

ELECTRIC BREWING  
SYSTEM TIPS

AMAZING HOME  
BAR SET-UPS

PARTIAL-MASH  
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# Brew

THE HOW-TO HOMEBREW BEER MAGAZINE

## YOUR OWN

NOVEMBER 2012, VOL.18, NO.7

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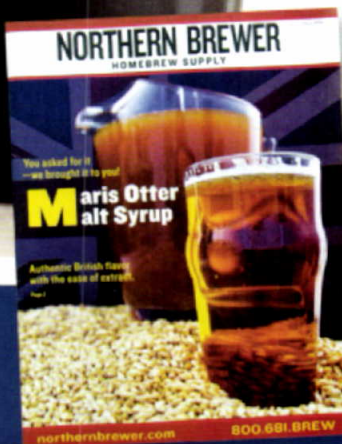
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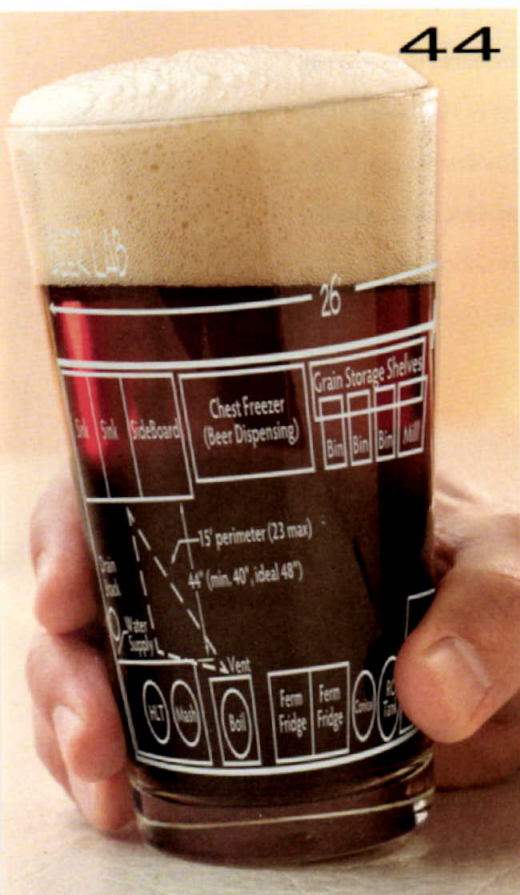


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## BYO RECIPE STANDARDIZATION

**Extract efficiency:** 65%

(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one gallon of water, would yield a wort of 1.024.)

**Extract values  
for malt extract:**

liquid malt extract  
(LME) = 1.033–1.037  
dried malt extract (DME) = 1.045

**Potential  
extract for grains:**

2-row base malts = 1.037–1.038  
wheat malt = 1.037  
6-row base malts = 1.035  
Munich malt = 1.035  
Vienna malt = 1.035  
crystal malts = 1.033–1.035  
chocolate malts = 1.034  
dark roasted grains = 1.024–1.026  
flaked maize and rice = 1.037–1.038

**Hops:**

We calculate IBUs based on 25% hop utilization for a one hour boil of hop pellets at specific gravities less than 1.050.



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# what's happening at **BYO.COM**

## TLC For Stainless



In addition to everyday maintenance and upkeep, every homebrewery needs some extra attention from time to time to keep all of the equipment in good shape. This is especially true for any of your stainless steel equipment. Check out some advice for caring for your stainless.

[www.byo.com/component/resource/article/1548](http://www.byo.com/component/resource/article/1548)

## Keep Your Brewhouse in Peak Form

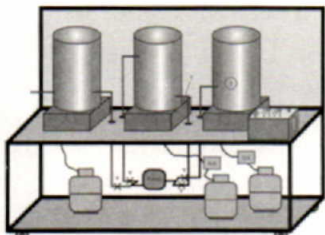


One of the biggest differences between your homebrewery

and a microbrewery is how the equipment is maintained. Commercial breweries follow very strict maintenance regimens. There is no reason you cannot maintain and sanitize equipment relatively the same way the big dogs do.

[www.byo.com/component/resource/article/951](http://www.byo.com/component/resource/article/951)

## ABCs of Recirculated Brewing Systems



In many ways, homebrewing is a scaled down version of commercial brewing.

However, homebrewing has yielded some unique brewing solutions. One such solution is the RIMS, which stands for recirculated infusion mash system. Learn the basics of RIMS systems.

[www.byo.com/component/resource/article/84](http://www.byo.com/component/resource/article/84)

# Brew

THE HOW-TO HOMEBREW BEER MAGAZINE  
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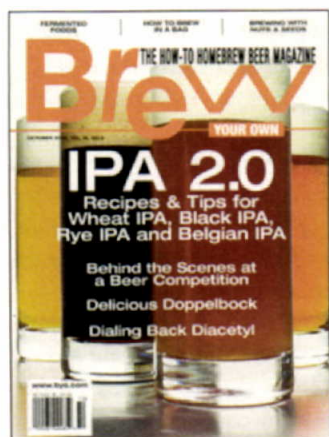
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### Pecan portion

In the October 2012 issue of *Brew Your Own*, the instructions for Pecan Doppelbock (p. 30) call for adding 1 cup of crushed pecans to the first mash rest and 2 cups of crushed pecans to the second mash rest. However, the total amount of pecans (3 cups) was left off the ingredient list. We hope this didn't cause any confusion.

### Digital copy a hit down under

Just got myself a digital subscription and downloaded the *BYO* app. Drinking a Duvel and reading your mag — Heaven.

Peter Youngquest  
New Zealand

Glad you are enjoying our magazine. We hope that the new digital subscription allows homebrewers all over the world to enjoy *BYO* now that physical copies do not need to be air-mailed (which is more expensive).

We also hope to start integrating interactive features into the digital subscription as soon as possible. In the first digital issues, internet links will be live and send you to the appropriate page, when clicked. For example, we could point out that if you wanted to brew our own Duvel-like beer, you could see Mike Heniff's recipe for Mike's "Devilish" Belgian Strong Golden at: <http://byo.com/stories/recipeindex/article/recipes/94-belgian-strong-ale/1807-mikes-devilish-belgian-strong-golden>.

As time goes on, we hope to have animations or embedded videos where they would be helpful in better explaining brewing ideas. And eventually, we'd like to have your digital device project 3-D holograms of Princess Leia. ("Help me Obi Wan, my mash is stuck.") Don't hold your breath for that last one appearing anytime soon.

### Getting started with starters

I have been brewing for awhile, but only recently have begun to get more serious about it. Specifically, I am hoping to make my beers taste more like professionally-brewed beers as opposed to homebrew. Looking around



Christian Lavender is an Austin, Texas area homebrewer who runs [kegerators.com](http://kegerators.com), a site devoted to finding the best prices on kegerators. You can also ask kegerator-related questions on the site and he will answer them.

In the November 2011 issue of *BYO*, he described how to build a homebrew bar with everything a homebrewer would want. In addition, he has contributed several installments of our "Projects" column in the past couple of years.

On page 36 of this issue, Lavender describes how to sanitize some of the hardest to clean parts of a homebrewing system, including plate chillers, ball valves, sintered air stones and more.



John Blichmann is President of Blichmann Engineering. For years, he worked at Caterpillar, among other things designing 8,000 horsepower diesel engines. Blichmann has been a brewer since 1991 and is a BJCP judge, but admits that design-

ing the equipment is his true passion. He founded Blichmann Engineering in 2001 in order to focus on designing and producing homebrewing equipment, including kettles, fermenters plate chillers and more (that can be seen at <http://www.blichmannengineering.com>).

On page 44 of this issue, he puts his engineering background to use in explaining how to layout a homebrewery to optimize your brew day workflow.



Glenn BurnSilver is a freelance writer who enjoys outdoor activities, including hiking and camping. He has lived in Colorado and Alaska, but now lives in Scottsdale, Arizona. BurnSilver is also an avid record collector and travels across the

United States to record conventions to buy and sell albums. His website, [www.burnsilver.com](http://www.burnsilver.com), contains his blog, *Liner Notes*, in which he reviews albums and concerts.

Glenn has written extensively for *Brew Your Own*, including compiling several clone recipe stories (for example, the summer beer clones in the July-August 2009 issue). On page 56 of this issue, he introduces North American homebrewers to a new homebrew club in China and relates how homebrewing is slowly catching on there.

at various sources, I see that making a yeast starter is something that is widely recommended. However, different websites give wildly different accounts of how one is made. Is making a yeast starter worth my while and if so how, exactly, should I go about making one?

Cody Cruikshank  
Lexington, Kentucky

A variety of different flavors have been characterized as "homebrew" at one time or another, ranging from flavors in beer made from malt extract that was not as fresh as it should have been to off flavors from contamination or not running a proper fermentation.

You can make beer that tastes every bit as good as professionally made beer. (Better even, because homebrew doesn't need to be shipped to reach your fridge or local bar.) However, you need to take the same amount of care that professional brewers making quality beer do — and this includes pitching an optimal amount of yeast. So, yes, making a yeast starter would almost assuredly help you.

Here is one way to make a yeast starter. There are endless variations on the details, but the basic principles are the same. A yeast starter is small batch of beer made with the purpose of raising healthy yeast for your main batch. To make a yeast starter, first determine the volume of wort you

will need to ferment. For 5.0 gallons (19 L) of moderate-strength ale (5–6% ABV), a 2 quart (2 L) yeast starter is the right size. Larger starters are required for higher gravity ales and for lagers.

The website [mrmalty.com](http://mrmalty.com) hosts a pitching rate calculator that is very handy for calculating optimal yeast starter size. With modern packages of liquid yeast (that contain around 100 billion cells, when fresh), making a yeast starter smaller than 1 quart (1 L) is not recommended.

Make low-gravity wort (SG 1.020 is plenty) by boiling some malt extract, cool and transfer to a clean and thoroughly sanitized container. Gallon jugs work great for this. Aerate the wort, at a minimum by capping the container and shaking, but better yet by injecting air or oxygen into the wort. Pitch your yeast, attach an airlock to the vessel and let the starter wort ferment "warm" — from ale temperatures up to around 80 °F (27 °C) is fine. You are raising yeast at this stage, not making beer, so don't worry about fermenting warm (even for lager strains). Once the starter has fermented, let the yeast settle (you can speed this by cooling the beer). On brew day, pour the beer off of the yeast sediment, swirl and pitch your yeast. (See <http://www.byo.com/stories/article/indices/58-yeast/1102-making-a-yeast-starter-techniques> for more details and a table of yeast starter sizes.) **BYO**

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# homebrew nation

## READER PROJECT

Eric Schulz • Grandville, Michigan

### Homemade Mini Kegs



I have a nephew who works in engineering who had come across these pressurized stainless steel canisters used for applying pressurized paint, etc. They didn't meet spec for resale, so they were going to scrap them and asked if I had any interest in saving them. After looking at them, I decided to try to convert them into kegs for my homebrew. I have been brewing for 10+ years, all-grain with a homemade cooler mash tun, and have recultured yeast, but I had never keged before.

After taking these to Lowes and a local hardware store, I found the proper fittings, valves and hoses to convert them to a keging system. I did own a smaller mini fridge, which is too small for Cornelius kegs, but two of these fit with room for a CO<sub>2</sub> tank in the back ledge — how perfect. The cost was about \$40 each in

hardware and gauges, plus whatever the stainless steel canisters cost. I did purchase a portable CO<sub>2</sub> injector for \$20–30 with small CO<sub>2</sub> cartridges for maintaining the 5–7 PSI pouring pressure as well.

The size was desirable for me to take these on the road to parties, bonfires, and camping with my little fridge; or just using a drywall bucket and ice to keep cool. Homebrewing and building my own equipment is a fun little hobby I must say — and this project was fun to build . . . just to say I could.

byo.com brew polls

Do you have your own homebrew bar setup?

No, but I would like to: 59%

Yes: 29%

No, I'm not interested: 12%

we WANT you

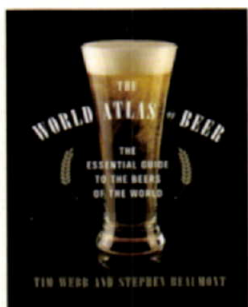


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Email our editors at [edit@byo.com](mailto:edit@byo.com)

# what's new?

## The World Atlas of Beer: The Essential Guide to the Beers of the World



This comprehensive, fully illustrated volume on beer by Tim Webb and Stephen Beaumont provides an in-depth history of beer — its origins, brewing methods and technologies, trends, and more, from ancient times until the present day.

\$30, at most major booksellers

## The BottleCap™



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## The Kegging Part



The problem of moving between your homebrew setup and a commercial setup has been solved. MerkTech Industries announces the debut of a new keg coupler adapter, The Kegging Part. It threads directly onto the coupler, providing you with an easy-to-use ball-lock connection. Works with any style keg coupler including the ubiquitous American sanke.

[www.TheKeggingPart.com](http://www.TheKeggingPart.com)



# calendar



## November 10 Monster Mash Brandon, Mississippi

The Homebrewers Association Of Middle Mississippi will host an awards ceremony to release the results of their annual homebrew competition on November 10. Registration for the event is open until October 19, and all beer categories will be accepted. Register online for entry or to volunteer as a steward. Entry Fee: \$5 per entry  
Deadline: October 19  
Contact: Brad Lovejoy,  
[president@hbamm.org](mailto:president@hbamm.org)  
Web: <http://hbamm.org/beercomp/>

## November 11 London, Merton, United Kingdom

The London Amateur Brewers invite you to enter your homebrews in their annual London and South East Craft Brewing Competition, which is held in conjunction with The London and South East Craft Brewing Festival.  
Deadline: November 10  
Entry Fee: £10  
Contact: Paul Henderson,  
[paulhenderson@yahoo.co.uk](mailto:paulhenderson@yahoo.co.uk)  
Web: <http://londonandsoutheast.brewcompetition.com/>

## November 17 Sunshine Challenge Winter Springs, Florida

The Central Florida Home Brewers along with World Of Beer Altamonte Springs present the 22<sup>nd</sup> Annual Sunshine Challenge Beer Competition and Festival. The Challenge is a two-day event combining a wide variety of activities in the Central Florida Home Brewers club homebrew competition. The Sunshine Challenge includes a Friday night beer festival, a Saturday afternoon pub crawl and Saturday night awards dinner. Guest of Honor brewers this year are John Cochran and Brian "Spike" Buckowski with Terrapin Brewing Company from Athens, Georgia.  
Deadline: November 4  
Entry Fee: \$6  
Contact: Chris Chubb,  
[cchubb@codegurus.com](mailto:cchubb@codegurus.com)  
Web: [www.cfhb.org/sunshine-challenge](http://www.cfhb.org/sunshine-challenge)

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## homebrew nation

### homebrew drool systems

#### The Doghouse Brew Rig

Clay Grogran • Richmond, Virginia



This is my fully automated, self-contained, portable brew rig that my wife affectionately dubbed "The Doghouse." It uses a high- and low-pressure gas system with Honeywell furnace valves and Auberins PIDs. It has two removable arms that are used to maneuver the rig like a wheel barrow and one of the arms doubles as a mount for the control panel.

I had very little room for storage so everything folds up or fits underneath. It has larger pneumatic tires so it can be rolled through the yard without getting hung up and can easily be rolled into the back of my truck to transport. Building this was quite a learning experience but well worth the time and effort. Brew days are much more enjoyable. If you are interested in how this all goes together I am putting together a write up at [www.2nobledogsbrewing.com](http://www.2nobledogsbrewing.com). Cheers!

## social homebrews



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*Brew Your Own* asked our Facebook fans to share photos of their hop harvests this fall. Thanks to everyone who posted! Rob Ling of Beaverton, Oregon sent us this shot of his backyard Cascade, Mt. Hood and Zeus bines (left to right).

"Miraculously enough, the bugs have left us alone this year," he said.

## beginner's block

# TEMPERATURE CONTROLLERS

by betsy parks

One of the most important processes to be controlled in your homebrewery is the temperature of your wort, be it hot or cold. If you want to have a better chance at brewing success, as well as more automation, consider investing in temperature controllers to help keep fermentation and mash temperatures more consistent.

### What are they?

Temperature controllers are electronic devices — essentially switches — that monitor the temperatures of your mash or fermentation and turn heating or cooling equipment off or on based on temperature readings.

On the cold side, a temperature controller installed in a refrigerator or freezer, for example, will override the machine's internal thermostat and maintain a specific temperature range (known as the differential) by turning off the power to the machine when the temperature goes too low, or back on if it is too warm.

Similarly you can also install a temperature controller for your hot liquor tank (HLT), which will turn off the heat source when your water heats up to the temperature point you specify. (This setup requires a gas valve pilot light or igniter or a Solid State Relay (SSR) to control the heat source.) If you are all-grain brewing you can also add a temperature controller to monitor your mash temperatures and turn heat sources and pumps on and off depending on your temperature differential. Using temperature controllers on the hot side, however, requires more expert knowledge to install and use safely, so be sure to get assistance from someone who is knowledgeable if you decide to install a temperature controller for anything heat related.

### Choosing a controller

Temperature controllers come in a

wide variety of models and prices and vary based on what you would like to use it for. For example, a simple model with a digital display and temperature probe for monitoring fermentation temperatures in a refrigerator can be had for around \$50 to \$100, while more advanced models that can control more than one heat/cold source or pump can cost a few hundred dollars.

Temperature controllers are available in both analog and digital models and have a differential between 1 and 4 degrees Fahrenheit (0.5 to 2.2 °C).

When choosing which controller you need, it pays to do a little research. There are lots of ways to use them, depending on your setup. Get in touch with your local homebrew supplier, or contact the customer service department of your favorite online retailer for advice. And of course ask your fellow homebrewers what works for them.

### Installing

Be sure when you choose a controller that you are comfortable installing it. Some temperature controllers are as simple to use as plugging an appliance into the controller and then plugging the controller into the wall outlet. Other controllers, however, require some electrical wiring to install. If you are not experienced and comfortable with electrical wiring, stick with using the simpler types of controllers that don't require wiring, or ask someone with electrical experience to install it for you. Improperly combining electricity and liquids is dangerous and can cause electrocution. Also, for additional safety always plug your temperature controllers into a GFCI (ground fault circuit interrupter) outlet, which is an outlet that shuts off an electric circuit when it detects that current is flowing along an unintended path, such as water — or a person.



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# homebrew nation

by marc martin

**DEAR REPLICATOR,** MY HOMEBREWING PARTNER RECENTLY BROUGHT ME BACK A FEW BOTTLES OF LOCAL BEERS FROM PORTLAND, OREGON THAT WE CAN'T GET IN COLORADO. ONE OF THE MOST INTERESTING BEERS WAS A PORTER FROM AN ODDLY NAMED BREWERY, CAPTURED BY PORCHES. IT WAS THEIR PUNCTURED BY CORPSES UNDEAD PORTER. I'M A FAN OF A GOOD PORTER AND THIS WAS UNLIKE ANY I HAVE HAD BEFORE. I WOULD LIKE TO FIND OUT HOW TO DUPLICATE THAT PROFILE.

DAVID O'HEARN  
DENVER, COLORADO



**C**aptured By Porches Owner and Brew Master Dylan Goldsmith gave me a full tour of the brewery in St. Helens, Oregon. He began homebrewing in Portland in 2000. After overworking two electric stoves with 10-gallon (23-L) batches he was kicked out of the kitchen so he moved his hobby to the large front porch. Thirsty neighbors would stop by to help and to sample his beer and stay longer than expected. Soon they called the phenomena, "being captured by his porch" and the name of the brewery was born.

His first foray into commercial brewing was at a fledgling theatre/brewpub in southeast Portland where he continued to perfect his recipes on a one-half barrel system. Public response was good enough that in 2008 he decided to open a production brewery of his own.

Today he has progressed from 150 barrels that first year to a projected 1,000 barrels for 2012. All of the beers are

based on his original homebrew recipes. Many of the beers are hand bottled in unique, returnable 750-mL swing top bottles. Speaking of unique, he also owns three converted school busses which act as mobile pubs.

The Punctured by Corpses is an interesting porter. The unusually heavy body/mouthfeel is the result of using a high percentage of unmalted grains — wheat, oats and rye. This medium dark beer displays ruby highlights and a dense white head that follows to the bottom of the glass. The nose accents hints of coffee and caramel. Chocolate dominates the flavor with just enough hops to prevent the finish from being too sweet.

Now David, you can taste the "Undead" anytime because you can "Brew Your Own." For more about Captured by Porches and their other fine beers visit the website [www.capturedbyporches.com](http://www.capturedbyporches.com) or call the brewery at 971-207-3742. **BYO**

## CAPTURED BY PORCHES BREWING COMPANY PUNCTURED BY CORPSES UNDEAD PORTER CLONE (5 gallons/19 L, extract with grains)

OG = 1.064 FG = 1.015 IBU = 29 SRM = 26 ABV = 6.3%

### Ingredients

3.3 lbs. (1.5 kg) Coopers unhopped liquid malt extract  
2.25 lbs. (1.02 kg) light dried malt extract  
1 lb. (0.45 kg) 2 row pale malt  
1.25 lb. (0.56 kg) crystal malt (30 °L)  
7 oz. (0.19 kg) crystal malt (60 °L)  
12 oz. (0.34 kg) chocolate malt  
10 oz. (0.28 kg) flaked wheat  
5 oz. (0.14 kg) flaked rye  
5 oz. (0.14 kg) flaked oats  
10 AAU Saaz hop pellets (first wort)  
(2.5 oz./71 g of 4% alpha acid)  
5 AAU Saaz hop pellets (0 min.)  
(1.25 oz./35 g of 4% alpha acid)  
½ tsp. yeast nutrient (last 15 min.)  
½ tsp. Irish moss (last 30 min.)  
White Labs WLP 001 (American Ale) or  
Wyeast 1056 (American Ale) yeast  
0.75 cup (150 g) of corn sugar for  
priming (if bottling)

### Step by Step

Steep the crushed and flaked grains in 2 gallons (7.6 L) of water at 156 °F (69 °C) for 45 minutes. Remove grains from the wort and rinse with 2 quarts (1.8 L) of hot water. Add the liquid and dried malt extracts and boil for 60 minutes. While boiling, add the hops, Irish moss and yeast nutrient as per the schedule. Now add the wort to 2 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L). Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Allow the beer to condition for 1 week and then bottle or keg. Allow the beer to carbonate and age for two weeks.

### All-grain option:

This is a single step infusion mash using an additional 6.5 lbs. (2.95 kg) 2-row pale malt to replace the liquid and dried malt extracts. Also, increase the flaked wheat by 24 oz. (0.68 kg), flaked rye by 12 oz. (0.34 kg), and flaked oats by 12 oz. (0.34 kg). Mix the crushed and flaked grains with 4.5 gallons (17 L) of 176 °F (80 °C) water to stabilize at 156 °F (69 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the First Wort hop addition to 2.25 oz. (64 g) of Saaz hop pellets (9 AAU) to allow for the higher utilization factor of a full wort boil. The remainder of this recipe is the same as the extract with grain recipe.

# Electric Homebrew

tips from the pros

## Go gas free

by Betsy Parks



THERE ARE MORE THAN A FEW WAYS TO BREW A BEER, AND ONE OF THOSE WAYS IS WITH AN ALL-ELECTRIC HOMEBREWERY. IF YOU ARE CONSIDERING MOVING AWAY FROM PROPANE, TAKE SOME ADVICE FROM TWO DEDICATED ALL-ELECTRIC HOMEBREWERS.

**T**here are many benefits to brewing with electricity instead of gas. It has easier precise control of temperature, safer for indoor brewing (no poisonous gases, no emissions), absolutely silent (the bigger gas burners sound like jet engines), provides a much more efficient use of energy (a 5500W heating element producing ~20,000 BTUs of heat will outperform an 80,000 BTU propane burner as electric is 100% efficient. You do not lose 50-80% of heat to the atmosphere), requires no tanks to refill, cheaper to run (in most locations natural gas is 2-3 times more expensive, propane 5-10 times more expensive) and it can be easier to produce consistent beers using advanced controls in the build.

Some people will argue that the up-front cost of going 100% electric is more expensive than gas. This is not true if you compare the cost of a full-blown electric setup with a gas setup that also has advanced controls. Gas only has a lower cost of entry if a simplified setup is implemented, such as a turkey fryer for the boil kettle and a picnic cooler for the mash tun. Once advanced controls are included the up-front costs are similar. Also, in many locations going electric will save you money over the long run.

I have noticed that newer electric brewers sometimes sacrifice safety either on purpose (to save money) or unknowingly because they are not familiar with electricity. Electricity and water can be a dangerous combination if not done safely. Follow the electrical code for your area when designing your electric setup and use parts that are rated correctly. Make sure all components of your electric setup are properly grounded (including the kettles) and always use a ground

fault interrupter to protect the brewer. Electric brewing is very safe when done right, possibly even safer than gas as there is no open flame or poisonous gas emissions. When in doubt, refer to a qualified electrician for help.

The world is full of electric brewers. Joining a local homebrew club is a great way to see some other electric setups and choose what is right for you based on your brewing process. Also, whether you choose to go gas or electric, always work out your brewing process first before choosing the equipment. Let the process drive the equipment, not the other way around.

Going all-electric opens up a realm of opportunities for the brewer from simple automation with only temperature control to complete automation including pump/valve control, motorized stirrers, and so on. Before implementing advanced features spend some time carefully thinking about the benefits you're trying to achieve. I've far too often seen electric brewers build overly complex setups that at the end of the day provide little or no added benefit. The setups are often more expensive to implement and maintain, harder to clean and sometimes require even more work to use on brew day. Look at each component and ask yourself, "What benefit does this really provide me?" If it's not clear, consider simplifying.

Brewers looking for resources to help in their electric brewery build can visit my website at [www.TheElectricBrewery.com](http://www.TheElectricBrewery.com) where I provide instructions on how to build an electric brewing setup. I show you what's needed, where to get it, and how to assemble it in easy to follow steps. There's no need to understand electrical schematics or AutoCAD drawings. Best of all it's 100% free.



Kal Wallner, Author/Creator of The Electric Brewery ([www.TheElectricBrewery.com](http://www.TheElectricBrewery.com)). Kal has homebrewed since the late 1980s. He holds a degree in electrical engineering and spent seven years designing plant floor process control systems used by operators at a manufacturing assembly plant.



Joe Lynch, all-electric homebrewer from Kansas City, Missouri. Joe brewed his first batch of beer in college in 1976. He started brewing all-electric two years ago.

**t**here are several advantages of electric brewing. I'm now able to brew anytime that I feel like doing so. I can get a faster and more vigorous boil using electric rather than stove top or propane and I've brewed the lightest lager and the darkest stouts without one bit of scorching. (I brew all-grain and extract beers.)

The only mistake that I have made so far is that I once let the heating element run dry for a few seconds. Luckily I caught my error in time, but this is something you should be very vigilant about if you build your own system.

I had a qualified electrician look at my system before I used it, and anyone building an all-electric system should do the same. My entire system is also on its own dedicated GFCI circuit and I observe all safety concerns that a brewer should have with several gallons of a boiling liquid. I feel that electricity, if done right, is much safer

than having an open flame.

My advice for a homebrewer interested in electric brewing is to do a lot of research. I wished I got paid for the amount of time I spent at the hardware store scratching my head while looking at electrical and plumbing supplies. A must read is Jeff Karpinski's article in *BYO* ([www.byo.com/component/resource/article/1987](http://www.byo.com/component/resource/article/1987)), and listen to James Spencer's interview of Jeff on *Basic Brewing Radio*. Also, check out the Internet. You will find several YouTube videos that feature electric brewing that will give you some ideas. You can then use that information to adapt your electric brewery to fit your needs. You will see some very elaborate and complicated systems. I even found one that was fully automatic that could be controlled from another location, although that was not for me. I like to still have a "hands on" approach so I kept mine simple. **BYO**

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# Pitching Wild Yeast

## Avoiding oxidation, batch sparging

help me mr. wizard

by Ashton Lewis



# Q

ARE PITCHING RATES SIMILAR OR DIFFERENT FOR "WILD" TYPE CULTURES (*LACTOBACILLUS*, *BRETTANOMYCES*, *PEDIOCOCCUS*, ETC.) TO THAT OF TYPICAL ALE YEAST?

SCOTT RYLIE  
VIA FACEBOOK

# A

Pitching rates for wild yeast and bacteria are really all over the place.

*Brettanomyces* species can be used in place of *Saccharomyces* species for the primary fermentation of wort into beer. *Brettanomyces* has become a very popular "wild" yeast in certain brewing circles and imparts an interesting aroma and flavor to a wide range of beer styles. When used as the primary yeast strain the flavor contribution is more up front and immediate compared to when *Brett* is added to beer during aging, where the aroma notes develop slowly over time.

If you are looking for numbers, the range in pitching rate varies from about 250,000 cells/mL to over 10 million cells/mL, depending on how the yeast is going to be used. If you want to use *Brett* for the first time, I would use it after primary fermentation is complete and add for bottle conditioning. This yeast is a "super-attenuator" and ferments sugars that ale and lager yeast cannot. This means that these beers have the potential to be bottle bombs. Heavy bottles, like champagne bottles, are recommended. Pitch with about 1 million cells per mL to give your beer a good shot of developing the aroma that is expected.

Bacteria, such as *Lactobacillus* species and *Pediococcus* species are completely different, for two big reasons. The first thing separating these bugs from yeast is that they are sensitive to hop acids, and in some cases

alcohol strength. This means that souring beers that are highly hopped and high in alcohol can be a real challenge. Even moderately hopped beers can give lactic acid bacteria the cold shoulder and will not turn sour. This is really frustrating when you are intentionally trying to do something that many brewers curse when it happens on its own. I have been in that boat!

The other thing about these bacteria that set them apart from yeast is that it does not take many cells to affect change. A few hundred cells/mL in the proper setting can grow into a population large enough to have obvious flavor contributions. In comparison to yeast cell densities, bacterial densities are usually much lower. A lager beer that has been thoroughly spoiled by lactic acid bacteria may have only 5,000 cells/mL of the culprit. The interesting thing about bacteria is that they can grow very well by feeding on amino acids associated with autolyzed yeast cells, especially in anaerobic environments. This means that the bottom of a beer tank is a pretty ideal propagation container for bacteria, and beers often sour when held for prolonged time periods with yeast present.

The take home message here is that the answer to your question depends on what you want to accomplish by adding these sorts of organisms and how quickly you want results. Most beers produced with these types of cultures are not produced overnight and it is very important to be patient.

“*Brettanomyces* has become a very popular ‘wild’ yeast in certain brewing circles and imparts an interesting aroma and flavor to a wide range of beer styles.”



Photo by Charles A Parker/Images Plus

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Q

WHAT IS THE BEST WAY TO MOVE MY BEER FROM PRIMARY FERMENTER TO SECONDARY WITHOUT OXIDIZING OR SPOILING THE BEER IN ANYWAY WITHOUT USING CARBON DIOXIDE?

GRANT (GRANTS GLUTEN-FREE HOMEBREW)  
GEELONG, VICTORIA, AUSTRALIA

A

Fortunately for homebrewers there are convenient ways to move beer around

without ruining your homebrewed suds with the ill effects associated with oxygen.

As you mention in your question, one handy method to help reduce oxygen pick-up during racking is by using carbon dioxide as a blanketing gas. While this method is handy, it does require you to actually have bottled carbon dioxide laying around for use. (I will assume that suggesting other blanketing gases like argon and nitrogen are not of interest to you, so I won't discuss them here.)

The best way in general terms to limit oxygen pick-up during racking and bottling is to fill the beer from the bottom of the container and then to limit the amount of headspace in the container by matching your container size to the amount of beer you have on hand. Using a solid racking tube to deliver beer to the bottom of the container being filled is a simple and reliable method to control turbulence during filling. Once the beer has been racked it is helpful if some carbon dioxide gas is produced by yeast because this will help scrub the headspace of oxygen. Racking with some residual extract is the best way to help this process happen.

Another important consideration is the oxygen barrier properties of the secondary fermenter. While it is acceptable to ferment beer in plastic containers, I would avoid aging beer in a plastic secondary because ordinary plastics allow oxygen to travel across the container wall and into your beer. Not the ideal situation.

The challenge of oxygen pickup pops up again when it is time to move your beer from the secondary to the

final container. If the container is a keg you can fill the keg from the bottom using the tube in the keg for filling. But most homebrewers who keg have carbon dioxide containers, and I am guessing that you don't have this set up. This means that you are most likely bottle conditioning your homebrew and need to rack your beer from the secondary to a bottling bucket, and then into your bottles. This is the step in the brewing process where real damage from oxygen often occurs.

The first challenge is to move the beer from the secondary to the bottling bucket. Unlike the transfer from the primary where some fermentation is happening, the beer at the end of secondary is done fermenting. My advice is to keep the time investment to a minimum. Start by preparing your priming solution and pouring into the bottling bucket, then, fill your bottling bucket with beer using your racking tube and quickly bottle. At home this is the method to use when you do not have pressurized containers.

Commercial brewers do things a bit differently. Even brewers who bottle condition fill their bottles with some level of carbonation in the beer. This allows the beer to be foamed or "fobbed" before the bottle is capped. Fobbing pushes air from the headspace and is a very effective method used to reduce the oxygen content of bottled beer. In order to do this the beer must be stored in a pressurized vessel, such as a keg during storage so that some level of carbon dioxide remains in the beer.

You ask a question with a short and simple answer. The fact is that without using carbon dioxide as a blanket gas and pressurized storage containers for secondary fermentation and/or bottling containers it is difficult to really control oxidation.

# Q

HELP ME WITH BATCH SPARGING. TO GET THE GRAIN BED TO 168 °F (76 °C) YOU NEED TO HEAT YOUR SPARGE WATER TO 180–195 °F (82–91 °C) DEPENDING ON THE VOLUME OF GRAIN. I ALSO HAVE READ THAT THE MASH OUT ISN'T REALLY NECESSARY AS THE BOIL STOPS ENZYMATIC ACTIVITY. DO YOU SEE ANY PROBLEMS WITH ONLY HEATING MY SPARGE WATER TO 168 °F (76 °C) TO ELIMINATE ANY POSSIBLE TANNIN EXTRACTION FROM THE HOT LIQUID ON THE GRAIN?

RUSS BRUNNER  
FORT LAUDERDALE, FLORIDA

# A

I remember when I first began homebrewing back in 1986 and almost immediately wanted to start brewing all-grain. At that time the information related to homebrewing was a little more difficult to find and my quest for information quickly landed me in the stacks of McKeldin Library on the University of Maryland campus in College Park. There I found a bunch of texts that seemed so confusing to my young mind. Luckily I later found some homebrew books that helped demystify mashing.

The mashing method I cut my teeth on was the “simple” infusion mash. One mash temperature followed by sparging with hot water and onto the kettle wort flowed. Only later did I pay much mind to step mashing and decoction mashing. These days it seems that many homebrewers have thrown out the KISS philosophy and have replaced simplicity with complexity. I suppose I am a hypocrite for taking this view since I actively encourage com-

mercial brewers who are building new brewhouses to invest in equipment permitting temperature profile mashing, but I really don't believe that there is a compelling argument for most homebrewers to mess around with step mashing.

OK, so now that I have set the stage, onto the answer. You are describing the dilemma of an infusion masher, that's you, who is peeking over the fence at what step mashers do. Step mashers tend to “mash-off” at the end of the mash before they move their mash to the lauter tun. Infusion mashers go straight from mashing to sparging and skip the mash-off step. So what's the difference and why?

When mash is stirred in a mash mixer and pumped to a lauter tun it behaves differently than an infusion mash. As it turns out, wort separation is easier when the mash is heated or “mashed-off” before the transfer. This also serves to inactivate enzymes and allows the brewer to control mashing, stop the mash, then get on with wort

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“ In practice, most brewers these days continue to sparge with water that is about 168 °F (76 °C) because it works well . . . ”

separation. This is not necessarily a better method from infusion mashing, it's just different. Most commercially brewed beer in the world uses some sort of stirred mash and lauter tun or mash filter for wort separation. Decoction mashing and the American double-mash used for dealing with solid adjuncts like rice and corn are both variants of stirred mashing.

In the infusion method there is no mash-off and hot sparge water, usually around 168 °F (76 °F), is sprayed directly on the mash bed after mashing. Since infusion mashing usually is conducted at 149–158 °F (60–70 °C), enzyme activity continues as wort flows from the mash tun to the kettle. Even when hot sparge water is sprayed on the mash bed the wort temperature in the kettle is never much hotter than the mash temperature due to heat loss. This

method works very, very well and is the traditional method the British use to brew ale.

Discussions of yield improvement may include increasing the sparge temperature of infusion mashes to reduce wort viscosity and eek out as much extract as possible from the grain bed. There has been a lot of research related to tannin/polyphenol extraction associated with high sparge temperatures and some of the studies conducted in the mid-1990s convinced me that high temperature sparging is not the recipe for disaster that many believe. Most of this research also included milling methods, especially hammer milling, that have dramatic improvements on extract yield when combined with modern mash filter technologies. The take home message is that “hot sparging” can be used to produce high quality wort as long as the variables effecting tannin/polyphenol extraction, mainly pH, are controlled during sparging.

In practice, most brewers these days continue to sparge with water that is about 168 °F (76 °C) because it works well and brewers tend to be a fairly traditional lot. The old adage stating “if it ain't broke, don't fix it” is alive and well in the modern brewery. 

*Do you have a question for Mr. Wizard? Email your questions with your name, city and state to [wiz@byo.com](mailto:wiz@byo.com).*

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# American Barleywine

style profile

Aged in the USA

by Jamil Zainasheff



Every homebrewer eventually wants to make a barleywine. When you start making your own beer because you can make it richer and more flavorful than the mass market products out there, it doesn't take much of a leap before you set your sights on the biggest and boldest styles of beer.

American barleywine is rich and strong. It has a big malt flavor and aggressive hopping, but it still has a balance between the malt character and hop character. The malt character often has lots of caramel, biscuit, toast and bready notes, while the hop character is often of the typical American citrus and pine type. The bitter/sweet balance is always toward the bitter side, although as barleywine ages, the malt character takes on more sweet caramel notes and the ester profile takes on some dried and dark fruit notes. American barleywine has a greater emphasis on hop bitterness, flavor and aroma than English barleywine, and often showcases American hops and yeast. With age the bittering drops and the overall character of the beer becomes more mellow and complex. While alcohol is present and warming, it is never hot or harsh. The color should range from light amber to dark copper and the mouthfeel should be full and rich, with a smooth, luscious texture. The key to making a good version of this style is avoiding the most common mistake of poor fermentation, which can reveal itself as not enough attenuation (resulting in a syrupy sweet beer) or solvent-y, hot alcohol notes.

You have some options when choosing base malt for this style. Using North American two-row will give the beer a clean, subtle, background malt character common to many fine American craft beers. Using North American pale ale malt adds a slightly richer background malt character, somewhat of a light bready note. Again, this is the type of malt charac-

ter common to many fine North American craft brews. Less frequent is the use of British pale ale malt. British pale ale malt provides an even greater depth of malt character to the beer, mainly a biscuit-like taste and aroma often found in British beers. Some folks feel British pale ale malt can be too much for American styles, but in barleywine it is never too much. You might want to adjust your use of specialty grains if you are switching from North American to British pale ale malt as your base to compensate. All-grain brewers can use a single infusion mash and should target a mash that will result in enough attenuation. A temperature around 149 to 154 °F (65 to 68 °C) is what you want to target. Higher temperatures for smaller beers, lower for bigger beers.

Specialty malt character can range from minimal to heavy. Bready, toasty, biscuit and caramel notes are all acceptable, but avoid adding highly kilned malts, except in very small quantities. In my favorite American barleywine recipe, I like to add pale chocolate malt, which enhances the color and adds a dark toasty note to the finish. You can use darker malts for the same thing, but even with small quantities you run the danger of introducing some chocolate, coffee, or even smoke character if you add too much. Much of the color in this style comes from crystal malts and longer boil times. If you want to develop more color and more melanoidin-based flavors and aromas, start with a larger pre-boil volume so you can boil the wort for two hours or more. This develops a unique character, not possible by grain additions alone.

When using caramel malts I like to break it up across two or three different colors of crystal malt for a total of 5 to 15% of the grist. If you are making a smaller beer, you can use the higher end of that range. If you are making a bigger beer, keep crystal malts below 10% of the total grist. If

## American Barleywine by the numbers

|      |                  |               |
|------|------------------|---------------|
| OG:  | .....1.080–1.120 | (19.3–28.1°P) |
| FG:  | .....1.016–1.030 | (4.1–7.6 °P)  |
| SRM: | .....            | 10–19         |
| IBU: | .....            | 50–100+       |
| ABV: | .....            | 8.0–12.0%     |



Photo courtesy of Encyclo Wine

Continued on page 21

## American Barleywine (5 gallons/19 L, all-grain)

OG = 1.115 (27 °P)

FG = 1.022 (5.5 °P)

IBU = 99 SRM = 17 ABV = 12.5%

### Ingredients

- 20.7 lb. (9.4 kg) Great Western North American pale malt (2 °L) (or similar)
- 14.1 oz. (400 g) dextrose (0 °L)
- 14.1 oz. (400 g) Briess crystal malt (20 °L)
- 14.1 oz. (400 g) Baird British crystal malt (75 °L)
- 3.5 oz. (100 g) Thomas Fawcett pale chocolate malt (200 °L)
- 3.5 oz. (100 g) Franco-Belges Special B malt (150 °L)
- 26 AAU Magnum pellet hops (2.0 oz./58 g at 13% alpha acids) (60 min.)
- 10.4 AAU Chinook pellet hops (0.8 oz./24 g at 13% alpha acids) (0 min.)
- 10.8 AAU Centennial pellet hops (1.2 oz./35 g at 9% alpha acids) (0 min.)
- 10.8 AAU Amarillo® pellet hops (1.2 oz./35 g at 9% alpha acids) (0 min.)
- White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis Safale US-05 yeast

### Step by Step

Feel free to substitute any high quality malt of a similar flavor and color from a different supplier than what is listed. Dextrose is also known as corn sugar and should be available from your homebrew supply shop.

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 149 °F (65 °C). Hold the mash at 149 °F (65 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F

(76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 7.1 gallons (27 L) and the gravity is 1.081 (19.6 °P). If you should come up short on the pre-boil gravity, top it off with some pale malt extract.

The total wort boil time is 120 minutes. This helps concentrate the wort and aids in the development of flavor compounds. The first hop addition comes with 60 minutes remaining in the boil. Add the Irish moss or other kettle finings with 15 minutes left in the boil. Add the last hop additions at flame out.

Chill the wort to 68 °F (20 °C) and aerate thoroughly. The proper pitch rate is 19 grams of properly rehydrated dry yeast, 4 packages of liquid yeast, or 1 package of liquid yeast in a 8 liter starter. Ferment at 68 °F (20 °C) to start, raising the temperature gradually to 70 °F (21 °C) for the last 1/3 of fermentation. When finished, carbonate the beer to approximately 2 to 2.5 volumes. You might be tempted to drink this early, but try to hold off until the beer has some age. Once it is carbonated, set aside as much as you can in a cool, dark place. Try some every six months to see how it is progressing and you will be able to enjoy it over the years.

## American Barleywine (5 gallons/19 L, extract with grains)

OG = 1.115 (27 °P)

FG = 1.022 (5.5 °P)

IBU = 99 SRM = 17 ABV = 12.5%

### Ingredients

- 13.2 lb. (6 kg) pale liquid malt extract (2 °L)
- 14.1 oz. (400 g) dextrose (0 °L)
- 14.1 oz. (400 g) Briess crystal malt (20 °L)
- 14.1 oz. (400 g) Baird British crystal malt (75 °L)
- 3.5 oz. (100 g) Thomas Fawcett pale chocolate malt (200 °L)

- 3.5 oz. (100 g) Franco-Belges Special B malt (150 °L)
- 26 AAU Magnum pellet hops (2.0 oz./58 g at 13% alpha acids) (60 min.)
- 10.4 AAU Chinook pellet hops (0.8 oz./24 g at 13% alpha acids) (0 min.)
- 10.8 AAU Centennial pellet hops (1.2 oz./35 g at 9% alpha acids) (0 min.)
- 10.8 AAU Amarillo® pellet hops (1.2 oz./35 g at 9% alpha acids) (0 min.)
- White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis Safale US-05 yeast

### Step by Step

Mill or coarsely crack the specialty malt and place loosely in a grain bag. Avoid packing the grains too tightly in the bag, using more bags if needed. Steep the bag in about 1 gallon (~4 liters) of water at roughly 170 °F (77 °C) for about 30 minutes. Lift the grain bag out of the steeping liquid and rinse with warm water. Allow the bags to drip into the kettle for a few minutes while you add the malt extract. Do not squeeze the bags. Add enough water to the steeping liquor and malt extract to make a pre-boil volume of 7.1 gallons (27 L) and a gravity of 1.081 (19.6 °P). Stir thoroughly to help dissolve the extract and bring to a boil.

The total wort boil time is 120 minutes. This helps concentrate the wort and aids in the development of flavor compounds. The first hop addition comes with 60 minutes remaining in the boil. Add the Irish moss or other kettle finings with 15 minutes left in the boil. Add the last hop additions at flame out. Chill the wort to 68 °F (20 °C) and aerate thoroughly. Follow the fermentation and packaging instructions for the all-grain version.

you are looking for more complexity or increased head retention, you can add other malts as well. CaraPils®, wheat malt, Victory®, Munich and others are common additions in many recipes, but restraint is important so that the beer does not become saturated with non-fermentable dextrans and cloying flavors. In general, keep the total of all specialty grain additions to less than 20% of an all-grain grist.

“ The balance of bittering versus malt sweetness should always be toward the bitter, but expect the beer to become more and more balanced as the beer ages and the bittering drops out. ”

It is important that your barleywine attenuates enough to keep it from being syrupy. If you find that you are not getting enough attenuation in a bigger barleywine, you might want to consider replacing some of the base malt with simple sugar, up to 10%.

Extract brewers can choose an extract made from British pale ale malt or North American two-row malt. Focus on the quality and freshness than what the malt it is made from.

The balance of bittering versus malt sweetness should always be toward the bitter, but expect the beer to become more and more balanced as the beer ages and the bittering drops out. Target a bitterness to starting gravity ratio (IBU divided by OG) of 0.7 to 1.4. Go toward the higher end for beers that have higher amounts of specialty grains or beers that you plan to age before consuming, and target the lower end of the range for simpler malt bills or beers that you will consume earlier in their

life. I tend to target a ratio of 0.9 to 1.0, which, if the beer is well attenuated, gives you a beer that is nice within a reasonable timeframe, but also ages nicely over several years. Keep in mind there are many factors at play in the final impression of bitterness for the drinker. The starting and final gravities, the character malts selected, the type of base malt, the yeast strain, the pitching rate, and even the

yeast cell size have an impact on the final bittering character.

Hop flavor and aroma varies from moderate to bold, with it being more assertive in younger beers and more mellow and integrated in aged beers. I really like using citrusy or piney American variety hops such as Cascade, Centennial, Columbus, Simcoe®, and Amarillo® for flavor and aroma, but there are plenty of

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## style profile

great examples out there that use a wide variety of hops from around the world. You can use almost any hop you feel has a pleasant character, but if you choose a combination of bold American style hops, the hop character can last for years. You can bitter with almost any hop, but neutral high alpha hops are most common. The big picture is that you want hop character and a firm bitterness, but both should

complement your malt and yeast choices. Dry hopping is acceptable as well, but moderation is key as too much can just end up as vegetal notes in an aged beer. As a general rule, late hop amounts should be equal to twice the amount of bittering hops. This is just a generalization, since using very low or high alpha acid hops makes the equation faulty. One or two late hop additions, totaling around 2 to 5

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ounces (57 to 142 g) for a 5 gallon (19 L) batch at 20 minutes or later, should be about right. Keep in mind, hop flavor and aroma should not completely overwhelm the malt character.

Fermentation for American barleywine is similar to most American-style ales, but it is not without its challenges. It is important to get enough attenuation to keep the beer from being syrupy sweet and also

lating early or producing off-flavors. Raising the temperature a few degrees near the end of fermentation can also help the yeast attenuate fully and may help clean up some of the intermediate compounds that are produced during fermentation.

Once this beer is finished fermenting, a long aging period does wonderful things for a barleywine. Yes, you might be tempted to drink it after just

a couple weeks, but try to set aside some bottles in a cool place and enjoy them over the years. **BYO**

*Jamil Zainasheff is the founder and brewmaster of Heretic Brewing Company in Pittsburg, California. He also blogs on byo.com and hosts two shows on The Brewing Network. He writes "Style Profile" in every issue of Brew Your Own.*

“I prefer to use a clean, moderately attenuating yeast, such as White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale).”

ensuring the alcohol produced is not hot and solvent-like. Fermentation overall should result in a clean profile. In barleywine, low to moderate fruity esters are acceptable and restrained fruitiness can add complexity. However, fruity esters should be complementary to the malt and hop character, not a prominent feature. I prefer to use a clean, moderately attenuating yeast, such as White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale). To get that clean, American-style pub character make certain that you oxygenate the wort and pitch an appropriate amount of healthy yeast. To ensure complete attenuation, you can add a second dose of oxygen 12 to 18 hours after pitching. This additional oxygen helps improve the cell membrane condition, which enables the yeast to better tolerate the elevated levels of sugar and alcohol in this beer. Ferment around 68 °F (20 °C), holding the temperature steady or rising slightly throughout fermentation. Temperature control is important to getting a proper level of attenuation and avoiding off-flavors, especially if you are making a bigger barleywine. Large temperature swings can result in the yeast floccu-

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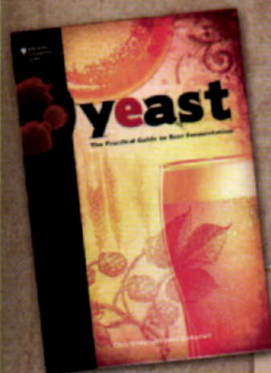
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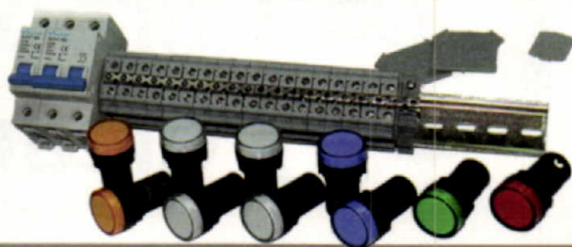


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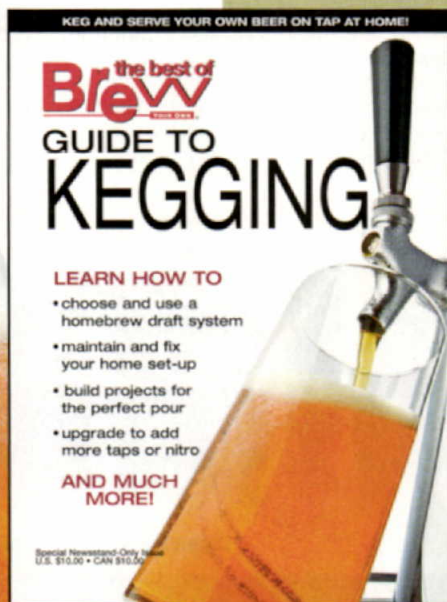
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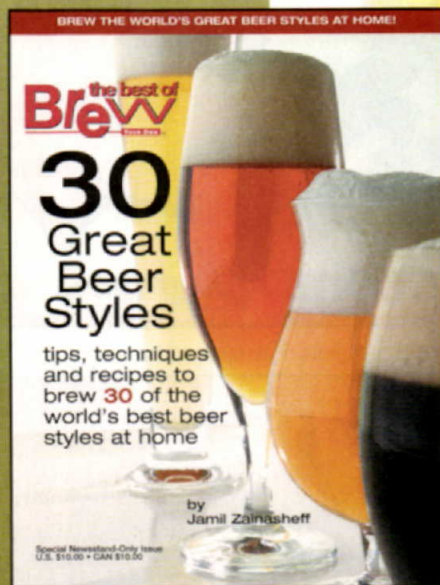
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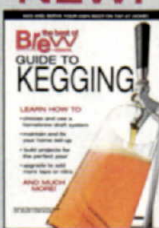


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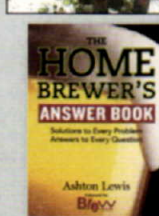
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# COOL HOMEBREW BARS

**A**s homebrewers, we often focus on the equipment in the brewery. We spend a lot of time oogling stainless steel, mash tuns and brew stands, but the fact is, there's got to be a place to enjoy all that tasty homebrew. Back in March, the *BYO* staff got to thinking that among all the great photos we receive from homebrewers of their brewing setups, we don't get to see a lot of homebrew bars. "Why not ask to see the bars?" we asked ourselves.

So we asked our Facebook and Twitter fans to post some photos of their best homebrew bars. For a little incentive we threw in a prize - the best bar would win a brand new kegerator from Beer Meister, LLC (<http://beermeisters.com>). The winner, Tony Cronkhite of Rockford, Michigan came out on top (see "Homebrew Nation" in the July-August 2012 issue), but we certainly had a great time looking at all the other photos — and we thought you'd like to see a few of them as well! Check out Tony's amazing home setup on the next page, as well as two hand-crafted hangouts from Mike Campbell (Enola, Pennsylvania) on page 34 and Tony Dutcher (Cedar Falls, Iowa) on page 35.

Thanks again to everyone who posted their photos — we really enjoyed taking a look at the "other" side of the homebrewing world. And thanks again to Beer Meister for donating such a great prize. Everyone else, feel free to send us your homebrew bar photos anytime — we always appreciate a glimpse of where your homebrews are most appreciated!

*Cheers!*

Story by **Betsy Parks**



"I had the idea for the build out from the time we built the house in 2007, we wanted an area for entertaining and the bar ended up being the main focal point," said Tony Cronkhite (left).



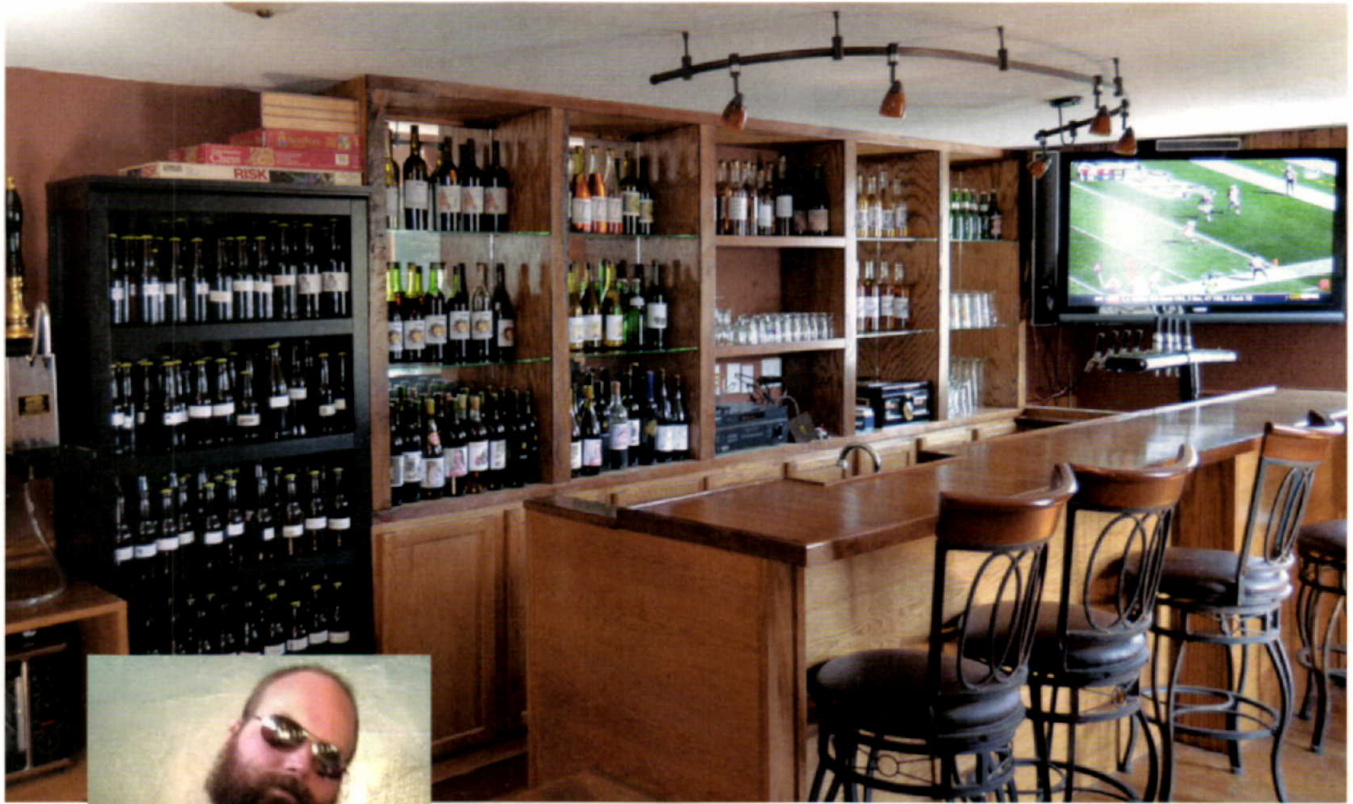
"It also grew a little from the original conception, but since this was my area no one really knew it was getting bigger until I built it, by then it was too late to go back and make it smaller. The construction took about six months from start to finish working weekends and evenings."



"Pretty much everything you see that's made of wood, I made in my woodshop. Everything from the bar top to the tap handles," said Mike Campbell (left).




"The bar top is made from maple, mahogany, cherry, white oak and walnut. The bar back is made from 100-year-old doors that I saved from the first house that I owned and the mirror frame is made from wormy oak. I turned the tap handles on my grandfather's 1940s Delta lathe."



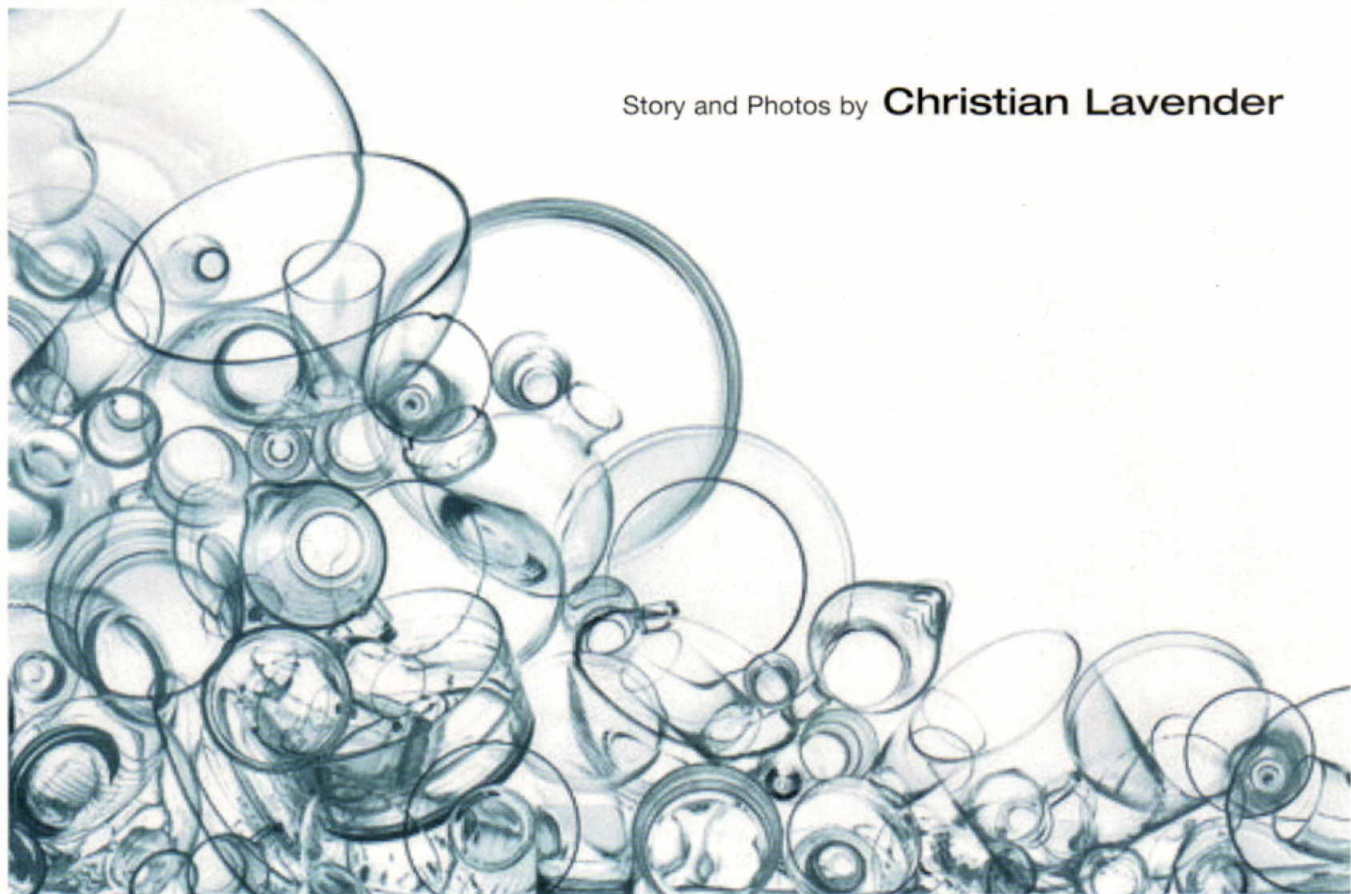
"I built the entire two-story building, which was a stained glass and ceramics studio with a wood shop. I did everything from the electrical to the foundation," said Tony Dutcher (left).



"I had no previous construction experience and read a copy of *Modern Carpentry* by Willis Wagner when I built the building and bar," said Tony. "The bar is trimmed with walnut from a tree that I cut down when I built the place, and I also made all the beer and wine in the building." 

# Sanitation of Hard to Clean Parts

Story and Photos by **Christian Lavender**

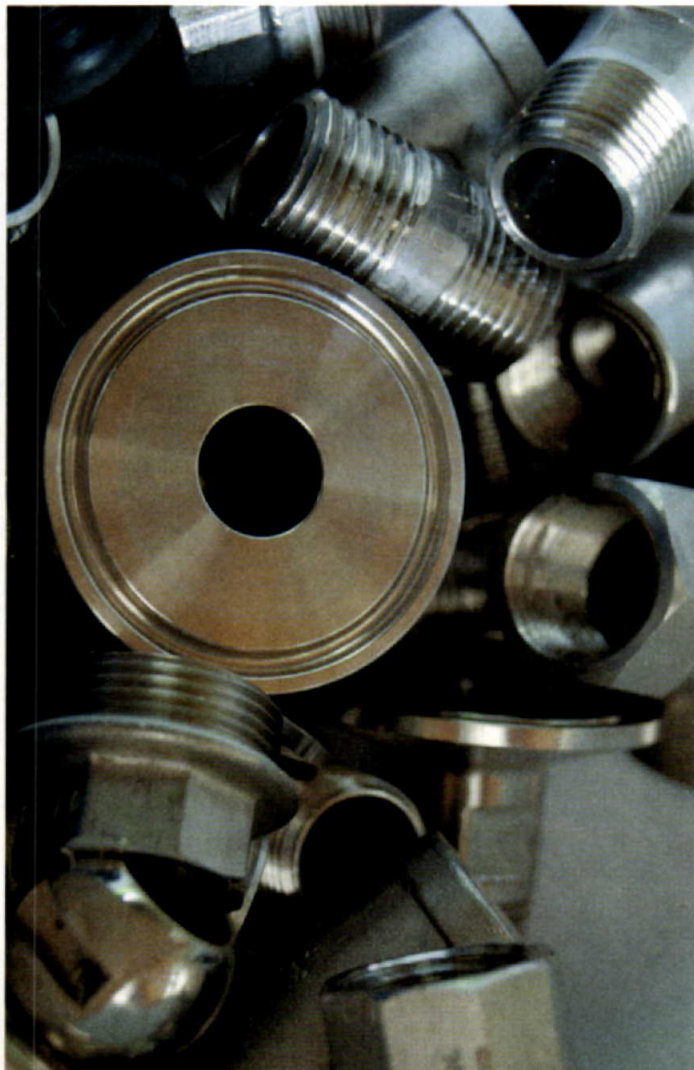




The pump heads for most homebrew pumps are easily disassembled to clean the impeller and inside surfaces.



Tubing brushes can reach inside fittings to remove debris that may come in contact with wort.



It is better to disassemble a part so you can visually inspect the effectiveness of your cleaning than to simply run hot cleaner through it.

**T**he most frustrating aspect of homebrewing is when a batch goes bad. The only way to improve your chances of avoiding this depressing situation is to maintain the highest possible degree of sanitation in your homebrewery. No matter how hard you try, or what techniques you use, achieving absolute sterility in a homebrewing environment (or for that matter, commercial operations) is impossible. Although some contaminants will always be present in pitched wort, many bacteria cannot survive in the beer — with the rapidly dropping pH and presence of alcohol — so trying to limit the amount of contaminants that get into the fermenter as much as possible is the goal.

As homebrewers, we put a lot of time and effort into cleaning and sanitation. Beginner books and brewing kit instruction sheets are showered with reminders to clean and sanitize every piece of equipment so that your beer doesn't get contaminated. Most beginner brewing kits are simple to take apart and clean, not taking up too much of your brew day. This practice of cleaning and sanitizing lays a foundation for the brewer to adhere to as they start to upgrade their system.

After running a few batches through my first plastic bucket setup, I started to notice the scratches left behind from my stirring spoon. Fermentation equipment, particularly plastic, which can be somewhat porous and easily scratched can harbor bacteria and be difficult to render sterile. Both siphon hoses and the plastic lines

going in and out of your beer kegs suffer from this problem too.

For this reason, some brewers decide to go with an all stainless steel setup. Fighting bacterial infestations, vinegar cultures and rogue yeasts in your homebrew is lot easier when you can scrub and clean all the surfaces until the equipment shines.

Homebrew cleaning and sanitation may be the most tedious and least glamorous part of homebrewing, but it is very important. It is nearly as important as drinking the brews! Each homebrewer develops different techniques and has different tools in their homebrew cleaning kit, so make sure to network with others to find out more tricks and tips for maintaining proper homebrew sanitation.

Bacteria love to hide in damp and sticky spots in your brewing system, so

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the first line of defense in homebrew sanitation is to take the time to clean all surfaces properly, even those in hard to reach places. For places that you cannot reach, special techniques may need to be employed.

### Plate Chillers

Unless you're careful with filtering, plate chillers can and do clog up with debris. Any debris that's trapped during transfer needs to be back flushed out by connecting the wort inlet to the water supply. I always back flush my plate chiller when done, and then pump hot PBW through it. I do this to clean my pump and hoses anyway, so there's no extra work. Then you can soak it in a sanitizer or bake it in the oven to sterilize. The baking process (dry heat sterilization) will kill any microorganisms that could impact your brewing. To be heat sterilized, items need to be heat-proof at specific temperatures. Glass and metal items are prime candidates for heat sterilization. If you pre-heat your oven to 340 °F (170 °C), an hour of baking time is required to sterilize the chiller. Fifteen minutes in 185 °F (85 °C) water would also work.

### Pump Heads

At the end of my brew day, I fill the hot liquor tank with hot water and cleanser to pump through the system. My system uses two centrifugal magnetic drive pumps to move water and wort around as needed. The final wort transfer is from the kettle to the plate chiller and it passes through the pump. This final push includes some trub and cold break which sometimes get stuck in the pump head. I do use a first level of filtration on the brew kettle, but it doesn't catch everything. The pump head is a great place for bacteria to

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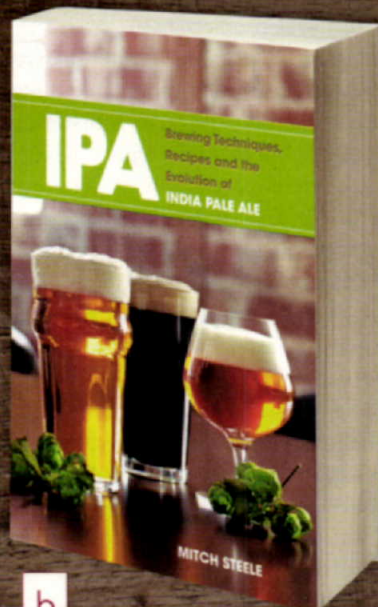
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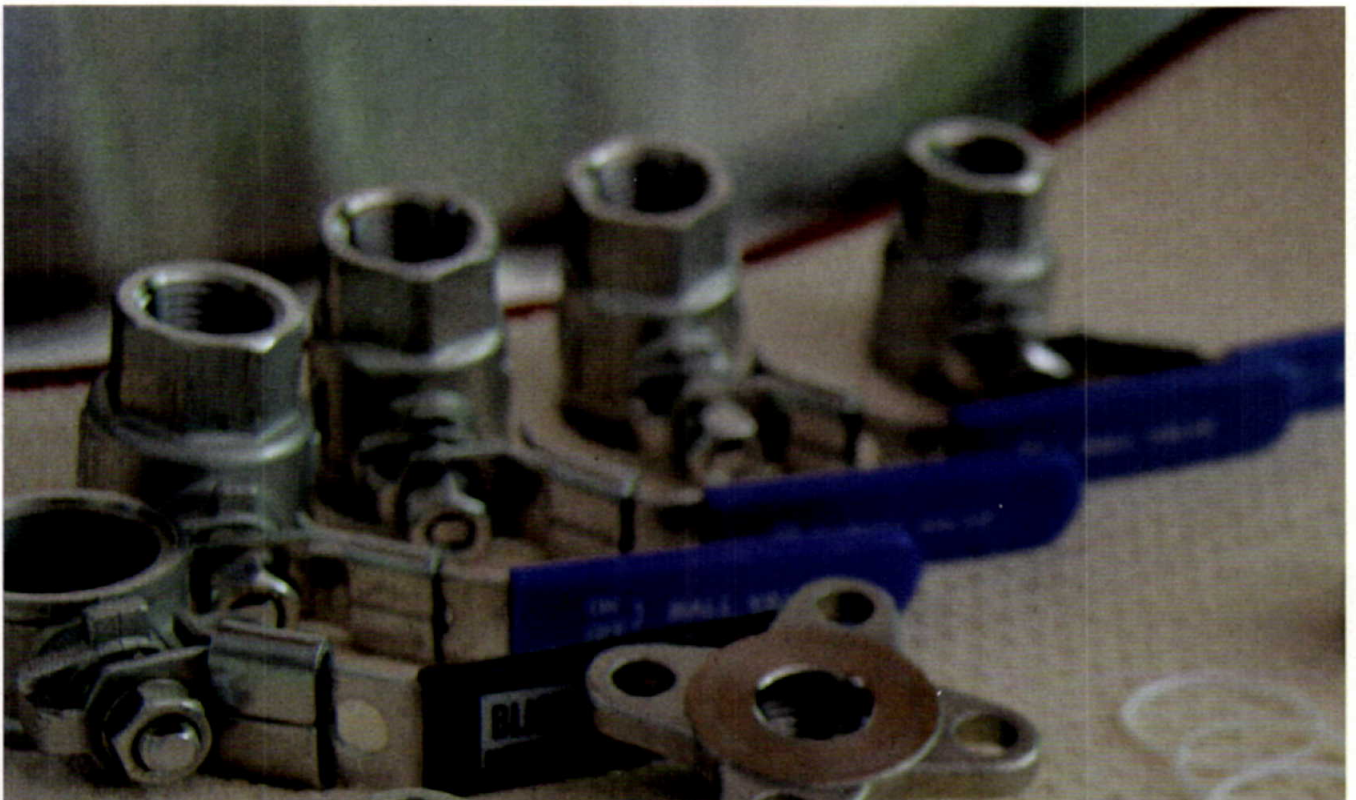
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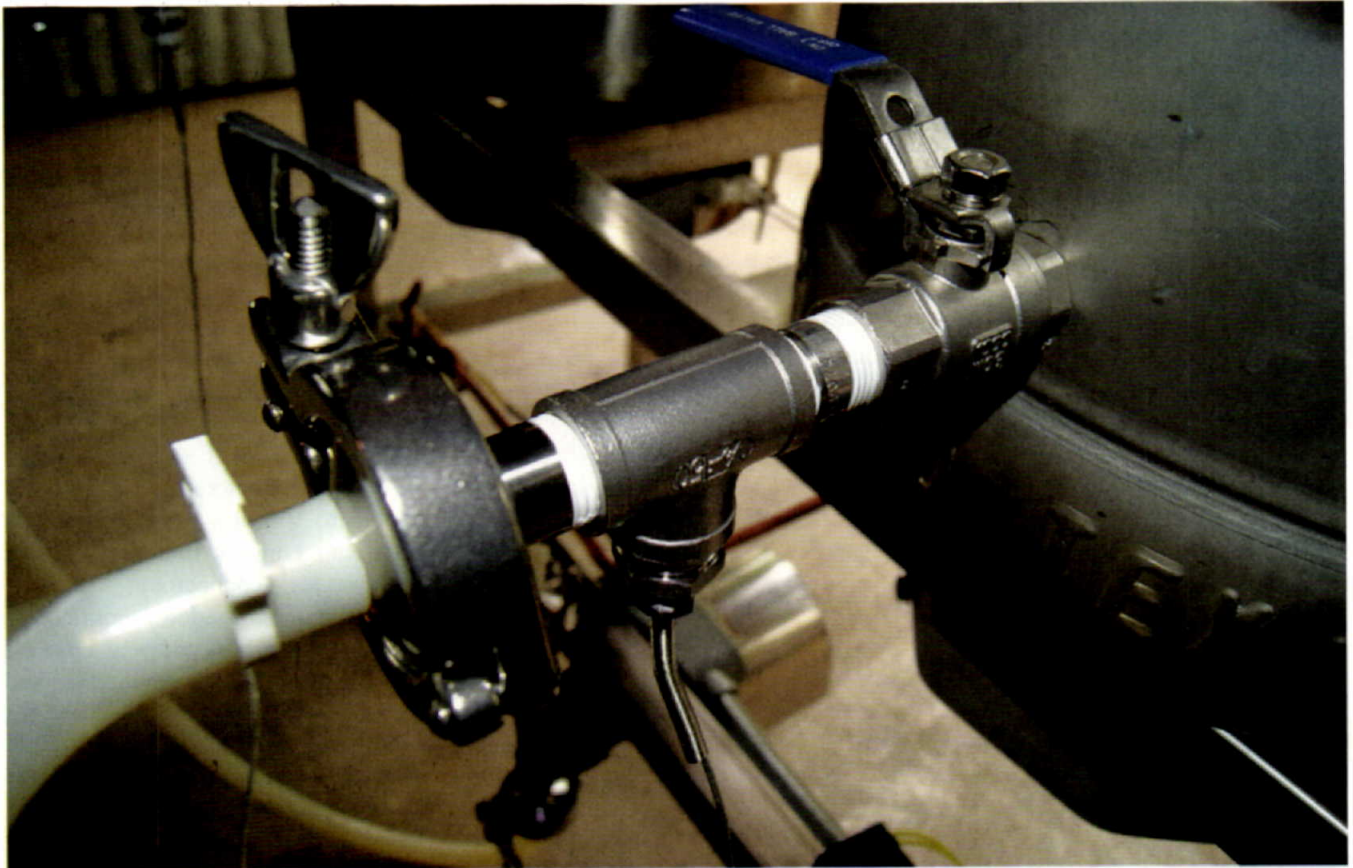
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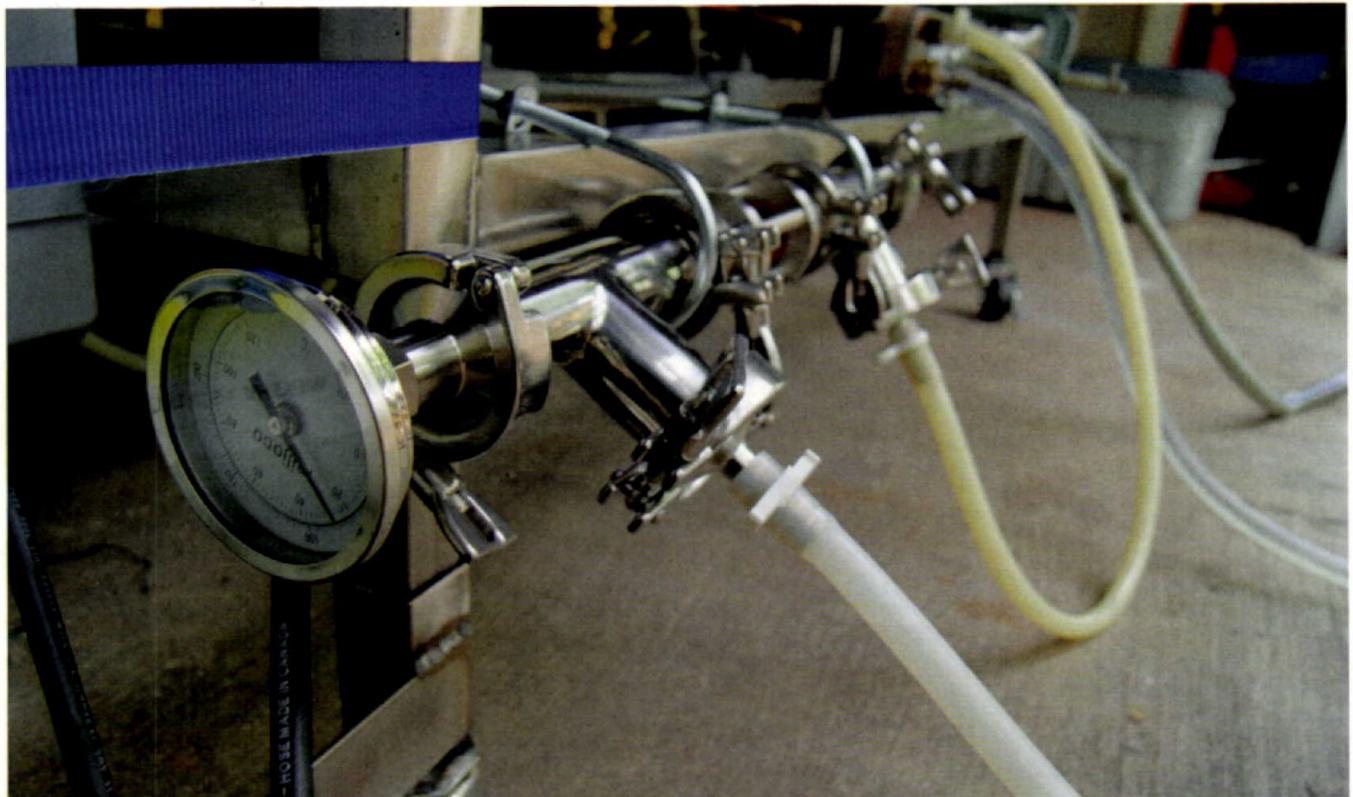
Dry heat can sanitize parts and is a great solution for equipment that has unreachable surfaces (such as this plate chiller). Baking for 60 minutes at 340 °F (170 °C) is required for effective sanitation. Hot liquid can also be used as a sanitizer and contact times are much shorter.



Ball valves can harbor soil and should be disassembled periodically and cleaned. Simply running a brush through them will not remove all the soil after they have been used for several brews. If the valve is on your kettle, it may be sanitized (from the heat), but not clean.



Threaded connectors provide a place for bacteria to hide. These need to be unscrewed, cleaned and occasionally re-wrapped with Teflon tape. There are many ways to connect homebrew vessels, and some connectors are harder than others to clean.



Sintered air stones become soiled with use and many of the pores may get blocked. Cleaning usually involves soaking in hot PBW and the stone can then be heat sterilized, with either dry heat (in an oven) or hot liquid (boiling water).

hide, so I make sure to open the pump heads and thoroughly clean the impeller, o-ring and stainless steel and plastic housings. Watch for scratches on your pump head housing and step up to an all-steel pump head if you have concerns.

### Ball Valves

This is another one I wish more people had told me about. I have a few differ-

ent types of three piece ball valves. I clean them with a brush, cleansers and sanitizers and thought this was all I needed to do. Wrong. There was still something more to clean. To be very honest, I didn't know you had to unscrew the entire valve for complete cleaning! When I did this for the first time I was horrified. The smell was of rotten feet. To imagine my beautiful brew had been flowing over this foul-

ness made me sick. The three piece valves are hard to crack open and should be disassembled monthly for cleaning to maintain bacteria free valves. I have since moved to tri-clamp ball valves that can quickly be disassembled and have no threads.

### Threaded Connectors

I'm a tinkerer. I just can't leave my homebrew system alone and sometimes modifications are only temporary while I test out a new piece of equipment or technique. This means the connections I use are usually threaded connectors until I am committed to the new arrangement and then can convert them to a more seamless style connector.

Having threaded connectors works fine, but they get dirty. I make a habit to pull off all the parts, clean and rewrap with Teflon at least once a month if I am brewing steadily. Back flushing with cleaners and sanitizers between these larger cleanouts will limit bacterial growth.

### Sintered Air Stone

I use an inline air stone within my oxygenation assembly. These stones get clogged from time to time. You have to be careful handling air stones too. Finger grease can gum them up, so imagine what wort can do. Whether you use your stone in an inline aeration, keg lid mount or on a tube/cane you need to boil the stone to keep the porous surface free of debris. Boil in distilled water for 15 minutes (preferably in a pressure cooker). Second best is to bake the stone in the oven at 340 °F (170 °C) for one hour. A third option is to soak the stone in Star San or hot PBW.

In general, if you can't reach a surface (even with a brush), take that piece of equipment apart to clean it. If it can't be taken apart, run hot cleaner through it and heat sterilize (wet or dry) if possible. Making the effort to find and clean the toughest spots in your brewery can mean the difference between good beer and great beer. (BYO)

*Christian Lavender is a homebrewer from Austin, Texas.*

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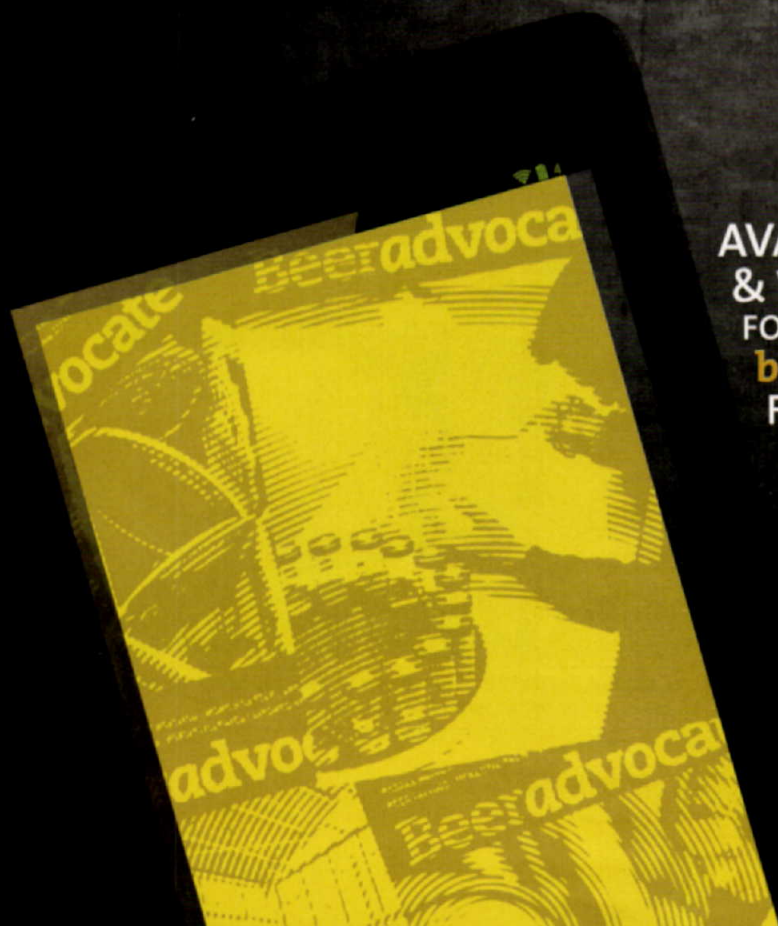
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# HOME BREWERY DESIGN



Designing a homebrewery involves allocating space for all the necessary equipment, considering how the workflow will progress on brew day and addressing safety concerns. A well-designed brewery layout will increase your enjoyment of brew day.

# Organize your layout and workflow to make your brew day more streamlined and fun.

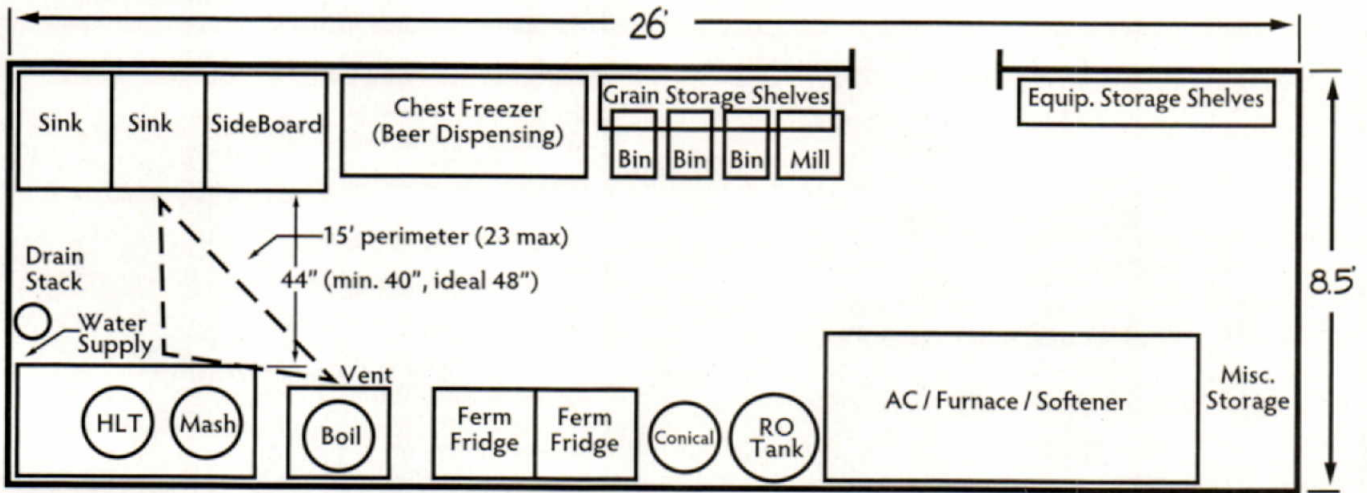
# W

Whether you're an engineer, a chemist, an artist or anything in-between, there are few things more rewarding than designing your ultimate homebrewery. Since a brewery is part factory, part kitchen and part art canvas, designing a brewery requires facets of all of these professions. And that, my friends, is why this hobby is so awesome and inclusive to all walks of life. In this article, I'll share my experience, as well as that of other brewers, about laying out an effective homebrewery.

As a mechanical engineer, my passion has always been product design and manufacturing. So naturally when I began homebrewing in 1991, I had an insatiable drive to improve my system and tweak my brewing processes. To be flat honest, I really enjoyed brewing, but I absolutely loved brewing hardware and processes. And that ultimately led me to start Blichmann Engineering in 2001.

In all my years of brewing gadgetry and tweaking, it was revamping my brewing factory that led to the most improvements. Not just the wicked cool gear within the brewery, but how it was laid out to produce the least defects (something not going to plan) and doing so in the shortest amount of time. That ultimately put making beer as fun for me as

# BEER LAB



Before you start construction or moving equipment into your brewery space, take some time to ponder alternate arrangements of your brewery setup. Try mentally walking through a brew day once you think you have the best setup figured out.

building brewing equipment.

Just like a factory, a brewery needs efficient uncluttered work areas, convenient work tool locations, and effective movement and storage for less fre-

quently used items and material. The basics for any organization is quite simple — a place for everything and everything in its place. Another rule I try to follow with all things is that less

is more. And that is never more critical than in work areas.

Equally important to organization is process flow and planning. Don't just jump into organizing and rearranging.



For one person, 40 inches (100 cm) of space in walkways should be enough to maneuver comfortably. Grouping tasks that occur at one time during the brew day into one space in your brewery streamlines your workflow.



Plan. You can't design a factory to produce a product without knowing the process to produce it! Start with a process flow map of everything you do in your brew day such as cleaning pots, fermenters, hoses, milling grain, preparing hops, water supply, wort cooling, etc. Then alongside the process flow boxes, list the tools and equipment needed in those boxes from wrenches, to sinks and pots, and ingredients. Next, sort those boxes by function, grouping them into work cells, and storage areas. All cleaning processes, all wort-making processes, ingredient prep processes, etc., should be grouped together.

Then move to making a scale drawing of your available brewing space so that you can determine how your equipment will fit within the allotted space. Whether your brewery is a stall in your garage, back patio or basement, sketch out all the hard walls and

“ A place for everything and everything in its place. ”

infrastructure that is difficult to move like water, power, furnaces, doors etc. Pencil and graph paper works just as well as CAD software and it allows you to use cut-to-scale Post-it note mockups of your equipment for experimenting with different scenarios. In my homebrewery, I have cleaning, brewing and grain prep work cells as shown in the drawing on page 46. I brew in my basement and share space

with my furnace and water heater, etc. My storage areas are grain, equipment, finished beer and fermentation. Since our local water is liquid drywall, an RO tank is where I store my brewing water. Even where you'll hang your stir paddle is an important detail.

Always try to minimize all movement when you locate your cells and for all work being done within the work cells. You'll also want everything you



A large stainless steel sink with a sideboard is ideal for cleaning brewing equipment, especially the bulkier vessels, and for letting vessels and equipment dry. You will never be sorry for allocating adequate space for a good sink.



An industrial mop is inexpensive and makes short work of the inevitable spills that occur in a brewery. This may be your second most important piece of brewing equipment.

need for that work cell located within arm's reach and always in the same spot. Again, think factory. In my brewery, I located the cleaning work cell directly across from my wort making work cell and located all the cleaning and sanitizing supplies on a shelf above it. The chest freezer is between the cleaning cell and grain milling cell because it becomes my work table for measuring hops and grains. I always grind my grain the evening before brew day, so it isn't necessary for me to locate it by the brewing equipment. But if you grind while you're heating brewing water, you may want to locate it closer so that you can tend to both. Bear in mind that, like a kitchen, too small and you're tripping over everything. Too big and you're spending too much time walking around. Draw a triangle between the three main pieces of equipment you use the most. This may be your sink, brew kettle, mash tun (or grain station) and make sure the perimeter of that triangle is less than 23 feet (7 m) total. Walkways should be no less than 40 inches (100 cm) for

one person brewing, ideally 48 inches (120 cm) for ease of maneuverability of for more than one person in the brew area. Much more than 60 inches (150



Ventilation is required indoors to remove evaporating water, heat and combustion gasses from the burner, not to mention aromas. Ductwork from Al Feeberg's brewery shown.

“You'll also want everything you need for that work cell located within arm's reach . . .”

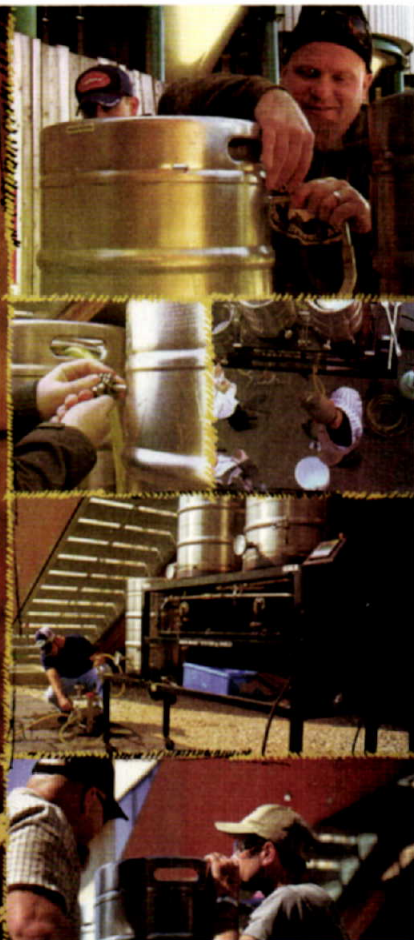
cm) is really wasted space and will slow you down.

We all know that brewing is about 80% janitorial. But this seems to be the most overlooked and inconvenient aspect in most homebreweries. My

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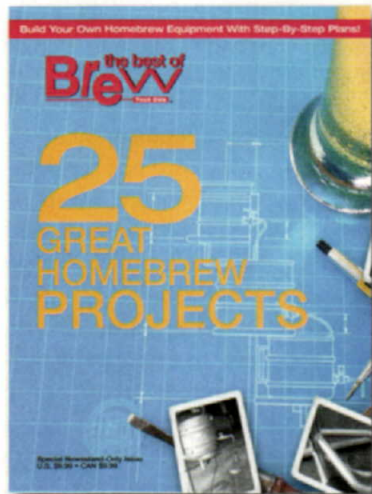
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Ventilation duct with a fan (in blue) and a silencer (the widened area to the right of the fan) to reduce noise. Airflow is from right to left (through the silencer, then the fan).

favorite two pieces of equipment in my brewery hands down are not my conicals and brewpots. They are my stainless commercial sink with a large side board for drying equipment and large basins and my industrial mop. Both make cleaning a breeze. A dinky little sink and mop are frustrating to use. Although a nice sink is expensive, my motto is buy once, cry once. Used restaurant supply stores are a great resource for this equipment and also many other brewing equipment needs. You can buy used for about half the price of new and the used equipment is generally thicker and better made. If you have a local store you can save a pile on shipping. Industrial mops can be purchased at any home improvement store for a very reasonable price. If your budget and or available space doesn't accommodate a large stainless sink, not to fret — plastic laundry sinks are big and economical.



Tim Runnette built a work bench and storage cabinet on casters so it can be moved around if needed.

The next aspect about brewing, particularly brewing indoors, is proper ventilation. Not only for safety, but keeping fumes out of the house that for some reason others find offensive. I can't tell you how many times I've heard, "Dad, that smells nasty!" Our old house had a scary old cellar that not even my dog would enter. When we moved to a house with a real basement, I decided to bring my brewery indoors. My wife's criteria was simple: if that stinks up the house, you're done. Needless to say, I was picking up what she was laying down. Well then, on to ventilation! This is a common question I hear. Ventilation calculations don't have to be complicated. Some simple rules of thumb will get you very close. If you're using a gas burner, your ventilation system will need to remove the evaporating water and aroma vapors, and it'll need to remove the heat and combustion gasses from the burner. A good rule of thumb is dividing your burner's BTU/hour rating by 30 to get the required cubic foot per minute (CFM) of air movement. Note that if you're using more than one burner at a time, you'll need to multiply by that quantity. Rarely is it more than two. This rule of thumb assumes you are installing a hood to collect the vapors. **Safety rule #1:** Always use a carbon monoxide and combustible gas detector. **Safety rule #2:** Always make sure you have a window or door open for incoming make-up air. A vacuum near your gas furnace or water heater flue to back draft from the vacuum. This is less of an issue with high efficiency furnaces since they are force drafted. If you're using an electric pot heater, your needs are about half of that since all you need to worry about is the vapor and aroma component. Take your electric heater power in watts and divide by 17.6 to get your required CFM. When selecting a fan, make sure to get one rated for at least 140 °F (60 °C). McMaster.com is a great source for duct fans and also duct silencers — these fans can make some noise so a silencer is a great idea. Now that your flow requirement is known, you'll need to select a fan and design your duct work. Note that fan flow

drops quickly with restriction from ducting. The data below is a simple guide to help you size the diameter of the duct you'll need to handle the flow you calculated. Note that elbows create a lot of restriction, so you'll want to minimize turns and use the most direct route to an outside wall. This data assumes a maximum total length of 100 ft. (30 m) of equivalent straight length. So for a system with four 90

degree elbows, you could have up to 60 ft. (7.2 m) of straight duct. See pages 48 and 50 for a few shots of some home ventilation systems — mine, and Al Feeberg's home setup.

When designing your ventilation, here are some facts to consider:

Each 90 degree elbow = 10 ft. (3.0 m) of straight duct. Each 45 degree elbow = 5 ft. (1.5 m) of straight duct.

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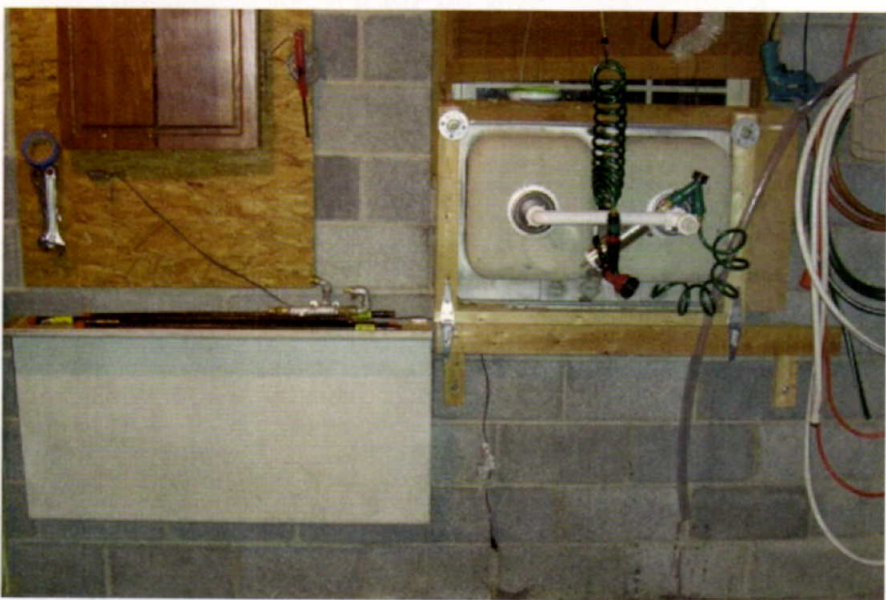
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double darkness



A work bench and sink in Matt Raby's garage homebrewery provides plenty of room to work and clean brewing equipment . . .



. . . and they fold down and up, respectively, afterwards so they take up less space when not in use.

A 10" (25 cm) diameter duct will handle 400 CFM. A 12" (30 cm) diameter duct will handle 700 CFM. A 14" (36 cm) diameter duct will handle 1100 CFM and a 16" (41 cm) diameter duct will handle 1500 CFM.

Another thing I love about my homebrewery is the epoxy garage floor coating on the floor. It is impervious to about everything: beer, StarSan, iodophor, wine, cat hair-balls,

you name it. And it is a breeze to mop up. But don't go with the cheap water based stuff. The real two part solvent based stuff is incredibly hard and durable, but you will want to ensure you have great ventilation when laying it down as it is quite strong smelling. A clear coat afterward is well worth it. Other floors I've seen are vinyl, PVC, enamel and ceramic tile. Either way, just make sure it is non-slip, stain resis-

“ Another thing I love about my homebrewery is the epoxy garage floor coating . . . ”

tant and can handle being subjected to occasional contact with hot objects. For walls make sure you install flame retardant and heat resistant material near the burners like ceramic tile. Plastic shower wall sheeting or durable paint are appropriate for other areas subject to splashing.

After my first few batches of stovetop brews, and a couple unfortunate boil-overs, I was kicked out of the kitchen and into the garage. At the time I didn't have a suitable basement in which to brew, just that nasty cellar that terrified my dog. I even had to carry that stupid 70-lb. (32-kg) dog into the basement once during a tornado warning. So the garage was the next best option. Unfortunately I'm also an avid tool collector, so space was at a premium, but that didn't keep me from brewing. And it shouldn't keep you from implementing many of the suggestions I've discussed with indoor brewing. Just remember to keep things mobile and easy to setup. Here are a few great ideas to organize your brew-garage: Tim Runnette, a brew friend of mine, made a cool and simple work bench that doubles as his brew bench. (See page 50.) It is made out of stock

kitchen cabinets and a Formica top with casters for mobility. All his brew gear is stored inside the cabinets when not in use to keep them close by and keep dust off of them when not in use. The one thing that really drove me nuts was constantly traipsing through the house with soiled pots to clean in the kitchen. So when I saw the system built by Matt Raby (State of Franklin Homebrewers) my immediate reaction was @!#&\*\$%! — why didn't I think of that!! (See page 52.) Both the sink and the work table fold up and out of the way on the perimeter of the garage. The sink drain is simply a hose routed to the floor drain, or outside, or could easily be a 5.0-gallon (19-L) bucket. Storage shelves above complete the ensemble. So don't think for a minute that a garage can't be an awesome and convenient place to brew. Just be creative and look for elevated storage locations and locate to minimize movement. And don't forget ventilation! Either keep the doors fully open or install a fan in a wall.

Storage of brewing equipment, supplies and ingredients are just like everything: it expands to fit the space you allot for it. Remember to keep the items you don't use during the brew day, or use infrequently, out of the main work space. Adjustable storage shelves



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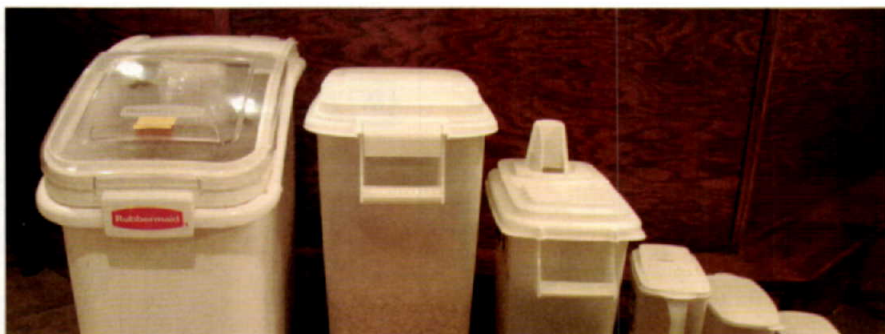
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are an excellent way to store carboys, kegs, and about every conceivable item. Grain milling, though, is part storage and part work space. So I located the storage and milling functions in the same space. I like to keep my "spice rack" full of a decent selection of specialty grains and there is no better way to keep them fresh and easily visible than small sealed plastic containers lined up on a shelf. The smaller



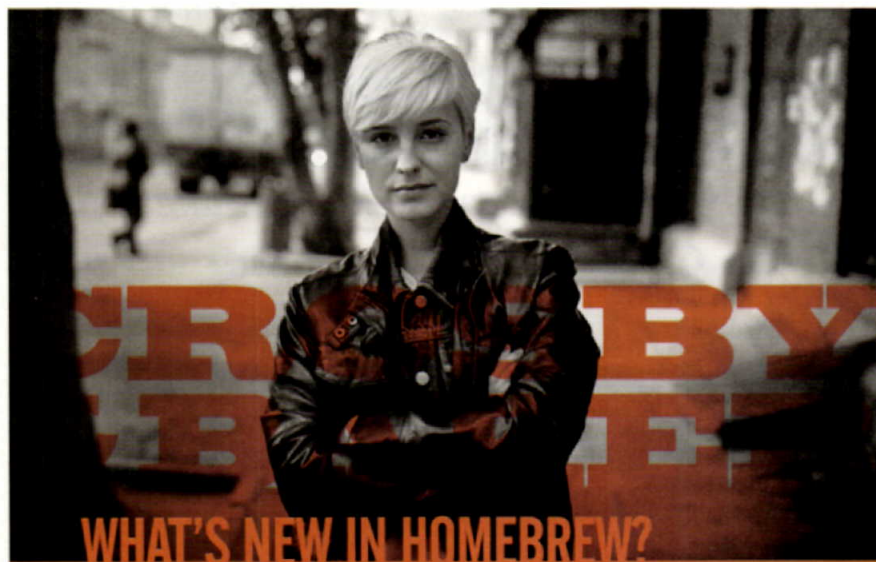
Resealable plastic containers are a great way to store dry ingredients.

containers can be found at Target or Wal-Mart. For the bigger containers used for base malt, I like pet food storage tubs which can be purchased at PetsMart. They are well sealed with a gasket and have a convenient pour spout. For over-the-top storage, stop by your commercial restaurant supply store for dry goods containers. Cool, but expensive. For labeling, I just use Post-it notes. Note that the grain mill and scales are located in the same work area and the whole work cell is right next to the chest freezer that I use as a work table for measuring the grains.

Properly designed and equipped work areas are also safe work areas. Minimizing traffic, reducing clutter, providing proper ventilation, installing CO and combustible gas detectors, and using pumps instead of lifting, are common sense and lead to a fun and safe brew day. Oh, and drinking while brewing? Not a good combination unless you're trying to win a Darwin award instead of a brewing award. OK, at least keep it to a couple.

Hopefully this article has inspired you to tweak your current brewery, revamp it, or set the creative energy in motion to build that dream brewery you've always wanted. Either way, remember that less is more, to plan before building, to visualize this as a brewing factory, and design for safety. And last but certainly not least, when you brew that award-winning beer in that new brewery, don't forget to send me a bottle! 

*John Blichmann founded Blichmann Engineering in 2001.*



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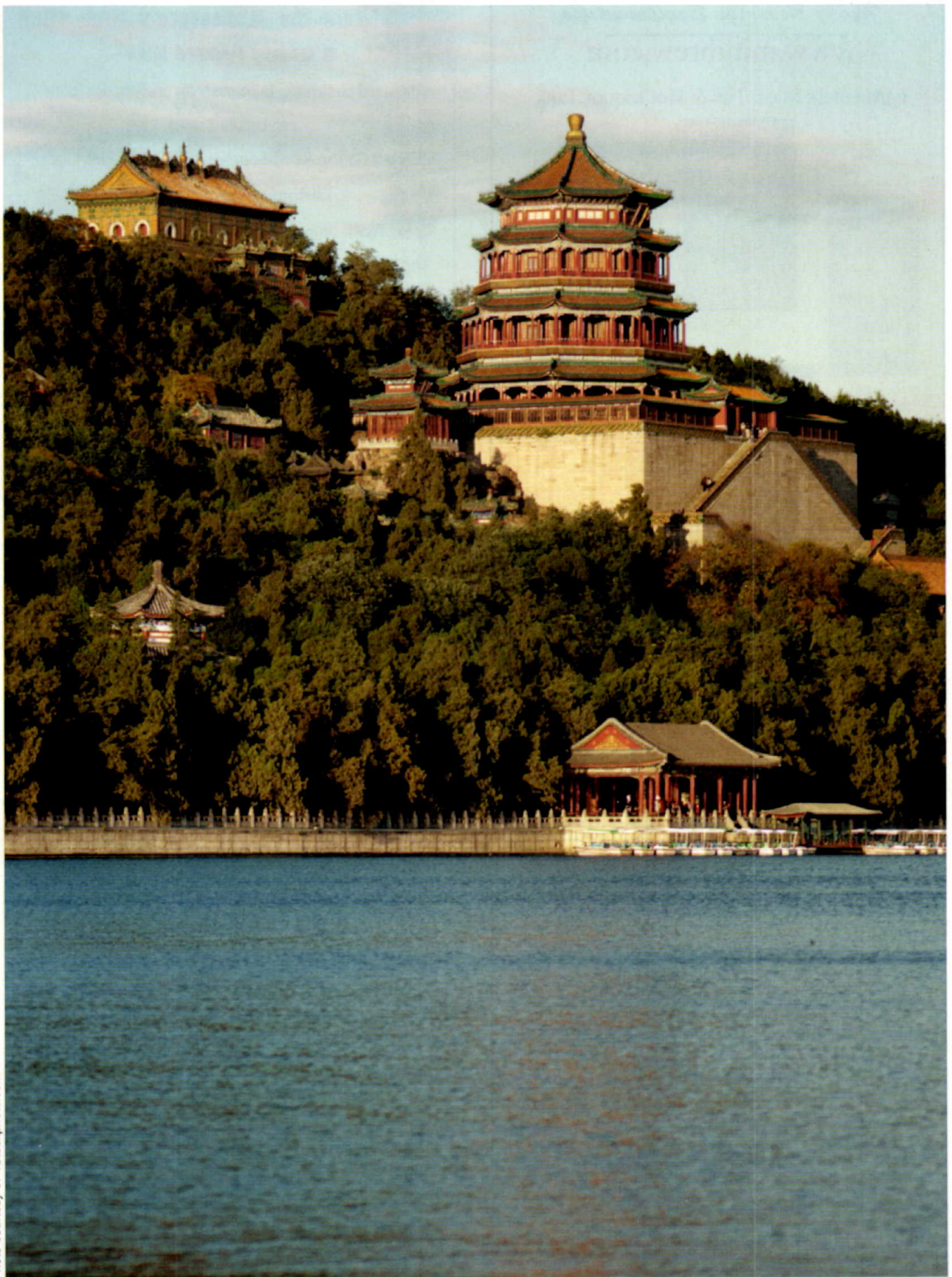


Photo courtesy of iStockphoto.com

The Emperor's Summer Palace in Beijing on the shores of Kunming Lake. Each November the Beijing Homebrewing Society throws a "Beer Boats" party here, which involves boating while enjoying club-made homebrews.

China has the world's largest population with more than 1.3 billion people. And since its communist leaders have loosened their grips in the past decades, China now has the fastest growing economy in the world. The Chinese also consume more beer than in any other country, so it's not surprising that homebrewers are beginning to materialize in some of the larger urban centers. The Beijing Homebrewing Society, a couple months shy of its first birthday, is the only formal homebrewing organization in China's capital city.

The club's genesis was in January 2012 when American expat Jacob Wickham, after batting around the idea of forming a club in talks with the

owners of Beijing craft brewery Great Leap Brewing, posted an internet message offering an informal meeting of homebrewers. Ten people showed up: eight Americans, one Russian and one Chinese.

"I've been homebrewing for several years, but had never known or even heard any other people doing the same thing in Beijing, or even China," Yin Hai, now Chinese president of the Beijing Homebrewing Society, explains. "I feel things started changing (recently). Many beer-themed bars and brewpubs opened (including Beijing's Slow Boat Brewery, Boxing Cat Brewery in Shanghai and Strong Ale Works in Qingdao), and the beer scene suddenly took off. So did the homebrewing scene."

Within months, club numbers swelled to more than 40 members, but most were non-Chinese. The society decided to split into English-speaking and Chinese-speaking groups, though both groups frequently come together. "At first I was the only Chinese member. We had trouble getting local Chinese out to attend our meeting," Yin explains. "Language is not a problem in Beijing; the main issue is that most local people don't feel comfortable attending an expat-dominated club. So I started a Chinese branch of Beijing Homebrewing Society in May. Like all the other things in China, it grows really fast, now it has more than 40 members also."

"We now have more Chinese than expats as members, and he's largely responsible for that," Wickham, a National Science Foundation International Research Fellow at the Institute of Chemistry, Chinese Academy of Sciences and president of the English-speaking club faction, confirms. Yin, an engineer, was also instrumental in getting the club legalized as an entity in China, and building its website ([www.beijingbrewing.com](http://www.beijingbrewing.com)).

With more than 80 members split between club factions, Yin, says both groups frequently meet to brew and talk all things brewing. Meetings often begin with technical discussions or presentations and have a "style-of-the-month" beer tasting. Of course, members share their own homebrews, recipes and knowledge. Yin says that

# Chinese BREWING

"The quest to brew real beer pulls homebrewers from different cultures together in the Beijing Homebrewing Society"

Story by **Glenn BurnSilver**

# Yin's Winning Recipes

## Cherry Smoked Porter (5 gallons/19 L, all-grain)

OG = 1.058 FG = 1.014  
IBU = 45 SRM = 38  
ABV = 5.6%

According to Yin, the Chinese malts are made from grains grown in Australia, but malted in China. The medium crystal malt did not have a color rating, but he guessed that it was 50–60 °L.

### Ingredients

1.8 lb. (0.81 kg) Briess Cherrywood Smoked Malt  
8.5 lb. (3.9 kg) Chinese 2-row pale malt  
12 oz. (0.34 kg) Chinese chocolate malt  
12 oz. (0.34 kg) Chinese crystal malt (60 °L)  
5.0 oz. (0.14 kg) crystal malt (120 °L)  
7.6 AAU Chinook hops (60 mins) (0.63 oz./18 g of 12% alpha acids)  
9.7 AAU Chinook hops (15 mins) (0.81 oz./23 g of 12% alpha acids)  
White Labs WLP001 (California Ale) (1 qt./1 L yeast starter)

### Step by Step

Single infusion mash at 154 °F (68 °C) for 60 minutes. Boil wort for 60 minutes, adding hops at times indicated. Ferment at 68 °F (20 °C).

### Partial-mash option:

If you reduce the 2-row pale malt to 6.2 ounces (176 g), you can perform a partial mash with 4.0 lbs. (1.8 kg) of grain. (Because of the amount of smoked malt, an extract with grains formulation is not possible.) Add 4.5 lbs. (2.0 kg) of light dried malt extract to reach your target original gravity.

## American Brown Ale (5 gallons/19 L, all-grain)

OG = 1.060 FG = 1.015  
IBU = 60 SRM = 28 ABV = 5.8%

*This American brown ale was brewed from Chinese malt and hops. The hops were given to Yin and he was never told what their alpha acid level was. (He guessed "less than 10%.") The special 2-row is a more darkly kilned malt, perhaps similar to biscuit.*

### Ingredients

10.5 lb. (4.8 kg) Chinese 2-row malt  
1.0 lb. (0.45 kg) Chinese crystal malt (60 °L)  
2.0 oz. (57 g) Chinese chocolate malt  
1.0 lb. (0.45 kg) Chinese special 2-row (similar to biscuit)  
9 AAU Xinjiang whole hops (60 mins) (1.0 oz./28 g of 9% alpha acids)  
12 AAU Xinjiang whole hops (15 mins) (1.5 oz./43 g of 9% alpha acids)  
1.0 oz. (28 g) Xinjiang whole hops (1 mins)  
White Labs WLP001 (California Ale) (1 qt./1 L yeast starter)

### Step by Step

Mash grains at 149 °F (65 °C), using a single infusion mash, for 60 minutes. Boil wort for 60 minutes, adding hops at times indicated. Ferment at 68 °F (20 °C).

### Extract with grains option:

Omit the 2-row pale malt and add 5.5 lbs. (2.5 kg) of light dried malt extract to reach your target original gravity. Substitute biscuit malt for the special 2-row malt and pick a dual purpose hop with a fairly high alpha acid rating to replace the Chinese hops.

### Partial-mash option:

Reduce the amount of 2-row pale malt to 2.0 lbs. (0.91 kg) and add 4.5 lbs. (2.0 kg) of light dried malt extract to reach your target original gravity. See extract option for other recipe substitutions.

while both sides of the society are very active in the pursuit of great beer, he believes there are more things happening on the Chinese side of the club.

"(Chinese) people are eager to learn and share everything about beer. So we have more classes and presentations," Yin says. "The Chinese club gets together two or three times every month, as most people are so excited to find this hobby and want to talk about it like, every day."

Within the club ranks, brewing skill levels vary, including many who just started brewing this year. But, Yin adds, the club's goal is to "get the like-minded people together, promote the craft beer culture and homebrewing in Beijing and China."

"We offer additional activities and educational opportunities that enhance homebrewers' techniques in making, tasting, and evaluating your beer," Wickham adds. "Anyone passionate about beer is welcome to join our meetings and activities. Membership is not required to attend our gatherings."

The club occasionally meets outside someone's home — quite literally. November's "Beer Boats" meeting involves drinking homebrew while boating on Kunming Lake at the Emperor's Summer Palace in Beijing.

"This is our planned outdoor activity," Yin says. "We bring several kegs of homebrew (and) rent a boat. (It) is one of the most beautiful places in Beijing city. It can be very beautiful on a nice day. And drinking there is what the emperors did a long time ago."

## Making "Real Beer"

According to the club's website, the group was founded on a premise to make "real beer." While the Beijing Homebrewing Society is very active in its brewing pursuits, resources remain limited as the homebrewing industry struggles to catch up locally. There are no homebrew supply stores in Beijing, so brewing resources are cobbled together with whatever's at hand. Plastic buckets, for example, often serve as mash tuns, when not being used as fermenters. Yin, who was first introduced to homebrewing while liv-



Photo courtesy of Hai Yin

President Hai Yin and Founder Jacob Wickham of the Beijing Homebrewing Society. Yin was the first Chinese national in the club, and subsequently spun off an all-Chinese group to attract more Chinese homebrewers. The two groups meet together frequently.

ing briefly in Ireland, says it adds to the spirit of homebrewing.

"Although it grows fast, there are still very few people brewing in China," he says. "You need to do-it-yourself to have your equipment, but do-it-yourself is the spirit of homebrewing anyway, so most people don't have any trouble to have their own equipment."

But locally sourcing specialty or high quality ingredients — malts, hops, grains and yeast — can be an impossible task. The club provides what guidance it can. For specialty items many China-based homebrewers order from online brew shops located in Europe and North America. Visitors are often asked to bring supplies along when traveling to China. Others take advantage of trips abroad to load up on hard-to-find ingredients.

"The only way to buy (special ingredients) is in Europe or the states," Yin explains. "When I travelled to Boston earlier this year with several friends, I brought back more than 100 pounds (45 kg) of malt and hops, and partitioned them into several (pieces of) luggage."

Yin put a portion of those supplies to good use when the club held its first homebrewing competition in June — what Yin says is the first event of its kind "ever in China." Fourteen brewers submitted 24 entries covering more

than 10 beer styles as classified by Beer Judge Certification Program (BJCP) standards. Brewmasters from local craft breweries served as judges. Yin took first place with a cherry-smoked porter using malts he brought back from Boston, and second place for his American brown ale. Most of the brown ale's ingredients came from China. See recipes for Yin's winning beers on page 58.

"To be honest, these beers would have difficulty to claim any awards in an American competition," he says. "But they were all brewed to a very high standard and can be regarded as great beers, especially taking into account the very limited and primitive ingredients and equipment in China."

That should change, Yin believes, as the homebrewing culture expands across China. As people realize beer doesn't have to be flavorless and "watery" the demand for "real beer" should accelerate that growth.

"There are still very few active Chinese homebrewers so far," Yin says. "Beijing has the most people and is the best organized, but . . . there is still no culture there. But yes, we are trying to change it, and I strongly believe it can happen in the coming few years." BYO

*Glenn BurnSilver is a frequent contributor to Brew Your Own.*

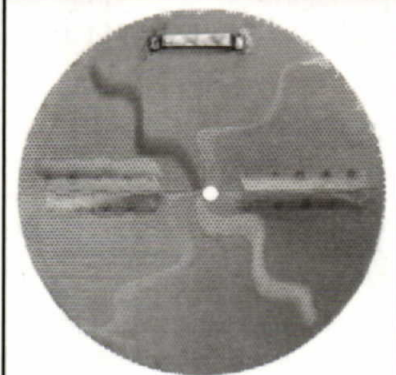
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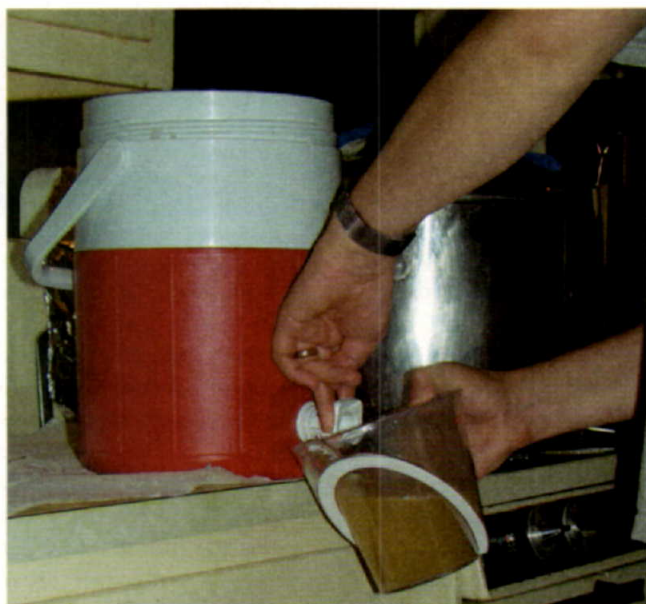
# CONVERTING TO PARTIAL MASH

How to set up your partial-mash brewery and convert your favorite recipes to this method

**P**artial-mash brewing combines many of the best aspects of extract and all-grain brewing. You can brew a partial-mash beer on your stovetop — with, at most, only minor changes to an extract-based brewing setup — yet you can also explore a wide world of base malts and make a large portion of your wort “from scratch.” One of biggest drawbacks to partial-mash brewing is the relative dearth of homebrew recipes that use this method. However, as I’ll show in this article, most extract or all-grain recipes can easily be converted to a partial-mash formulation.



If you already have an extract-based brewery, all you need is one additional vessel — a 2–3 gallon (7.6–11 L) pot or beverage cooler (shown) — and a large grain bag to upgrade to partial mashing.



The small mash yields wort, decreasing the amount of malt extract used compared to a similar extract-based recipe.

In partial-mash brewing, the brewer makes wort from mashing malted grains (as all-grain brewers do), but then supplements this wort with malt extract to reach his target original gravity. Most partial-mash brewers boil less than their total volume of wort (as stovetop extract brewers do), diluting it to working strength in the fermenter. In many ways, partial mashing is similar to making an extract beer supplemented with steeped specialty grains. The big difference is, in partial mashing, base malts are mixed along with the specialty malts and the temperatures and volumes of brewing water used in the “steep” fall into a narrower range.

Partial mashing offers several benefits to extract brewers. There is a wide variety of base malts available to all-grain brewers, all with different flavors and aromas. In contrast, there are relatively few light or pale malt extracts. Partial-mash brewing allows extract brewers to fine tune the base malt character of their beers by blending wort made from mashed base malts with their malt extract. Partial-mash brewing also yields beer with more malt aromatics, as some of the aromatic compounds from malt are lost when malt extract is concentrated. Steeping specialty grains, a common practice in extract brewing, helps compensate for this somewhat. However, malt aromas specifically from the base malt can be added when partial mashing. (Compare the aroma of



All-grain brewers occasionally use partial-mash methods when brewing inside is preferable to braving the outdoor elements.

pale or Pilsner malt at your homebrew shop to the aroma of the specialty malts you commonly steep; they aren't the same.) Partial mashing can also help demystify the process of mashing, potentially helping an extract brewer decide if he wants to make the leap to all-grain brewing.

For all-grain brewers, partial mashing can be a way to schedule a shorter brew day — or a brew day away from inclement weather outdoors — while still yielding great beer.

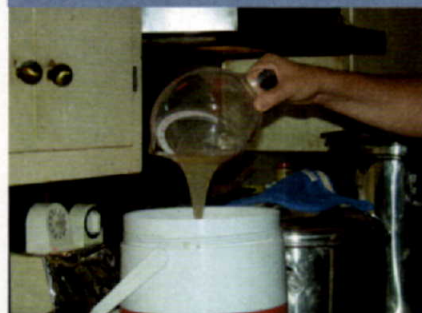
No matter what type of brewer you are, you can likely use almost all of your favorite recipes in a partial-mash formulation. Converting a homebrew recipe to a partial-mash formulation involves either converting a certain amount of malt extract into malted grain or a certain amount of malted grain into malt extract, depending on whether your initial recipe is extract or all-grain. The amount of ingredients other than water (hops, kettle adjuncts, yeast, etc.) do not change. So generally, you are left with one simple calculation to convert your extract or all-grain ingredient list into a partial-mash ingredient list.

### How Partial to Make Your Mash

Before you start converting recipes, you'll need to decide how much grain you will be mashing. The volume required to mash a given weight of malted grain is given in Table 1 (p. 66). For a 5.0-gallon (19-L) recipe, you should mash a minimum of 2.0 lbs. (0.91 kg) of grain (specialty malts and base malts combined). Below this amount and you aren't going to get many of the benefits of partial mashing. The maximum amount you can handle will likely depend either on the size of your brewpot or the size of your mashing vessel. And of course, if the size of your partial mash is such that you only use a very small amount of extract, you might as well go all-grain.

The amount of wort you collect from the partial mash goes up with the weight of the grains added. So, the size of your brewpot may limit the size of your partial mash. In partial mashing, the volume of wort yielded is about 20% larger than the volume of the mash. For example, in most of my own partial-mash recipes, I mash 4.0 lbs (1.8 kg) of grains in enough water to

## Types of Partial Mashing



Homebrewing equipment set ups, and the methods used with them, are highly varied. Nowhere is this more true than with brewers who use partial-mash methods. This is a survey of some of the ways homebrewers approach partial mashes and the strengths and weaknesses of each. The first approach is both simple and flexible — place all the grains you will be mashing in a large steeping bag and mash in your brewpot. The mash can be kept on the stovetop and heated and stirred occasionally, or the brewpot can be insulated with towels. Some brewers even turn their oven on its lowest setting, open the door and place the brewpot inside. A big strength of this method — besides the fact that all you need beyond your basic extract brewing equipment is a large steeping bag — is that you can heat the mash directly on your stovetop. You could even do step mashes if you wanted. A variation on this is to mash your grains in a separate pot. You could do this on the stovetop, insulated with towels or in the oven as with the brewpot. The strength to this method, assuming you have a kitchen pot big enough to hold your mash, is that you can be heating the water in your brewpot as the mash rests. In fact, you can steep dark specialty grains (if your recipe calls for them), in your brewpot while mashing pale malt in your secondary pot. A third approach involves using an unmodified beverage cooler as a small mash tun. Although you cannot heat this mash directly, containing the mash in a cooler and draining it via the spigot eliminates the need to lift bags of hot grain out of your mash pot and into a colander to be rinsed. The full description of this method can be found at: <http://www.byo.com/stories/article/indices/48-partial-mashing/511-counter-top-partial-mashing>



A 2-gallon (7.6-L) beverage cooler (right) or a 3-gallon (11-L) cooler (left) may be used as your mash vessel in a 5-gallon (19-L) brewery. Pots of the same size could also be used.



Most existing extract and all-grain recipes can be converted to a partial-mash formulation with little effort, giving the brewer the added flexibility of choosing the brewing method that best meets his or her needs.

yield a 2.0-gallon (7.6-L) mash. After draining the first wort and sparging, I usually end up collecting just short of 2.5 gallons (9.5 L) of wort. Table 1 on page 66 gives an estimate of how much wort you will collect from a given grain bed and its specific gravity, when dilut-

ed to 5.0 gallons (19 L). How much hot water you rinse the grains (sparge) with is, of course, the biggest variable relating to the volume of wort collected. In practice, your numbers may differ, but those given in Table 1 are a good reference point for beginners.

In general, you should mash as much as you can. If you can mash, say, 6.0 lbs (2.7 kg) of grain, it really doesn't make sense to mash only 5.0 lbs. (2.3 kg) — the differences in time and energy expended would be minimal. Plus, larger mash volumes fluctuate in temperature less than smaller volumes. In addition, malted grains are cheaper than malt extract, so the larger the partial mash, the cheaper your ingredient costs (although admittedly, the difference isn't that substantial at the 5.0-gallon/19-L scale).

If you plan to mash in your brewpot, figure on having the mash fill about 66% percent (two thirds) of the brewpot. This makes it easier to control splashes and allows you to slowly lift the grain bag out with less chance of slopping wort onto your stovetop. And, as you will yield slightly more than that volume of wort for the boil, this still provides a nice buffer for boilovers. For example, if you had a 5-gallon (19 L) brewpot, and were using that as your mash vessel, set your partial-mash volume to 3.3 gallons (12 L). This way, you will yield 4.0 gallons (15 L) of wort to boil.

If you are using a separate vessel for a mash/lauter tun, a very handy solution is a 2.0-gallon (7.6-L) or 3.0-gallon (11-L) beverage cooler. These will hold 4.0 lbs. (1.8 kg) or 6.0 lbs. (2.7 kg) of grain, respectively, and yield roughly 2.4 to 3.6 gallons (9.1–14 L) of wort — amounts that would work well for any brewer with a 5.0-gallon (19-L) brewpot. Plus, at that size, you will not need to modify the cooler in any way. Just place all the grains inside a grain bag and place it in the cooler. One drain hole (from the built in spigot) is plenty to drain the cross-sectional area of the vessel. The simple "grain bag in a cooler" method works well in coolers up to 5.0 gallons (19 L). Beyond that you'll probably want to install some sort of manifold. An added benefit of using a cooler versus mashing in a pot is that there is no lifting bags of hot, wet grain and so splashing is minimized.

### Converting Extract Recipes

If you want to convert a malt-extract-based recipe to a partial-mash recipe,





If you use a cooler for the mash, you do not need to lift the grain bag out to rinse it.

first check on the type of malt extract called for in the recipe. If it is a "straight," unblended malt extract, you are in business. By "straight" malt extract, I mean any malt extract that is not made from a blend of different malts. Dark malt extract and amber malt extract are two types of malt extract made from more than one kind of malt. In the absence of knowing the types of malt and their proportions in the extract, you cannot make a good conversion to a partial-mash recipe.

On the other hand, if the malt extract used is light (or extra light) malt extract, pale malt extract or Pilsner malt extract, you are fine. Likewise, wheat malt extract and Munich malt extracts are blends, but generally the proportion is 50% wheat malt or Munich malt to 50% pale barley malt, so again you can make the conversion, albeit with a couple added calculations. In a like manner, most extracts designed to make American-style Pilsners are blends, but the blend ratio is usually in the ballpark of 30–40% corn or rice and 60–70% barley malt.

So, you've got your extract recipe with an unblended malt extract and

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# PARTIAL-MASH RECIPES

## Poe's Boston Bitter (5 gallons/19 L, all-grain)

OG = 1.037 FG = 1.009  
IBU = 33 SRM = 9 ABV = 3.6%



*"Fill with mingled cream and amber,  
I will drain that glass again.  
Such hilarious visions clamber  
through the chambers of my brain.  
Quaintest thoughts – queerest fan-  
cies, come to life and fade away:  
What care I how time advances? I  
am drinking ale today."  
– Edgar Allan Poe*

### Ingredients

7.0 lbs. (3.2 kg) British 2-row pale  
ale malt  
0.5 lb. (0.23 kg) crystal malt (60 °L)  
7.5 AAU Kent Golding hops  
(60 mins)  
(1.5 oz./43 g of 5% alpha acids)  
2.5 AAU Kent Golding hops  
(10 mins)  
(0.5 oz./14 g of 5% alpha acids)  
2.5 AAU Kent Golding hops (5 mins)  
(0.5 oz./14 g of 5% alpha acids)  
0.5 oz. (14 g) Kent Golding hops

(0 mins)  
0.5 oz. (14 g) Kent Golding hops  
(dry hop)  
Wyeast 1028 (London Ale) or White  
Labs WLP026 (Burton Ale) yeast  
(1 qt./1 L yeast starter)

### Step by Step

Mash at 153 °F (67 °C). Boil for 60  
minutes, adding hops at times indi-  
cated. Pitch yeast and ferment at  
68 °F (20 °C). After primary fermen-  
tation has ceased, let beer set for 2  
days, then rack to secondary and  
add dry hops. Dry hop for 1 week.

## Poe's Boston Bitter (5 gallons/19 L, partial mash)

OG = 1.037 FG = 1.009  
IBU = 33 SRM = 9 ABV = 3.6%

### Ingredients

3.5 lbs. (1.6 kg) British 2-row pale  
ale malt  
0.5 lb. (0.23 kg) crystal malt (60 °L)  
2.0 lbs. (1.4 kg) light dried  
malt extract (such as Muntons)  
7.5 AAU Kent Golding hops  
(60 mins)  
(1.5 oz./43 g of 5% alpha acids)  
2.5 AAU Kent Golding hops  
(10 mins)  
(0.5 oz./14 g of 5% alpha acids)  
2.5 AAU Kent Golding hops (5 mins)  
(0.5 oz./14 g of 5% alpha acids)  
0.5 oz. (14 g) Kent Golding hops  
(0 mins)  
0.5 oz. (14 g) Kent Golding hops  
(dry hop)  
Wyeast 1028 (London Ale) or White  
Labs WLP026 (Burton Ale) yeast  
(1 qt./1 L yeast starter)

### Step by Step

Mash grains at 153 °F (67 °C) for 45  
minutes in 7.8 qts. (7.5 L) of water.  
Sparge grains to yield just short of  
2.5 gallons (9.5 L) of wort. Add  
water to make 3.0 gallons  
(11 L) and add roughly one third of  
the malt extract. Boil wort for 60

minutes, adding hops at times indi-  
cated. Add remaining malt extract  
for final 15 minutes of boil. Cool  
wort and transfer to fermenter. Top  
up to 5 gallons (19 L) with cool  
water and pitch yeast. Ferment at  
68 °F (20 °C). After primary fermen-  
tation has ceased, let beer set for 2  
days, then rack to secondary and  
add dry hops. Dry hop for 1 week.

### Extract with Grains Option:

Reduce amount of pale ale malt to  
1.5 lbs. (0.68 kg) and increase  
amount of light dried malt extract to  
3.0 lbs. (1.4 kg). Steep grains at  
153 °F (67 °C) in 2.8 qts. (2.6 L)  
water for 45 minutes. Add water to  
make 3 gallons (11 L) of wort and  
add roughly one third of the malt  
extract. Boil wort for 60 minutes,  
adding hops at times indicated. Add  
remaining malt extract for final 15  
minutes of boil. Cool wort, transfer  
to fermenter and top up to 5 gallons  
(19 L) with cool water. Pitch yeast  
and ferment at 68 °F (20 °C). After  
primary fermentation has ceased, let  
beer set for 2 days, then rack to  
secondary and add dry hops. Dry  
hop for 1 week.

### Tips for Success

Both the extract and all-grain ver-  
sions convert into the partial-mash  
version of this recipe. Some 2-row  
pale ale malt is converted to light  
dried malt extract in the all-grain to  
partial-mash conversion; the oppo-  
site in the extract to partial-mash  
case. This beer is named for Edgar  
Allen Poe. This Boston-born writer,  
whose short stories of mystery and  
the macabre are still enjoyed today,  
was a fan of ale. This British-style  
bitter is well-suited to a partial-mash  
formulation as two thirds of the  
extract weight comes from grain.  
For best results, use fresh malt  
extract. This beer will condition  
quickly. You can easily be draining  
your glass 13 days after brewing.

# PARTIAL-MASH RECIPES

## Old Cthulhiar (a.k.a. Very Old And Very Peculiar) (5 gallons/19 L, all-grain)

OG = 1.078 FG = 1.017  
IBU = 41 SRM = 32 ABV = 7.8%



### Ingredients

13 lbs. (5.9 kg) British pale ale malt  
8.0 oz. (0.23 kg) crystal malt (60 °L)  
2.0 oz. (57 g) crystal malt (120 °L)  
5.0 oz. (0.14 kg) aromatic malt  
3.0 oz. (85 g) chocolate malt  
2.0 oz. (57 g) black malt  
3.0 oz. (85 g) molasses  
12 oz. (0.34 kg) cane sugar  
9 AAU Northern Brewer hops  
(60 mins)  
5 AAU Fuggles hops (15 mins)  
(1 oz./28 g at 5% alpha acids)  
1.0 oz. (28 g) Fuggles hops (2 mins)  
0.5 oz. (14 g) Fuggles whole hops

(dry hop)

Wyeast 1028 (London Ale) or White  
Labs WLP026 (Burton Ale) yeast  
(2 qt./2 L yeast starter)

### Step by Step

Mash at 152 °F (67 °C). Boil for 75 minutes, adding hops at times indicated. Add sugar with 15 minutes left in the boil. Pitch yeast and ferment at 68 °F (20 °C). After primary fermentation has ceased, let beer set for 3 days, then rack to secondary and add dry hops. Dry hop for 2 weeks. Let age for 6 months.

## Old Cthulhiar (a.k.a. Very Old And Very Peculiar) (5 gallons/19 L, partial mash)

OG = 1.078 FG = 1.017  
IBU = 41 SRM = 32 ABV = 7.8%

### Ingredients

4.0 lbs. (1.8 kg) British pale ale malt  
8.0 oz. (0.23 kg) crystal malt (60 °L)  
2.0 oz. (57 g) crystal malt (120 °L)  
5.0 oz. (0.14 kg) aromatic malt  
3.0 oz. (85 g) chocolate malt  
2.0 oz. (57 g) black malt  
5.0 lbs. (2.3 kg) light dried  
malt extract  
3.0 oz. (85 g) molasses  
12 oz. (0.34 kg) cane sugar  
9 AAU Northern Brewer hops  
(60 mins)  
5 AAU Fuggles hops (15 mins)  
(1 oz./28 g at 5% alpha acids)  
1.0 oz. (28 g) Fuggles hops (2 mins)  
0.5 oz. (14 g) Fuggles whole hops  
(dry hop)  
Wyeast 1028 (London Ale) or White  
Labs WLP026 (Burton Ale) yeast  
(2 qt./2 L yeast starter)

### Step by Step

Mash pale malt at 153 °F (67 °C) for 45 minutes in 7.8 qts. (7.5 L) of water. Sparge grains to yield just short of 2.5 gallons (9.5 L) of wort. While mashing, steep specialty grains in 2 qts. (~2 L) of water in

your brewpot at 153 °F (67 °C). Add wort from partial mash to steeping liquid in your brewpot and add roughly one third of the malt extract. Boil wort for 75 minutes, adding hops at times indicated. Add sugars and remaining malt extract for final 15 minutes of boil. Cool wort and transfer to fermenter. Top up to 5 gallons (19 L) with cool water and pitch yeast. Ferment at 68 °F (20 °C). After primary fermentation has ceased, let beer set for 3 days, then rack to secondary and add dry hops. Dry hop for 2 weeks.

### Extract with Grains Option:

Reduce amount of pale ale malt to 0.75 lbs. (0.34 kg) and use a total of 6.75 lbs. (3.1 kg) light dried malt extract. Steep grains at 152 °F (67 °C). Add roughly one half of the malt extract and boil wort for 75 minutes, adding hops at times indicated. Add sugars and remaining malt extract for final 15 minutes of boil. Cool wort and transfer to fermenter. Top up to 5 gallons (19 L) with cool water and pitch yeast. Ferment at 68 °F (20 °C). After primary fermentation has ceased, let beer set for 3 days, then rack to secondary and add dry hops. Dry hop for 2 weeks. Age for 6 months.

### Tips for Success

The partial-mash formulation of this beer utilizes steeped specialty grains (in the brewpot) and a separate small mash. This beer is a darker, stronger and more bitter interpretation of Theakston's Old Peculiar. It gets its name from Cthulhu — a central character (one of the Old Ones) in H. P. Lovecraft's writings. For best results, make a 2-qt. (2-L) yeast starter and pitch the yeast from this. This is underpitching, compared to the optimal pitching rate, but is done intentionally to help the yeast develop an estery character that is appropriate for this beer.

**Table 1: Grain Weight vs. Mash Volume, Wort Yield and Specific Gravity**

| weight of grains (lbs) | mash volume (gallons) | wort yield (gallons) | specific gravity (in 5 gallons) |
|------------------------|-----------------------|----------------------|---------------------------------|
| 3                      | 1.5                   | 1.8                  | 1.014                           |
| 4                      | 2                     | 2.4                  | 1.019                           |
| 5                      | 2.5                   | 3                    | 1.024                           |
| 6                      | 3                     | 3.6                  | 1.029                           |
| 7                      | 3.5                   | 4.2                  | 1.034                           |
| 8                      | 4                     | 4.8                  | 1.038                           |
| 9                      | 4.5                   | 5.4                  | 1.043                           |
| 10                     | 5                     | 6                    | 1.048                           |
| weight of grains (kg)  | mash volume (L)       | wort yield (L)       | specific gravity (in 19 L)      |
| 1.5                    | 6.3                   | 7.6                  | 1.016                           |
| 2                      | 8.3                   | 10                   | 1.021                           |
| 2.5                    | 10.4                  | 12                   | 1.026                           |
| 3                      | 12.5                  | 15                   | 1.032                           |
| 3.5                    | 14.6                  | 18                   | 1.037                           |
| 4                      | 16.6                  | 20                   | 1.042                           |
| 4.5                    | 18.7                  | 22                   | 1.048                           |

The volume calculations assume a mash thickness of 1.375 qts./lb (2.9 L/kg) and that the grain bed is sparged up to the point that the wort yield is reached. (At this point, the grain bed should be close to fully sparged.) The specific gravity estimates assume a grain bill of pale malt with an extract efficiency of 65%.

**Table 2: Potential Extract of Selected Malted Base Grains and Malt Extracts**

|                     |             |
|---------------------|-------------|
| liquid malt extract | 1.033–1.037 |
| dried malt extract  | 1.045       |
| 2-row pale malt     | 1.037       |
| 6-row pale malt     | 1.035       |
| 2-row pale ale malt | 1.038       |
| Pilsner malt        | 1.038       |
| Vienna malt         | 1.035       |
| Munich malt         | 1.034       |
| wheat malt          | 1.038       |

have decided on the size of your partial mash. Now, all you need to know is how to convert a portion of the malt extract to the appropriate base malt.

**The Steps To Do This Are:**

1. Decide on the volume of your partial mash and the corresponding weight of your grains.
2. Subtract the weight of the specialty

grains from the partial-mash weight.

3. Add this amount of the appropriate base malt to reach your partial-mash weight (based on extract type).

4. Decrease the amount of malt extract corresponding to the weight of the added base malt times the potential extract of the base malt divided by the potential extract of the malt extract. (See Table 2, above, for repre-

sentative numbers for potential extracts for common base grains and malt extract types.)

**Extract Example:**

As an example, let's say you had a Bohemian Pilsner recipe that called for 0.5 lbs. (0.23 kg) of light crystal malt (20 °L), 8.5 lbs. (3.9 kg) of light, liquid Pilsner malt extract, 40 IBUs of

Tettnanger bittering hops and lager yeast. To convert the recipe, leave the amount of specialty malts (in this recipe, the crystal malt) and all the other ingredients alone and focus on the Pilsner malt extract. Let's say you have decided that you are going to mash 4.0 lbs. (1.8 kg) of grains. Subtracting the weight of the specialty grains (0.5 lbs./0.23 kg) from 4.0 lbs. (1.8 kg) yields 3.5 lbs. (1.6 kg) of grain needed in the recipe. Given that you used Pilsner malt extract, that 3.5 lbs. (1.6 kg) of malt will be Pilsner malt and you have now completed the partial-mash portion of your ingredients list. The only thing remaining is how much Pilsner malt extract to delete from the initial recipe. Malt extract and grain cannot be swapped 1:1 on a by weight basis. (In this example, you can't just subtract 3.5 lbs. (1.6 kg) of malt extract for the 3.5 lbs. (1.6 kg) of Pilsner malt in the partial mash.) You need to take into consideration their extract potential — a measure of how much they increase the specific gravity of a solution per weight of the ingredient added. (See Table 2 for a list.)

To calculate the weight of malt extract to subtract, multiply the weight of the malted grain by its extract potential divided by the extract potential of the malt extract. In this case, 3.5 lbs. \* (37 ppg/33 ppg) = 3.9 lbs. of malt extract. As such, your final ingredient list would be 0.5 lbs. (0.23 kg) crystal malt (20 °L), 3.5 lbs. Pilsner malt (for a total of 4 pounds of grain to mash), 4.6 lbs. (2.1 kg) of liquid Pilsner malt extract, plus the hops and the yeast from the original recipe.

### Converting All-Grain Recipes

Converting an all-grain recipe to a partial mash formulation is simple. Assemble your partial mash by combining all of the specialty grains the recipe calls for plus whatever base malt will be needed to reach your intended partial-mash weight. Then convert the remaining base malt to malt extract. In this case, you will multiply the remaining amount of base malt by its potential extract, then divide by the potential extract of the malt extract. The rest of



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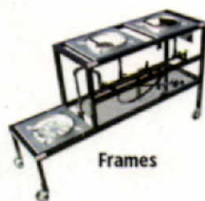
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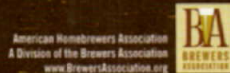
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the ingredient list remains the same. Only the procedures change.

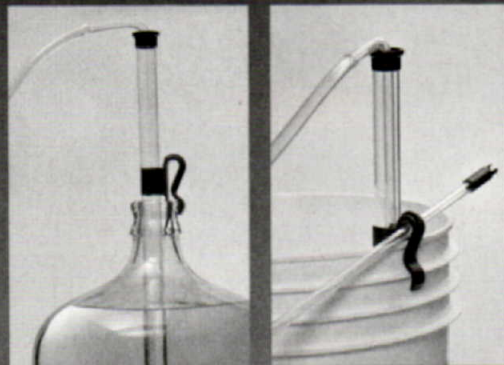
Of course, you can only make this conversion if there is a malt extract equivalent of your base malt. If the recipe calls for 2-row pale malt, 2-row pale ale malt or just "pale malt," use pale, light or extract-light malt extract. There are Pilsner malt extracts for Pilsner malts and malt blends for some other types of base malt. As mentioned before, Munich malt extract is usually made from a 50:50 blend of Munich and pale (or often Pilsner) malt and wheat malt extract is usually made from a 50:50 blend of wheat malt and pale malt.

All-grain recipes should include a mash program — what temperature rests are used and for how long (and sometimes the mash thickness is also given). One obvious approach to partial mashing would be to follow the mash program specified in the all-grain recipe. For simplicity's sake, this should be your choice if the recipe specifies a single-infusion mash. If the recipe specifies a step mash, decoction mash or other mash program, you'll need to decide if you want to duplicate that in your partial mash, or simplify the instructions and perform a single-infusion mash. Part of that decision will be based on your set-up. If you are using an insulated cooler as a mash tun, you can't do any mash program that calls for directly heating the mash. Step mashes generally take longer than a single-infusion mash when all the rests are added up (especially when heating times are added) and they result in wort with a higher fermentability than a single-infusion mash with the same saccharification temperature. So, if you simplify a step mash down to a single rest, pick a temperature near the bottom of the range for single-infusion mashes — 148–150 °F (64–65 °C).

Also, for beers you want to be dry, try this trick. Run off your wort and hold it in the low end of the saccharification range (148–162 °F/64–72 °C). Then stir in your malt extract (or at least the first addition, if you are withholding some for late in the boil) and hold the mixture at 148–150 °F (64–65 °C) for 5 minutes before

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you begin to heat the wort. This allows the enzymes from the malted grain to work on any carbohydrates in the malt extract that could be reduced to simpler sugars.

### All-Grain Example:

For the all-grain example, let's pick a recipe for which we'll have to use a blended malt extract. Specifically, let's say we have a wheat beer recipe that calls for 70% wheat malt (7.0 lbs./3.2 kg), 30% Pilsner malt (3.0 lbs./1.4 kg). If we are using a 4.0-lb. (1.8-kg) partial mash, which base malt or combination of base malts do we choose? We know that we will be using wheat malt extract for the malt extract and that it is made with 50:50 wheat malt to pale malt, so we'll want the portion of the grain bill converted to extract to be as close to 50:50 as possible with regards to the two types of malt. A quick look shows that using 4.0 lbs. (1.8 kg) of Pilsner malt leaves a 50:50 blend of the two base malts. This is perfect, but what if we want some of the aroma from the wheat malt?

Let's say we make the partial mash out of 3.0 lbs. (1.4 kg) of pale malt and 1.0 lb. (0.45 kg) of wheat malt — close to the initial ratio in the all-grain recipe (but rounded to the nearest pound to make the example calculations simpler to follow). This leaves 2.0 lbs. (0.91 kg) of wheat malt and 4.0 lbs. (1.8 kg) of Pilsner malt to convert to malt extract. To do this, we need to break the malts up into two portions — a portion to be converted to wheat malt extract and a portion to be converted to Pilsner malt extract. If we take the 2.0 lbs. (0.91 kg) of wheat malt pair it with 2.0 lbs. (0.91 kg) of Pilsner malt, we can convert this to wheat malt extract; then we simply convert the remaining Pilsner malt to Pilsner malt extract. This would leave us with a grain bill of 1.0 lb. (0.45 kg) Pilsner malt, 3.0 lbs. (1.4 kg) wheat malt, 3.4 lbs. (1.5 kg) dried wheat malt extract and 2.0 lbs. (0.91 kg) liquid Pilsner malt extract.

You can increase the flexibility of your brewing program by including partial-mash methods in your set of skills. 

Chris Colby is Editor of BYO.



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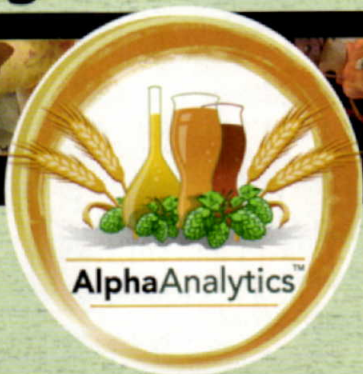


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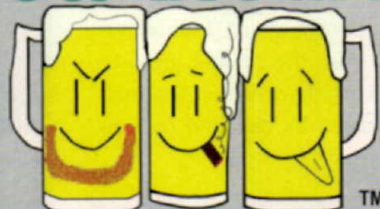
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# Move Your Wort

techniques

## Using homebrew pumps

by Terry Foster



**t**here comes a time in every homebrewer's life when you ask yourself, "Is there an easier way to transfer liquid than manhandling some 60 lbs. (27 kg) or more of wort or beer?" In other words, "Should I invest in a pump?" The answer to that question is that if you are asking the question then you probably should! If you want to install a pump, you do not have to be the type of person who can do your own stainless steel welding.

But before you go pump shopping, first think about what exactly you want your pump to do. For example, a pump that is fine for transferring beer from a carboy to a keg may well have different characteristics from one that is used for moving hot wort from a mash tun to a boiling kettle. What's more, you will see that there are a variety of brewing operations in which a pump may be useful, so that versatility may play an important part in your choice of pump. So with that in mind, let's explore the types of pumps available to homebrewers and their pros and cons.

### Pump types

There is a great variety of pumps out there, many of them designed for particular functions and most of them too expensive or otherwise unsuitable for our purposes. There are three main types you might want to consider: centrifugal, diaphragm and peristaltic pumps, and the table on page 72 lists some of their more important properties. Just be careful as I have had to make some assumptions to keep things as simple as possible, so this is really an overview and you would need to check carefully with any supplier as to the suitability of a particular pump. Some of the questions you might have to ask should become obvious from the text on the table on page 72.

### Diaphragm pumps

I'll start with diaphragm pumps, which

operate very simply by flexing a diaphragm so that pressure changes occur inside the pump chamber, forcing the liquid that is present out and then drawing more liquid into the chamber. It is a form of positive displacement pump, which means it does not require priming; in other words you do not have to fill the chamber with liquid before the motor is switched on. These can work against a head — that is, pump the liquid upward as far as 9 feet (2.7 m), and it can accurately deliver a variety of liquids of different viscosity and chemical composition. The diaphragm can be made of a variety of flexible materials including food-grade materials. I have had some experience with these for precise dosing of highly viscous polymer solutions, at which they were very efficient. I do not see them as very suitable for the homebrewer, largely because of the limitation on operating temperature. They are only suitable for transferring beer from, say, a carboy to a keg, and you would need a different one for transferring hot wort, which is hardly economical, and something capable of doing both operations would be better.

### Peristaltic pumps

The first time I saw one of these I was astonished at its simplicity. A length of tubing sits inside a housing in which a mechanically-driven shaft causes a set of rollers to compress the tubing and to force the liquid along it. The only part of the pump that comes into contact with the liquid is the tubing, which makes for easy cleaning after use and means that there can be no contamination arising from the pump's construction materials. These too are positive displacement pumps and so can deliver accurate doses of a wide variety of materials and can lift the liquid against a head of as much as 30 feet (9 m). Peristaltic pumps can handle any kind of liquid, no matter how viscous or corrosive, so long as the

“There are three main types you might want to consider: centrifugal, diaphragm and peristaltic.”

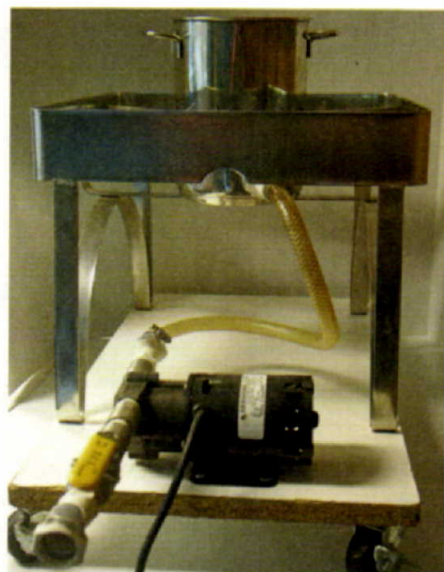


Photo courtesy of Terry Foster

## Typical Pumps for Homebrewers

| Type        | Housing *     | Maximum Operating Temp °F | Typical Flow Rate, gpm** | Approximate Cost, \$*** | Self-Priming | Flow Control |
|-------------|---------------|---------------------------|--------------------------|-------------------------|--------------|--------------|
| Centrifugal | Polysulfone   | 250                       | 3-4                      | 160                     | NO           | No           |
| Diaphragm   | Polypropylene | 125                       | 3                        | 140                     | Yes          | Yes          |
| Peristaltic | Tubing        | 275                       | 2-3                      | 1000 and up             | Yes          | Yes          |

\* This means the nature of the material which comes in contact with the liquid in the pump, which should be an inert, food-grade material; for a peristaltic pump polypropylene variants would be suitable as tubing.

\*\* Actual flow rate depends upon the head against which the pump has to work; I have assumed a lift of 3-4 ft. (~1 m) for the above numbers.

\*\*\* I have pulled these figures out of various catalogues, so there may be variations for other models. I have also chosen pumps which would be suitable for 5-US Gallon (19L) brews; for bigger volumes of wort/beer you might need a higher capacity, more expensive pump.

right type of tubing is used. Tubing suited to food-grade uses is readily available from the pump supplier. One of the beauties of this kind of pump is that the only thing that can really go wrong is if the tube itself should split — an event that would be unlikely in a homebrewing environment where the pump will not be running for extended periods.

Peristaltic pumps are used in some commercial breweries, although usually only for dosing solutions of things like finings or water treatment chemicals, rather than for

moving bulk quantities of beer or wort. I have not seen them offered by homebrew suppliers, but I do not see any reason why they could not be used for moving hot or cold wort or beer in a homebrew set-up, although I have not actually used one in this way. You could even use it to control the sparge rate and ensure that sparge flow matches the wort run-off rate, as has been suggested by Stephen Galante (*BYO*, April 1997, "Pump it Up!"). They are available in a wide range of capabilities and prices.

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## Centrifugal pumps

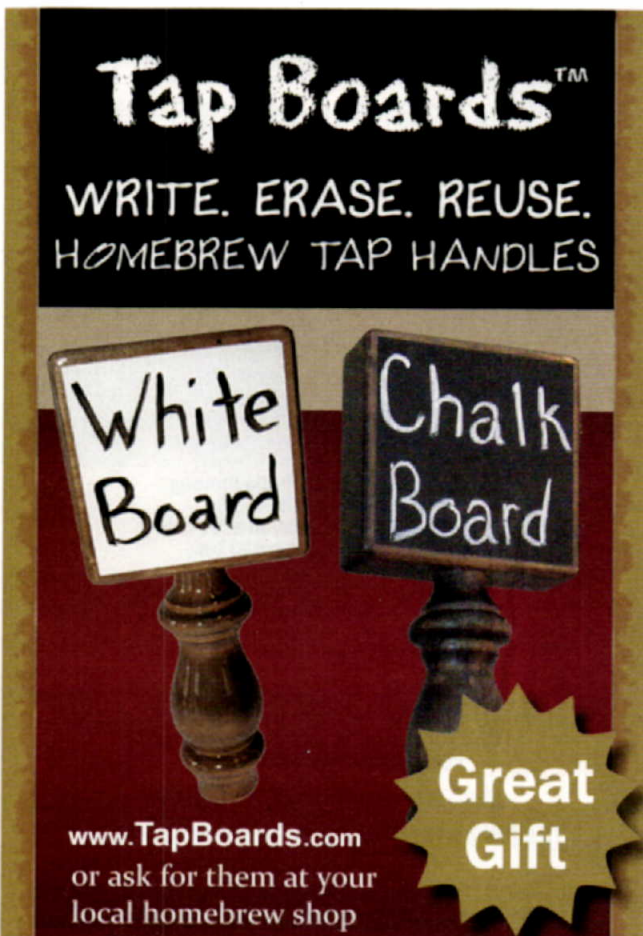
These are widely used in commercial brewing applications and are available from homebrew suppliers. Essentially the liquid enters through one port of a chamber and is whizzed round by a rotating impeller to the exit port. Therefore the liquid comes into contact with the material of the pump housing and of the impeller, as well as any seal around the drive shaft where it enters the housing. That is not a problem provided all such materials are of food grade. Stainless steel is generally the material of choice for the professionals, which can materially add to the cost of the pump. The type that has become popular with both homebrewers and their suppliers has the chamber constructed of food grade polysulfone, and uses a polysulfone-coated magnetic impeller, which is driven externally, so that there are no seals to be concerned about.

These pumps come in different sizes. Different suppliers seem to give them different numbers, but the most common version is often designated "815," has a maximum flow rate of 7 gpm at zero head and can lift the liquid up to 18 feet (5.5 m). I have used a smaller version — "809" — for some years; this has a max flow of 6.0 gpm and will pump against a head of up to 12 ft. (3.7 m). My pump works very well in the way in which I use it (read on), but the larger one is more suitable if you are going to multi-task with it.

As I said earlier, these pumps are not self-priming, but that is not really a problem. All you have to do is to mount it below the outlet of the vessel from which you wish to remove liquid; that way the liquid will simply run down into the pump chamber and fill it, so that the pump is primed and ready to go. Also, these pumps do not have any flow controls, so you will get the flow the head permits and have no precise adjustment of flow as with a peristaltic pump. In fact, you are unlikely to need precise flow control for most brewing applications, and you can control it approximately (from the maximum permitted by the head) by throttling a ball valve on the outlet of the pump. For the record, at BrūRm@BAR in New Haven, Connecticut, we have an electrical controller on our centrifugal wort transfer pump, and can control flow quite accurately. However, that would add considerably to the cost and is not really necessary in a homebrew setup.

### Installing a centrifugal pump:

1. You are working in a wet area, so you must use a GFCI outlet (a ground fault circuit interrupter circuit breaker) so that there is no risk of electric shock.
2. Mount the pump securely (the base of a March pump can be screwed to a suitable surface).
3. Use appropriate fittings so that the tubing can be firmly fixed on both sides of the pump. March pumps come with



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## techniques

1/2-inch pipe thread outlet and inlet, so you should use 1/2-inch ID (inner diameter) tubing.

4. Tubing must be food grade and made of thermoplastic material for pumping hot liquids.
5. You can install hose barsbs on the pump inlet and outlet for fitting the tubing. I prefer polysulfone quick connectors, which just push into place, so that the hose can easily be removed for cleaning and drying. Use silicone lubricant on the O-rings of the connectors to prevent breakage or leaks.
6. The ball valve should be installed directly on the pump outlet (which will be marked by an arrow in the direction of flow) with a hose fitting on the other side. This is not just a flow controller, it is also ensures that you do not get liquid siphoning through the pump and onto the floor!
7. Make sure that all appropriate valves are open before switching on the pump!


### Uses of pumps

The choice is yours. Use it to pump wort through a counterflow chiller, or to pump ice water through an immersion chiller. Use it to pump sparge water onto the grain bed or to pump hot wort into the kettle. Use it to pump cooled wort to the fermenter. Use it when racking beer to transfer the siphoned wort back up to a fresh carboy at the same level as the original. Even use it to transfer racked beer to a keg that is already sitting in your refrigerator or beer freezer.


For the last three applications you will have to sanitize both pump and tubing using hot water with a trace of sanitizer. A pump is also indispensable in a RIMS set-up. If you use your pump in a variety of applications the polysulfone quick disconnects makes changing connections very simple.

I use my March centrifugal pump in wort re-cycling, which I like to do as it clarifies the wort and settles the grain bed. It also helps to ensure good extraction of wort from the grains. About 15–20 minutes before the end of the mash I run the wort off to a 1-gallon (3.8-L) back then pump it back over the top of the grain bed. The back is actually a stainless steel vessel with an inlet at the top and outlet at the bottom (both fitted with quick disconnects); during re-cycle I just collect enough wort to cover the outlet before pumping it back over the bed, using a low flow rate so that the bed surface is not disturbed. When mashing is done I transfer the outlet tube to my boil kettle, commence wort run off into the back (turning on sparge water as appropriate), switching on the pump to empty the back when it is full. When all the wort has been transferred to the boiler, I remove the outlet tube from the boiler, place it in a bucket and clean the back, pump and tubing by pumping through a gallon or two (3.7–7.5 liters) of very hot water. **BYO**

*Terry Foster writes "Techniques" in every issue of BYO.*




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# Crystallization

advanced brewing

## Forming the ice in your eisbock, baby

by Chris Bible



**e**isbock is a style of beer that is characterized by a strong, rich, warming aroma and flavor profile. Eisbock beers are produced by allowing an already-strong doppelbock to partially freeze. (See the October 2012 issue of *BYO* for how to brew a doppelbock.) The ice crystals that form are then removed and the liquid component that remains contains the concentrated alcohol and flavor compounds that were originally in the entire volume of beer prior to freezing.

To make a good eisbock (or any other kind of ice beer) it is helpful to have a good understanding of how ice crystals form, and to be able to effectively manage crystal formation within the beer.

### Crystal formation

Ice crystal formation within a beer happens as a result of cooling the beer down to the freezing point of the solution or below. As the temperature is lowered, the vibrational energy of the water molecules becomes lower and lower until the point is reached where the vibrational energy is unable to overcome the intermolecular attractive forces between the water molecules. The individual water molecules join together and form an orderly, bonded structure with each other — ice (see Figure 1, on p. 76).

There are two steps involved in the formation of solid crystals within a liquid. The molecules must first form a solid particle in the liquid. This initial solid particle formation is called nucleation. This solid particle must then increase in size within the liquid. This step is (unsurprisingly) called growth.

The growth process involves two steps. First, diffusion of molecules within the liquid to the surface of the crystal solid/liquid interface must happen. The molecules that are at the interface must then be incorporated into the lattice of the crystal. Ice crystals form hexagonal plates that grow

both by becoming larger hexagons and by forming a column. One interesting property of ice is that it expands and becomes less dense as it makes the transition from liquid water to solid ice. This is why ice floats. It is also why you should avoid making ice beer in a glass carboy. If the surface of the beer freezes solid, the pressure exerted by the expanding ice can easily crack the glass.

### Crystal nucleation and crystal growth rate

Nucleation and growth rate are two defining parameters within the overall crystallization process. Figure 2 (p. 77) shows a generalized time and temperature relationship for the crystallization process as it occurs within a pure water system, and provides a description for what is happening at specific points within the process.

Initially, the temperature of water decreases and even temporarily dips below the freezing point, while still remaining liquid. Once the crystallization process begins, the temperature of the system remains at the freezing point while water is frozen into ice. (The system is losing heat over time to the crystallization process, but the temperature does not change.) Once the water is frozen, the temperature of the ice will begin decreasing.

### Nucleation

Nucleation is the word used to label the initial formation of solid particles within liquid at the molecular level. It is to this “core” of solid particles the other molecules then attach and form the crystal. The molecules forming a crystal nucleus must resist the tendency to return to the liquid state, and also must become oriented into a fixed lattice.

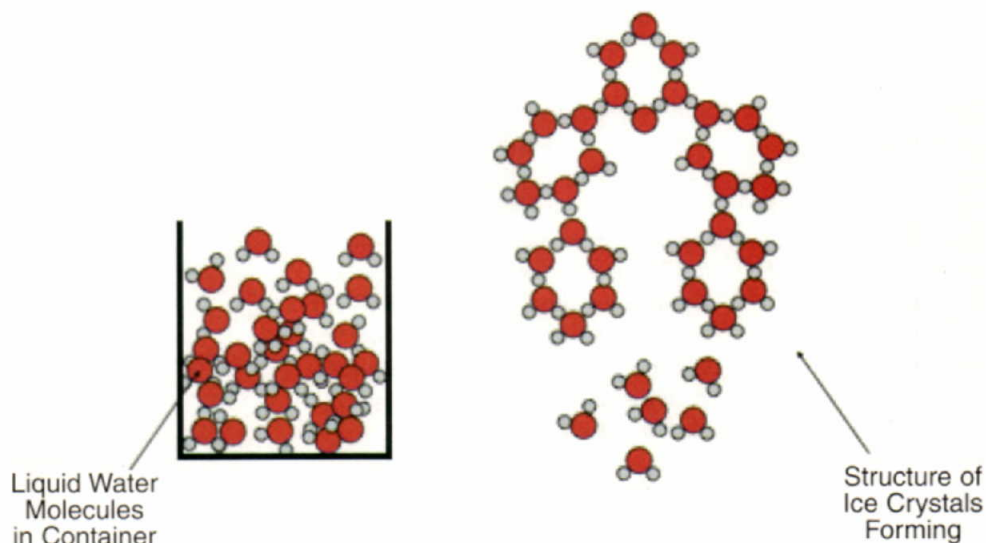
The mechanism of crystal nucleation from solution has been studied by many scientists, and their work suggests that the nucleation rate is the sum of contributions by (1) primary

“ To make a good eisbock (or any other kind of ice beer) it is helpful to have a good understanding of how ice crystals form . . . ”



Photo by Charles A. Parker/Images Plus

Figure 1: Ice Crystal Formation



nucleation and (2) nucleation due to contact between the crystals, the walls of the container, or the impeller mixing the system. This is stated succinctly as:

$$B^0 = B_{ss} + B_{cc} + B_{ci}$$

Where:

$B^0$  = the net number of new crystals formed in a unit volume of liquid per unit of time

$B_{ss}$  = the primary nucleation rate due to the thermodynamic driving force

$B_{cc}$  = the rate of nucleation due to crystal-crystal and

crystal-container contacts

$B_{ci}$  = the rate of nucleation due to crystal-impeller contacts

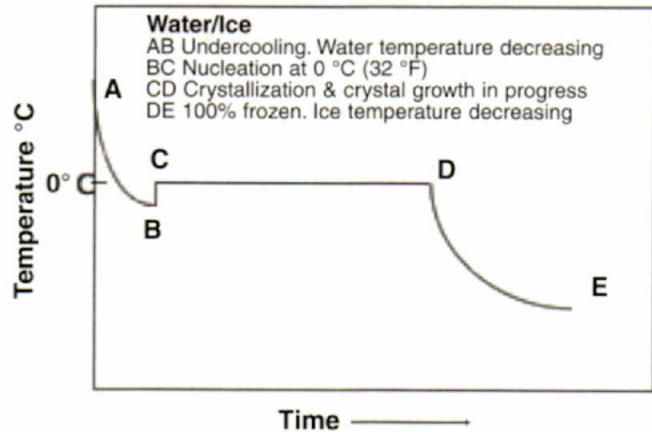
Impellers are used in laboratory situations to keep the temperature of the liquid uniform. Obviously, in a homebrew setting, it is highly unlikely you will be mechanically stirring your eisbock. If an impeller is not used, the last term in the equation becomes zero. The probability that a stable crystal nucleus will form depends on many factors including activation energies, lattice bond energies and the presence of impurities (which affect overall system energies). The minimum number of water molecules required to form a stable crystal nucleus has been estimated to be between 80-100.

### Crystal growth rate

Crystal growth is a layer-by-layer process. Crystal growth can only occur at the face of the crystal. Water molecules must be transported to the crystal face from the bulk of the liquid via diffusion. Diffusional resistance to the movement of molecules to the growing crystal face, as well as the resistance to integration of those molecules into the face, must be considered.

If  $L$  is defined as a characteristic dimension of the crystal, the rate of growth of a crystal face that is perpendicular to  $L$  is defined as:

**Figure 2:  
Water Crystallization Curve**



$$G \equiv \lim_{\Delta t \rightarrow 0} \left( \frac{\Delta L}{\Delta t} \right) = \frac{dL}{dt}$$

Where:

$G$  = the growth rate over time interval  $t$

$\Delta L$  = change in the length of characteristic dimension of the crystal

$\Delta t$  = time interval

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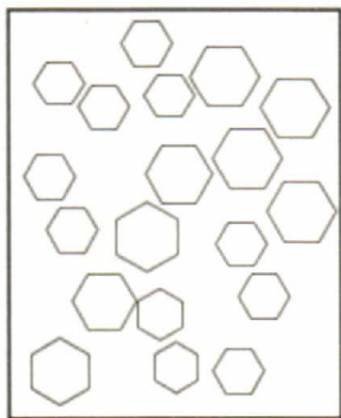
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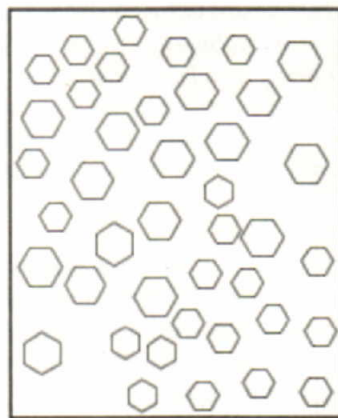


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Figure 3: Effect of Freezing Rate on Crystal Size




Slow Freezing = Fewer, Larger Crystals




Fast Freezing = Many, Smaller Crystals

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Crystal growth rate, when defined in this way, is independent of crystal size, provided that all crystals in the suspension are treated alike.

A mathematical model has also been developed which can correlate the nucleation rate to the crystal growth rate. Because the crystal growth rate is more easily determined than nucleation rate, and because nucleation is a very non-linear phenomena, a model of this form is used:

$$B^0 = ks^b$$

Where:

$B^0$  = the net number of new crystals formed in a unit volume of liquid per unit of time

$s$  = crystal saturation extent (mass of total system – mass of crystals present)

$b$  = experimentally derived constant

$k$  = dimensional coefficient specific to the material

The form of this model implies that the more crystals that are already present in the system, the slower the formation of new primary nucleation sites will be. This makes intuitive sense, as it becomes easier and easier for a water molecule to find a crystal and attach as the number of already-existing crystals within the system increases. It is generally more thermodynamically favorable for a water molecule to

attach to an existing crystal than to begin to form a new nucleation site.

### Practical considerations for brewing

Crystal size strongly depends upon the rate of freezing. A fast freezing rate promotes the formation of many small ice crystals. A slower freezing rate promotes growth of larger crystals. If the beer is cooled quickly, the freezing will happen faster, but the ice crystals that are formed will be smaller, on average, than crystals in beer that was frozen more slowly. Smaller ice crystals may be more difficult to remove from the beer than larger crystals.

Agitation increases primary nucleation rate and therefore crystallization rate within the system. If faster freezing with correspondingly smaller crystals is desired, shake the container of beer when the ice crystals initially begin to form in order to increase the number of "nucleate" crystals. If you desire larger, more easily-removed crystals, avoid agitation of the container of beer during the freezing process.

If your beer freezes solid, it can exert a tremendous amount of pressure on the walls of the vessel. Strong beers such as doppelbocks tend to form slushy mixtures and may take a very long time to freeze solid in a freezer. Still, it is prudent to check on them periodically, just in case. **BYO**

*Chris Bible is BYO's "Advanced Brewing" columnist.*

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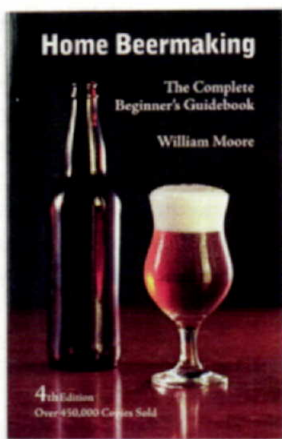
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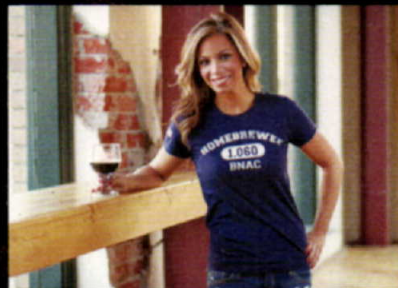
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# Wine Barrel Table

Give an old wine barrel a new life

by Warrick Smith



I recently came across a used half barrel that the local pub was throwing out. It was almost ready to fall to pieces as two of the bands had fallen off and the top one was also ready to fall off. It would be very difficult to reassemble, so I carefully put the bands back on and took it home. I knew there was a good use for it, but I wasn't sure what that was at the time.

I knew I wanted to use the barrel for some sort of furniture project, but I was not sure what to make with it until I saw the nice graphics on the top. I sanded the top back and put furniture oil on it to make the art stand out. It looked good when I finished so I decided to keep the graphic, which would mean keeping the top intact. My first thought was to convert the barrel into a coffee table, but as the project progressed, the missus said she liked the height of the table and would like it on the deck next to her chair.

I decided to make the table with three legs as they don't rock around on uneven surfaces, which would be best for outdoor furniture. If you have all of

your materials ready to go, it should take only a few hours to build from start to finish, especially if you have help — I convinced my kids to help me with the sanding and staining.

The basic premise of the project is to mark out the legs and cut them out with a reciprocating hand saw. Once you have the legs cut out, you can remove the bottom ring, reinforce the top ring and do some sanding and staining. Aside from the task of acquiring the actual barrel, you don't need too many tools or supplies (see list below), especially if you already like to construct woodworking projects at home.

As is the case with any woodworking project, always be safe. Be sure to use eye protection when sawing, grinding, sanding and hammering, and also build your barrel table in a well-ventilated area or outside where you won't inhale fumes from any wood treatments or finish.

I enjoy building my own projects, many of which you can check out on the Web at Instructables.com (find my posts at [www.instructables.com/member/liquidhandwash](http://www.instructables.com/member/liquidhandwash).) In addition to my wine barrel table project I also made a fruit bowl with some of the left over barrel planks. After making the table, I spent a long time sitting and thinking on a pile of the oak barrel planks, which were curved and tapered, making them difficult to work with. So the fruit bowl idea was a great way to use some of that leftover wood. You can make your own fruit bowls with most of the same tools you use for this table project along with some wood glue and a few wood clamps. A coat of furniture oil makes the wine stain on the inside of the timber darker, which gives the bowl an unusual look. (In addition to my other build-it projects on Instructables, you can also see some great photos of my kids helping me out with building the projects.)

“I knew I wanted to use the barrel for some sort of furniture project, but I was not sure what to make with it until I saw the nice graphics on the top.”

## Materials & Tools

- a used 60-gallon (225-L) wine barrel
- sand paper grits 40, 80, 120, 240
- matte black paint (or your color of choice)
- 3 or 4 coach bolts with washers and nuts
- drill and drill bits
- 3 or 4 wood screws
- small nail or tacks
- hammer
- jig saw (reciprocating saw)
- clean rags
- your favorite timber finish
- angle grinder, with sanding disc





### 1. REMOVE BANDS

Start by removing the top two bands with a hammer and a block of wood and then clean them with thinners. I hung them from the roof with wire and spray painted them matte black, but you can spray them any color you like. I also painted the heads of the coach bolts.

Next, mark out the three slats that are going to be used for legs. Make sure the bands are straight and tight as well as drilled and screwed to the three slats to the bottom band so nothing will move in the next steps. The top band had quite a sharp edge on it, so I used a grinder with a sanding disc to remove the edge.



### 2. SANDING, OILING, DRILLING

Next you can give the barrel an initial sanding. I used four different grit sand papers starting with 40, then 80, 120 and 240. I only sanded the top and the top of the sides and the legs. You could probably do this step last, but I put a coat of my favorite furniture oil on so that it would be under the bands, helping protect the timber from spills and moisture. Just use a rag to rub the oil on. I only oiled the surfaces that were not going to be removed. Next drill three holes big enough for a jigsaw blade to pass through.



### 3. CUTTING THE LEGS

Next, cut around the bottom line the second band has left. I found the oak was very hard and difficult to cut with a dull blade, so be sure to have a new, sharp blade. (I should really have put a new blade in the saw, but the store was closed.) Don't forget to leave the the legs uncut. The waste wood can then be removed and the second band can now be fitted. I knocked it down with a hammer and a block of wood and drilled three holes through the band and the legs into which the coach bolts were fitted.

#### 4. SECURE THE TOP BAND

To help keep the top band in place, I drilled three small holes and nailed in some carpet tacks as they had an old style black head which matched the look of the table.



#### 5. REMOVE THE BOTTOM HOOP

Now that the table has been bolted together, the bottom band can be removed and the legs sanded and finished off. The missus likes the height of the table so I left it at this height, but it could also be cut down for a coffee table or to whatever height you would prefer. The legs are then sanded before more oil is applied.



#### 6. ENJOY YOUR TABLE

Finished! The table is sturdy (even though the curve of the staves may give the impression that it is not). This little table is great for serving drinks. You may reapply wood oil periodically if the wood looks dry after a few seasons. [BYO](#)

*Warrick Smith lives in Numurkah, Australia. This is his first story for Brew Your Own.*



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# Vermont Pride

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**T**he Green Mountain Mashers homebrew club first met in April of 1989 at the Vermont Pub and Brewery (VPB) in downtown Burlington, Vermont. Close to 40 people attended. Over the next several months we continued to meet and discuss ideas about forming a club and what that would entail. Through this entire process Greg Noonan — VPB's founder and brewmaster, was always available to offer advice and support. Regardless of what he was doing he would always take the time to talk to us about putting a club together and offering ideas for topics of discussion and even writing a piece for the monthly newsletter which we called "Ask Mr. Lager." (Greg authored the book *New Brewing Lager Beer*.) Brewers in the club would pose questions to Greg and his answers appeared in a monthly column.

There has never been a group of brewers more fortunate than us to have had someone the caliber of Greg Noonan at our disposal. Always smiling, always happy to see you, always willing to discuss brewing and offering advice on how to make better beer, we could not have been a luckier lot. Greg passed away in 2009 and losing Greg has left a big hole in our brewing community. We only hope to honor and pay our respects by keeping the club alive. We've renamed our yearly

homebrewers competition the Greg Noonan Memorial Homebrewers Competition and brew a club beer in his honor every year.

Our most exciting event so far was last year when we brewed a wee heavy in tribute to Greg. We chose the wee heavy because Greg literally wrote the book on Scotch ales for the *Classic Beer Styles* series. We brewed it with a used bourbon barrel that we got from Sean Lawson of Lawson's Finest Liquid (in Warren, Vermont) and sourced our yeast from the Vermont Pub and Brewery, using the same yeast that Greg used to brew his Scotch ales. Last spring we did two separate big brews at a fellow member's house, Andy Hunt, who has a 30-gallon (114-L) homebrew system. After primary fermentation we gravity fed all of the beer into the bourbon barrel, along with a bottle of our favorite bourbon, for cellar aging. Next month we plan to keg all of the beer and condition it in the kegs.

### Greg Noonan Memorial Wee Heavy

(5 gallons/19 L, all-grain)

OG = 1.083 FG = 1.019

IBU = 29 SRM = 20 ABV = 8.3%

### Ingredients

13.75 lbs. (6.2 kg) Maris Otter malt  
 0.75 lbs. (0.34 kg) Carapils® malt  
 0.25 lbs. (0.11) roast barley malt  
 1.25 lbs. (0.6 kg) Munich malt  
 0.2 lbs. (91 g) Belgian Special B  
 0.5 oz./14 g Magnum whole hops (60 min.)  
 0.33 oz./9.4 g Goldings whole hops (20 min.)  
 Wyeast 1728 (Scottish Ale) yeast

### Step by step

After primary fermentation slows, rack the beer into a secondary with used bourbon barrel staves, adding a desired amount of bourbon. Age for 8 months minimum. **BYO**

“There has never been a group of brewers more fortunate than us to have had someone the caliber of Greg Noonan at our disposal.”

Photo courtesy of Mike Willey



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