterilizing the wort, since as the wort cools it will pull in air to compensate for compression.

As with the soda can or bucket, temperature control is difficult in a keg propagator. However, it is possible to fit a glycol jacket around the keg or to put it into an area attached to a walk-in cooler with a separate thermostat (cooled air can be blown in like in a dispense line cooling system). One advantage of a keg propagator in a brewpub is that you can place the keg (full of wort) on a stove and boil it to sterilize the wort. If you do use this method, remember that the vapor and liquid in the keg will compress as it cools. Venting will allow air (through a sterile filter) and avoid compression.

Although a keg is larger than a soda can, it is barely sufficient to grow up yeast for pitching a 15 bbl batch. Aeration of the yeast to encourage growth is important to get high enough concentration of the yeast for pitching.

To measure the pitch by weight you will need a scale with a capacity of 150 lbs, and 0.1 lb precision—an expensive item. The best option is to measure the pitch by volume or transfer to a soda can for pitching.





YEAST MANAGEMENT IN THE BREWPUB

Cylindroconical Fermentor Cone

The cylindroconical fermentor cone is the most common propagation system in most brewpubs. It's main advantage is that it is inexpensive (as long as you already have a cylindroconical fermentor). There are several ways of making this system work, and they all depend on the number of free fermentors you have available, and whether you have some method of making up small quantities of wort. If you have a pilot system of some sort, you can make up 1.5 barrels of wort, and put it into the bottom of a 15 bbl fermentor along with your yeast and ample aeration. After the fermentation has finished (2-3 days), you can add an additional 13.5 bbl to the tank, again with aeration. Although this method often results in underpitching, it is fairly sanitary, and there are no yeast transfers involved. You may also simply brew a smaller batch and top that up, but it may increase the variability of your brew.

Another method requires two empty fermentors. You will do a full brew, and put 13.5 bbl into one fermentor, which you will grow up with the old yeast that you are phasing out. The remaining 1.5 bbl of wort will be put into the cone of the other fermentor, and the new yeast will be added along with aeration. Although many breweries will top up the second tank the following day, it is preferable to wait for several days until the yeast has finished its growth cycle. This method is simple, but the need for two empty fermentors, along with the need for two brews of the same style (unless the excess beer is decanted off before adding the second brew).

Overall, using a fermentor cone for propagation gives you very little control of the pitch rate, and in many cases you will be underpitching. In addition you need to have cone cooling to use this method.

Dedicated propagator

The most expensive option is a dedicated propagation tank. This system gives you the greatest control and flexibility over the propagation process, and can have any or all of the following features (listed in order of importance):

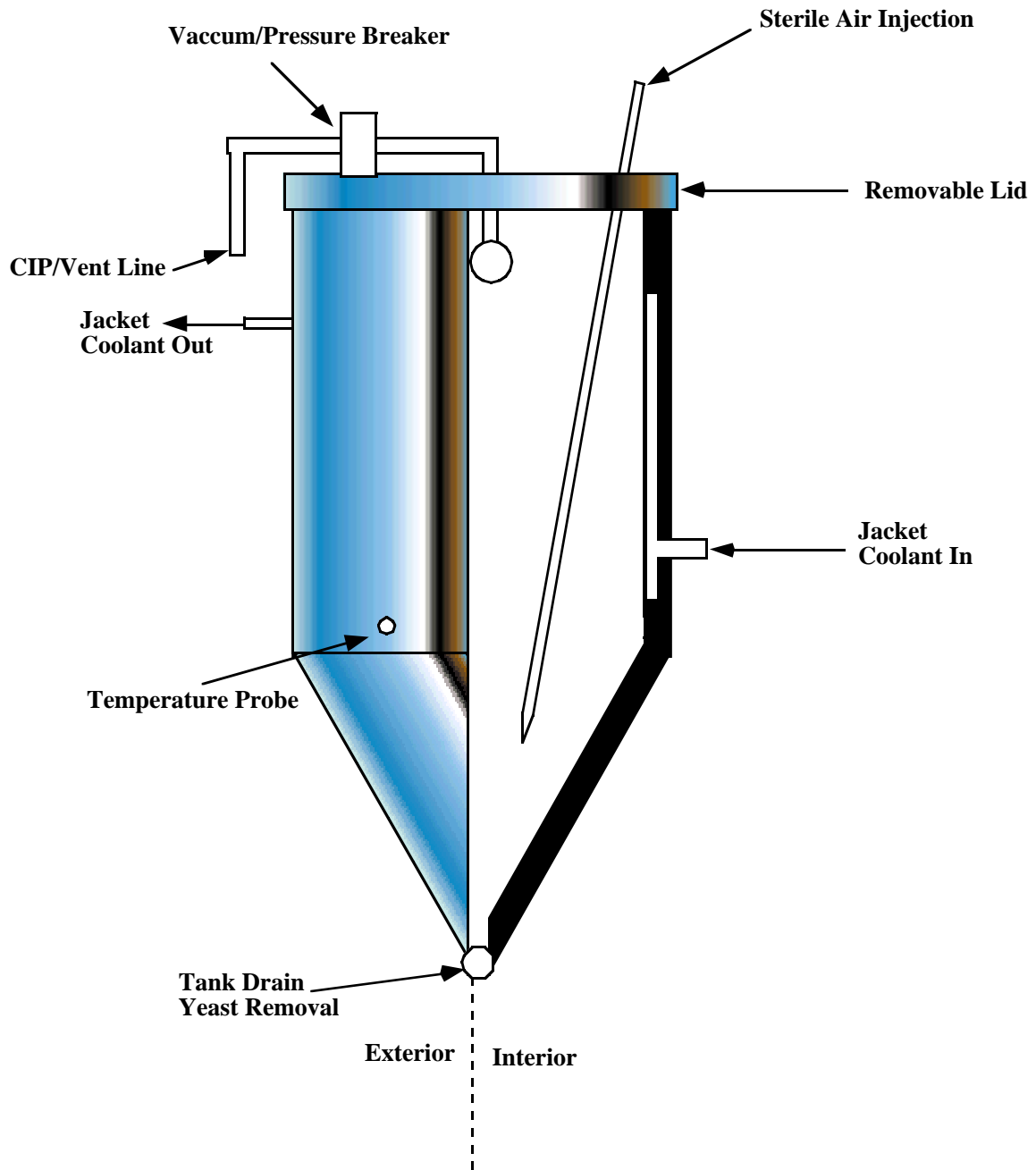
- with cooling
- with aeration
- with stirring
- with heating
- with load cells/flow meter

A properly installed jacket can be used for both heating and cooling simply by installing quick connects to the jacket that allow a transfer from glycol to a steam source. This feature is definitely above what most brewpubs will require.

Although stirring is not required, it is an excellent feature that will increase the homogeneity of the pitch, and increase the growth rate during propagation. Sterile air can be used to stir the slurry by injecting air through a "lance". However, as the slurry gets thicker this may not be sufficient.



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DEDICATED PROPAGATOR



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If you wish to pitch by weight you may also consider transferring the settled yeast slurring into another container for pitching (i.e. a soda can) to allow for accurate measurement of the pitch. Otherwise you should mix the slurry and measure by volume.

Wheels on the propagator will allow for portability, but the cooling lines and temperature controller must have disconnects as well. If you plan to use the jackets for both heating and cooling, portability may be important since the glycol and steam supply may be in separate locations.

One of the biggest advantages of a dedicated yeast propagator is the speed with which you can grow up the yeast. If the propagator is of sufficient quantity, it will allow you to bridge the gap between flask propagation and pitching with just one step. Because it is simple operate a dedicated propagator, you may be able to manage multiple strains with less trouble, giving you the option to produce more beer styles.

FURTHER READING:

D. Jolda, "The Yeast Directory," *1996 Brewer's Market Guide* (Brewing Techniques, Eugene, Oregon, 1996), pp. 40-59.

P. Farnsworth "Propagating Your Own Yeast," *The New Brewer*, September/October 1997, pp. 65-73.

ON THE INTERNET

Additional information on yeast management is available at the American Brewers Guild Web Site at:

<http://www.masterbrewer.com>

For further questions or comments:

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Credits

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