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THE HOW-TO HOMEBREW BEER MAGAZINE

JULY-AUGUST 2009, VOL.15, NO.4

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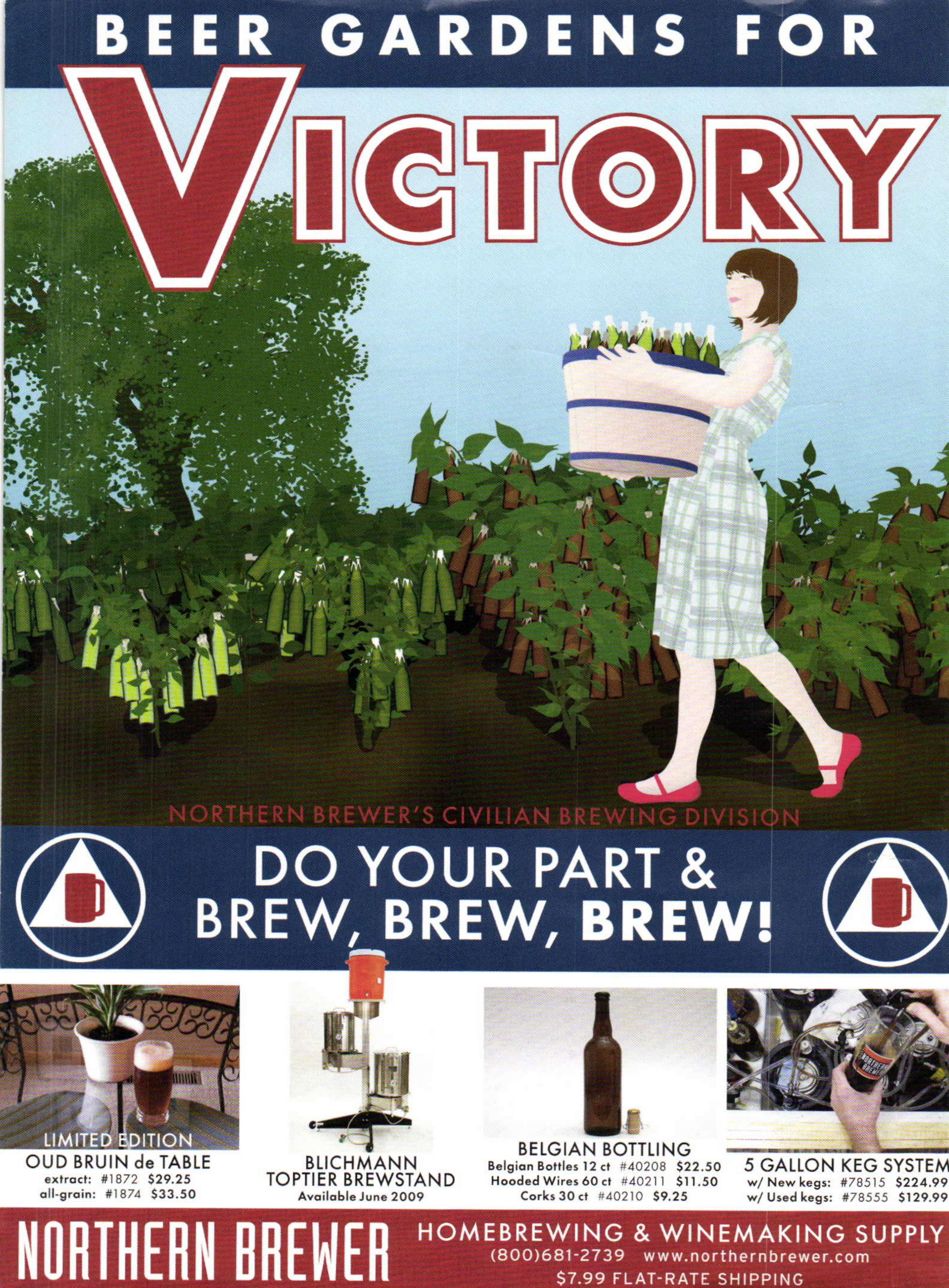
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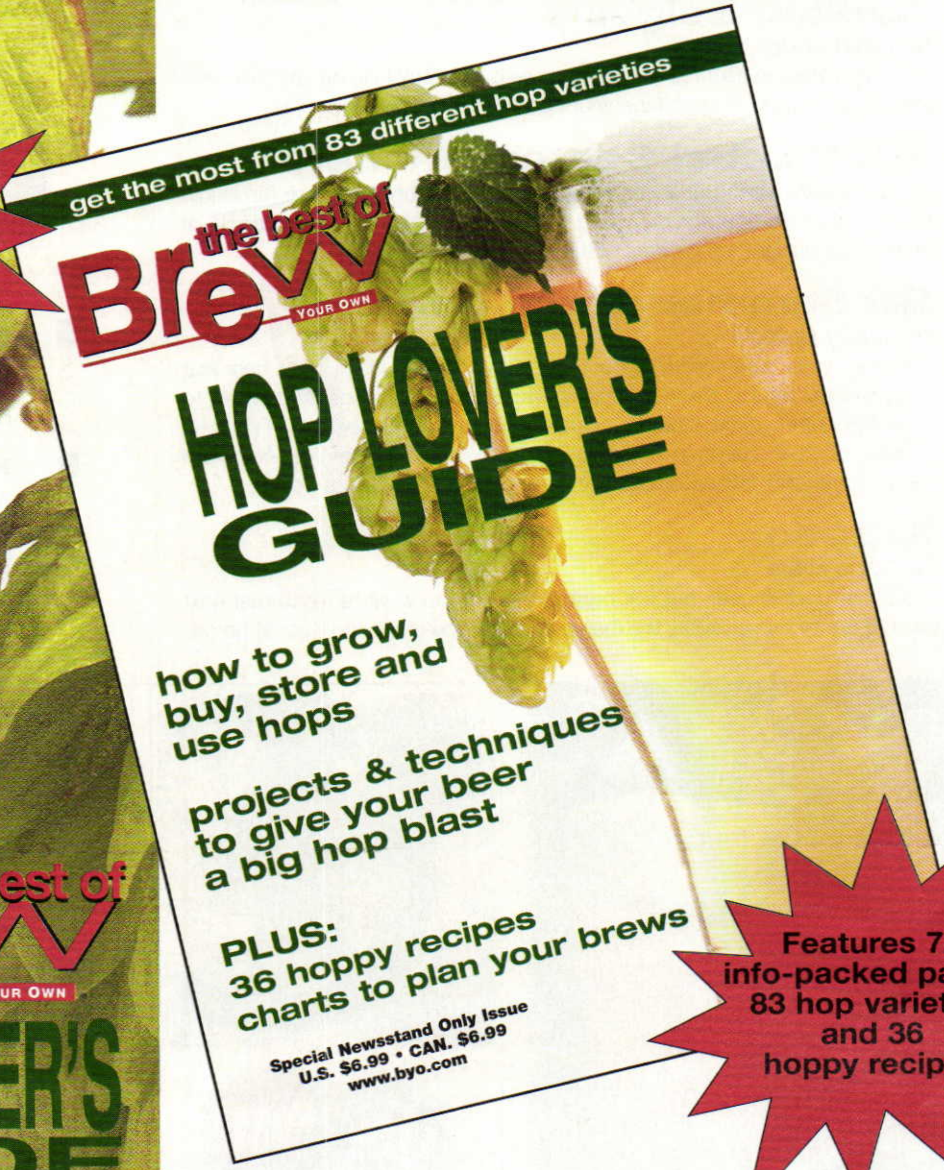

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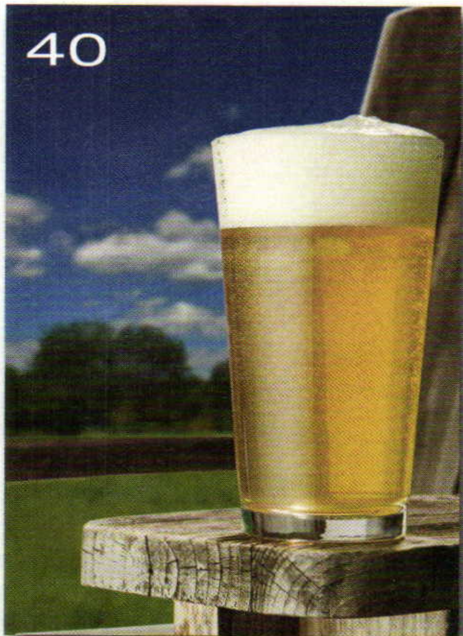
Brew YOUR OWN
THE HOW-TO HOMEBREW BEER MAGAZINE

JULY-AUGUST 2009
Volume 15 Number 4

Features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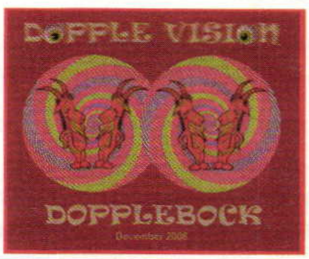
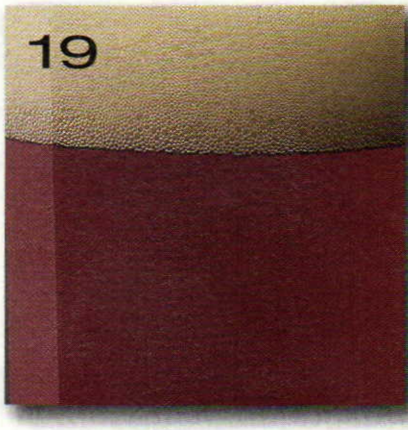


Where to find it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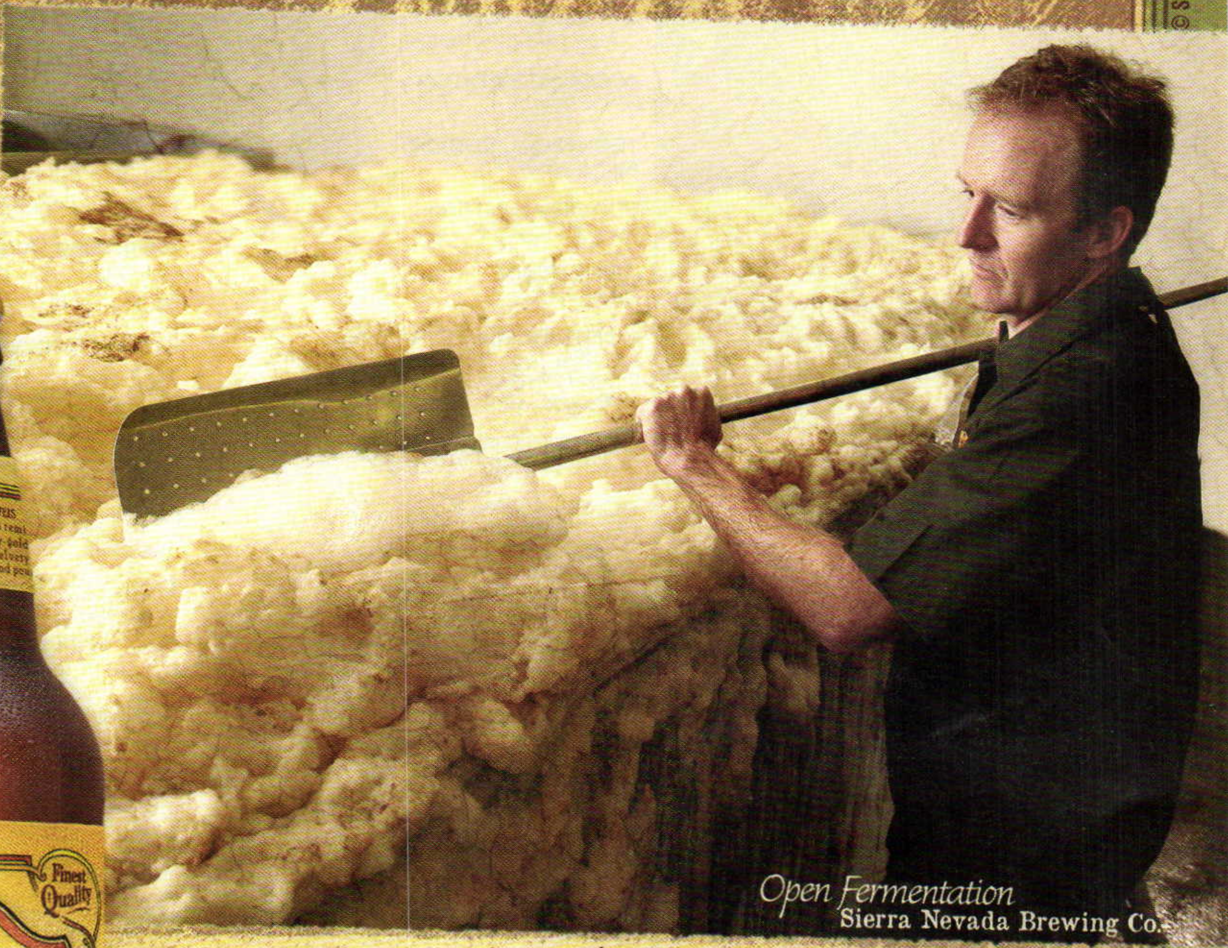
Departments

SIERRA NEVADA KELLERWEIS™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RECIPE INDEX

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.

Brew YOUR OWN
THE HOW-TO HOMEBREW BEER MAGAZINE

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Cover Photo: **Charles A. Parker**

Mail

Zero, My Hero

As a pale ale fan, I was very happy to find the Summit Brewing Extra Pale Ale recipe in the latest issue of BYO (May-June 2009), but I didn't understand one thing. You write to add the Cascade hops at 0 minutes. What does it mean? Dry hopping or just adding the hop and remove it immediately (which doesn't make a lot of sense)? Please elaborate on this point.

Eddie Saar
Holon, Israel

In every BYO recipe, every hop addition has a time (in minutes) associated with it. This is the amount of time left in the boil or, equivalently, the amount of time the hops are boiled. For example, if it says "15 mins" next to a hop addition, this means to add the hop for the final 15 minutes of the boil (so it gets boiled for 15 minutes total). Occasionally, you will see a beer recipe that gives hop additions as the amount of time elapsed since the beginning of the boil. However, all BYO recipes give additions in terms of time left during the boil.

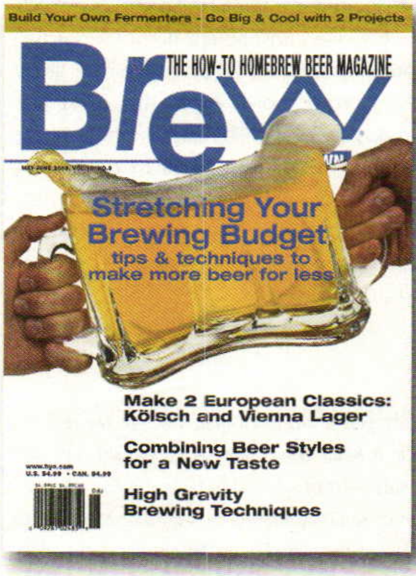
When we give "0 mins" as the timing instruction, this means to add the hops right when you turn off the heat (a time called knockout or flameout). Hops added immediately after the boil contribute aroma and a little flavor, but no bitterness.

Other hop instructions we get asked about somewhat frequently are "FWH," which means first-wort hops — hops added while the wort is being collected from the mash, Dry hops are hops added to beer, usually after primary fermentation has finished. If you check out the summer beer clones on page 40, you will see recipes that call for mash hops (hops added to the mash) and whirlpool hops. Like zero-minute hops, whirlpool hops are added immediately after the boil. The difference is that the hops are allowed to steep in the hot wort for awhile (20–30 minutes) before cooling begins. In the case of zero-minute hops, we expect that cooling will begin immediately after the hops are added.

Many commercial breweries get a substantial amount of their IBUs from hops added in the whirlpool. In homebreweries, however, the volume of wort is much less and the temperature drops sharply once the heat is turned off. When whirlpool hops are specified, many homebrewers add these late in the boil (for the final 10–15 minutes).

Credit Where Due

It was nice to open the May/June issue and see the item about the ladies club Pacific Gravity started. It also felt good to see the



snapshot I took of Nathalie-in-the-brewpot appear in a national magazine. Any chance of an attribution in a future issue? If not, no big deal, since that picture keeps turning up all over the place without attribution. It was just a snapshot, after all, if a rather inspired choice of model and setting, if I may say so myself.

Greg Beron
Culver City Home Brewing Supply
Culver City, California

Sure, we're happy to give you the proper attribution — and we're sorry it wasn't included in the May-June issue.

What To Do In Winter

I'm following your write-up for growing container hops ("Container Hop Gardening," March-April 2009). I live in southeast Austin, Texas and so far the hops I've got are doing nicely.

Your write-up was great for getting started, but I'm a little confused as to what I should be doing at the end of the season. Do I pull up the rhizomes and store them for winter inside? Do I just keep watering them over the winter? Perhaps you could do a write-up later in the season about what to do once you've harvested the hops.

Brian Parrett
Austin, Texas

Story author, BYO editor and Texas resident Chris Colby responds: "At the end of the growing season, the hop vines (technically bines) will die

Contributors

CHRIS BIBLE is a chemical engineer from Tennessee. His love of beer and science intersected when he became a homebrewer almost 10 years ago. Since then, he has been on a quest to not only brew the perfect beer, but also to gain a deep understanding of all the aspects of the art and science of brewing.

In the September 2008 issue, Chris wrote about mouthfeel in beer. In this issue, on page 48, he discusses beer clarity and filtration. If you read his article, you will see clearly how to filter your beer at home.

TONY PROFERA currently lives in Charlotte, North Carolina and works there as a web developer. Tony has been homebrewing since 1994 and meadmaking for the past six years. His favorite beers include IPAs, stouts, porters and Belgian brews. A long-time member of the Carolina BrewMasters homebrew club, Tony regularly volunteers to help at the Charlotte Oktoberfest Beer Festival. In the November 2008 issue of BYO, he shared his plans for his club's traveling kegerator — and in the December 2008, he detailed "the Hopinator," the hop transducer that goes with their serving platform.

On page 61 of this issue, he shows homebrewers how to build an in-line wort aerator.

GLENN BURNSILVER is a freelance writer, backcountry adventurer and record collector. He has authored several articles for BYO. Glenn recently moved from Colorado to Alaska.

In the December 2008, issue of BYO he wrote about three small-scale commercial brewers — essentialy, pro brewers who work at a homebrew scale. Usually, however, he contacts professional brewers and constructs clone recipes. Past clone collections include Belgian-inspired beers (July-August 2008 and organic beers (October 2008). In this issue, on page 40, Glenn comes out of hibernation to present six summer beer clones.

back and you can cut them down. Commercial growers cut the vines down at harvest time. The rhizome then overwinters and sends up sprouts the next spring. If you are growing your hops in containers, you do not need to do much to maintain the rhizome during the off-season. Just place your containers somewhere where they will receive rain or check them every month or so to ensure that they have not dried out completely. With no above-ground growth to support, the rhizome does not need a lot of water.

If you grow hops in the south, it's probably best to store your containers in the shade until spring. Too much sun and they will sprout way too early. In addition, southern hops may not get enough cold exposure each year. So, when there is a cold snap or light freeze, move your containers somewhere unprotected so they can benefit from the chill (away from houses or other buildings).

If you live in the northern US, I would recommend the opposite. Keep the containers near a house or building, shaded from the worst of the cold and wind, then drag them out into the sun in the spring.

No matter where you are growing hops, they need to be in the sun once they have sprouted.

Splitting Rhizomes

We planted our hops in the spring of 2005. In 2006, we had enough hops for our first batch. Both 2007 and 2008 were good years. Now April 2009, the hops are already knee high but there are going to be many secondary bines to cut. I think this fall I am going to need to dig up the rhizomes to break them apart. What is the best way to do that and store the rhizome over the winter?

Mark Banner
via email

Once you've cut down your vines in the fall, just take a hand shovel and — using that and your hands — start excavating the soil around the rhizome. You'll eventually expose most of the crown (the big mass of rhizome tissue that accumulates after a few years). Pull this out of the ground. You may have to cut some thinner lengths of rhizome to do this. If there are still thick rhizome runners that haven't been exposed, keep digging.

Once you get the crown out, take a look at it. You will see "buds" that indicate where the rhizome has sent out a root or a shoot in the past. Decide how many pieces you are going to split the rhizome into, then look for places to make cuts so that each piece has roughly the same number of buds. Use heavy garden shears to make the cuts. If you cut multiple rhizomes, wipe the blade between plants. Once you have your rhizomes cut, wrap them in damp newspaper and place them in a large Ziploc bag, or something similar. Poke a few tiny holes in the bag and store the rhizomes in your refrigerator until the spring.

Questions, concerns, comments?

Contact us!

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reader PROFILE and RECIPE

Josh Gum • Lebanon, Oregon

A local brewpub, Calapooia Brewing, is known for its spicy Chili Beer. I've always enjoyed their beers, but I think this one is usually a little too spicy in the mouth and overwhelming after a full pint. I've tried to create a chile beer that I can enjoy a few pints of in a session. My goals were to try to balance the hop bitterness, chile aroma and malt against the spiciness in the mouth and the chiles' heat in the throat and chest. This has become one of the most requested beers by my friends and family who like a fair bit of spiciness. My latest revision came out having a chile aroma, malty taste and just enough fruity character and heat to make it a treat to drink.

RevGum's Chile 6

(5 gallons/19 L, all-grain)
OG = 1.066 FG = 1.015
IBU = 40 SRM = 12 ABV = 6%

Ingredients:

9.75 lb. (4.4 kg) Great Western 2-row malt
1.75 lb. (794 g) Weyermann Munich malt
1 lb. (453 g) Briess crystal malt 40 °L
0.5 lb. (227 g) De Wolf-Cosyns CaraPils malt
0.5 lb. (227 g) Briess Crystal 60 °L
35 AAU Sorachi Ace hops (60 mins.) (0.65 oz./18 g of 14% alpha acids)
5 AAU Cluster hops (20 mins.) (0.5 oz./14 g of 7.5% alpha acids)
0.5 oz. (14 g) Nugget (0 min.)
1 tsp. Irish moss (15 mins.)
~2 lbs. (900 g) Fresh Serrano, Anaheim, Pasilla, and Jalapeño chopped chiles (10 mins)
Chile qualities and amount:
Anaheim (2–4) : Mildly spicy, adds to the chile aroma and flavor.
Pasilla (2–4) : Mildly spicy, adds to the chile aroma and flavor.
Jalapeño (10–15) : Very spicy, adds to the chile flavor, and heat in the mouth and chest.
Serrano (15–20) : Extremely spicy, adds heat to the mouth and chest.
White Labs WLP005 (British Ale), Wyeast 1187 (Ringwood Ale) (1 qt./ ~1 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step

Before you start brewing, chop and freeze the chiles. Freezing will help to break down the cell walls and aid in extracting the flavor and heat qualities. Thawing the chiles before brewing helps to reduce the time it will take for the wort to return to boil after they have been added.

Heat 4.5 gallons (17 L) of carbon filtered brewing water to 168 °F (76 °C) and mash in grains at 153 °F (67 °C) for 60 minutes, or until conversion is complete. While the grains are mashing, heat 5.5 gallons (21 L) of carbon filtered water to 170 °F (77 °C) for batch sparging. Drain the wort first runnings into the boil pot, making sure to vorlauf the first quart (L) to clarify the wort. Pour sparge water over grains, stir briefly to break up any clumps, and let sit for a minute. Drain wort second runnings into the boil pot, making sure to vorlauf the first quart (L) to clarify the wort. Collect a total of 6.5 gallons (25 L) of wort before stopping the batch sparge.

Bring wort to a boil and maintain a steady boil for 60 minutes. Add hops, and Irish moss at times specified in the ingredients list. Add the thawed chiles at the final 10 minutes of the boil; shorten this time if you want less spicy heat in your beer. The chiles should be very soft by the time the boil has finished.

Cool wort to 66 °F (19 °C). Transfer the wort to the fermenter; making sure to strain the hops and chiles. Aerate the wort and pitch the yeast starter. Start fermentation at 66 °F (19 °C) and let rise to 68 °F (20 °C), holding the temperate steady at 68 °F (20 °C) until fermentation is complete. If bottling, use priming sugar and bottle once the yeast has flocculated. If kegging, transfer to serving keg and carbonate. This beer is best enjoyed young and fresh, you don't need to worry about letting it age.

For an extract version and more of Josh's recipes, visit www.revgum.com.

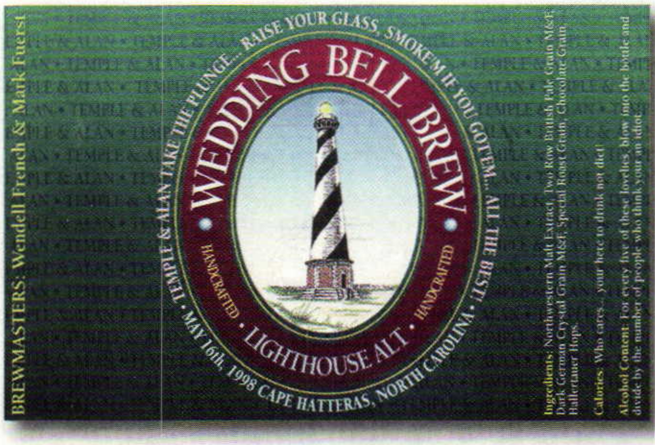
reader **LABEL**

Anniversary Brew

Mark Fuerst & Wendell French • Oviedo, Florida

Ten years ago in May of 1998, one of our best brewing buddies got married at the Cape Hatteras Lighthouse in North Carolina. He was a member in good standing of the R.A.N.G.E.R.s (Rage All Night, Guzzle Every Round) club formed a number of years earlier.

For a mutual friend's wedding, we of course decided that the perfect gift for the upcoming nuptials was a homebrew. Since the couple was getting married in Cape Hatteras, our inspiration was to center the beer and the labels featuring the region's famed lighthouse. We decided to brew two beers — Lighthouse Alt for the men and Thimble Shoals Lager for the ladies. Thimble Shoals is part of the "Graveyard of the Atlantic" where severe weather, unusually strong currents and navigational challenges posed by continuously shifting sands have caused the wreck of over 2,000 ships. The name was a weak attempt at marriage humor that pretty much garnered no laughs whatsoever — only a few penetrating stares from the bride.



The couple recently celebrated their tenth anniversary by inviting all their friends to stay at a house on the Outer Banks. Since the couple got married, the Cape Hatteras Lighthouse had been physically moved to prevent the encroaching ocean from toppling it into the sea. Mike Victa, a graphic designer friend of ours was enlisted to move the lighthouse out of the center of the label to the right side. Rails were added to show the "move" because the actual lighthouse was moved inches at a time on a complicated series of rails. A mound of excavation dirt was added in the center of the label, along with a starburst announcing the tenth anniversary edition. The bride was so overwhelmed with joy that she actually cried. We found out later it was because we didn't have any beer to go with the gift.

byo.com BREW POLLS

Do you ever filter your beers?

No 87%

Yes, depending on the style 8%

Yes, but not often 5%

Check out the latest poll question and vote today at byo.com

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Brew a simple, summer style

Looking for an easy, tasty style to quench your summer thirst? Check out some pro tips and recipes for making "lawnmower" beers.
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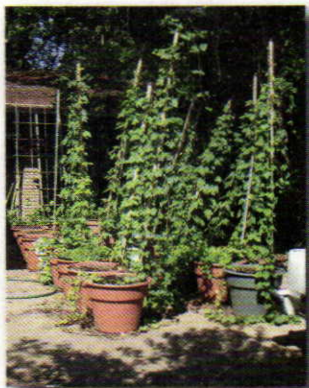
Keep up with BYO Editor Chris Colby's homebrew garden



Read along as Chris grows and harvests his backyard homebrewing garden of hops and barley, all in the confines of balmy Bastrop, Texas.
http://byo.com/blogs

replicator

by **Marc Martin**

Dear Replicator,

I must confess my wife is a complete wine snob. I have been homebrewing for four years now, and while she will taste my beers she definitely won't ask for a pint. In exchange for my trip to the Great American Beer Festival last year I agreed to take her to the south eastern Washington State wine region. Late one afternoon, while driving to Dayton, Washington, we passed through the little town of Waitsburg and I saw a sign that said "Caution – fresh beer ahead" (or something like that). You can imagine my surprise when just a couple of blocks ahead we saw Laht Neppur Brewing Company in a long metal building. I ordered a sampler tray and since I had been a good sport with wine sampling she joined in. The wheat beer was excellent, light and refreshing. She finished the rest of the glass and said if I could brew a beer like that she would enjoy some. If you could help me with this brewery's recipe we can possibly be on our way to converting a wine snob.

Jason Hantsbarger
Seattle, Washington

The south central valleys of Washington State are fast becoming known as a mecca for fans of big red wines. More than eighty wineries, many of them boutique size, produce some of the highest quality Cabernets and Merlots in the country rivaling those of the Napa Valley. You can easily understand why it would take a lot of drive and courage to open a small brewery here. The resolve of the owners, Court and Katie Ruppenthal, can best be illustrated by a slogan they often say, "It takes a lot of beer to make good wine."

Court began the hobby of homebrewing in 1983. He quickly became fascinated with the fermentation process which led him to winemaking. His desire to become a professional winemaker resulted in a move to Walla Walla, Washington where he enrolled in a two-year college vintner program. After graduating and working at a local winery he discovered the area had a bigger need for quality beer.

Things began to come together in 2006 when he found a large empty storage building in Waitsburg, Washington. The town had a population of only 1,300 but was situated on a major east/west state highway with plenty of tourist traffic. Searching the Internet, he found a 3 ½-barrel Pub copper clad system being auctioned by a Hops restaurant in Ohio. Struggling to bid with a dial-up connection he finally logged the top offer to secure the heart of his small brewery.

Relying on his tried and true homebrew recipes, he and Katie opened the doors of Laht Neppur Brewing in June of 2006 with six basic beers on tap. They now have four additional part-time employees and are preparing for a big third anniversary party. Court jokes that the name is Gaelic for "drink to life" but also is Ruppenthal spelled backwards.

Word of the brewery spread quickly and business steadily improved. This area is also home to vast wheat fields and the local farmers were skeptical of the heavier, darker beers on tap. Needing something to compete with American industrial lagers, Court set out to make a light, crisp, refreshing ale. The result was an American hefeweizen.

This beer is a slightly cloudy (unfiltered) beautiful straw color with a rocky, dense white head. The aroma is all malt with a blending of fruit and mild spice. A great malt profile is accompanied by a mild fruitiness. The hops are virtually undetectable but are just enough to offset the low residual sweetness. Court ferments this beer with the attenuative Danstar Windsor yeast to produce a very dry finish. IPA remains their best seller but this weizen consistently ranks number two or three. He also reports that this is a perfect beer for our current economic climate since it is a relatively low cost recipe.

Jason, you now have a good chance of converting a wine snob with this wonderful American Hefeweizen because you can "Brew Your Own." For further information about the brewery and their other fine beers visit www.lahtneppur.com or call 509-337-6261.

Laht Neppur Brewing American Hefeweizen

(5 Gallons/ 19, extract with grain)

OG = 1.054 FG = 1.009
IBUs = 13 SRM = 5 ABV = 5.8 %

Ingredients

3.3 lbs. (1.5 kg) Muntons light, unhopped, liquid malt extract
2 lbs. (0.9 kg) Muntons dried wheat malt extract
1 lb. (0.45 kg) 2-row pale malt
1 lb. (0.45 kg) wheat malt
3.85 AAU Cascade pellet hops (60 min.) (0.7 oz./20 g of 5.5% alpha acid)
½ tsp. yeast nutrient (last 15 minutes of the boil)
White Labs WLP 002 (English Ale) or Wyeast 1335 (British Ale II) yeast or one 11-gram package of Danstar Windsor dry yeast
0.75 cup (150 g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 2 gallons (7.6 L) of water at 150 °F (66 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.9 L) of hot water. Add the liquid and dried malt extracts and bring to a boil. Add the hops and yeast nutrient during the boil as per the schedule. 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 70 °F (21 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing. Condition for one week 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 a total of 6 lbs. (2.7 kg) 2-row pale malt and 4.75 lbs. (2.15 kg) wheat malt. Also add 0.5 lb. (0.23 kg) rice hulls to help prevent a stuck mash. Mix the crushed grains with 3.5 gallons (13 L) of 168 °F (76 °C) water to stabilize at 150 °F (66 °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 60 minute hop addition to 0.5 oz. (14 g) Cascade pellet hops to allow for the higher utilization factor of a full wort boil. The remainder of this recipe and procedures are the same as the extract with grain recipe.

Note: Add the rice hulls to your mash tun first to help create the best possible filter bed.

Homebrew CALENDAR

July 11
The Pisgah Organic Pro-Am Homebrew Competition
Black Mountain, North Carolina

Organized by MALT (the Mountain Ale and Lager Tasters Homebrew Club of Asheville North Carolina). Pisgah Brewing Company will brew the Best Of Show first place winning recipe with the help of the homebrewer. Open to all amateur homebrewers 21 years of age or older from North Carolina, South Carolina, Tennessee, Georgia and Virginia. For rules and online registration, visit http://maltsters.org/GeneralinfoPisgah2009.htm

July 27–31
Advanced Siebel Institute/Fort Lewis College Advanced Homebrewing Program
Durango, Colorado

A program designed to address every key area of small-scale brewing, from ingredients to recipe formulation to brewing, fermentation, and critical evaluation. For more information, visit http://www.siebelinstitute.com/course_desc/homebrewing.html

August 8
Montgomery County Agricultural Fair Homebrew Competition
Gaithersburg, Maryland

Entry deadline is 12 p.m., August 1. All BJCP styles and categories may be entered. More information about dropoff locations, rules and regulations are available by emailing ridgely@burp.org or visiting http://g_a_b_s.tripod.com/

August 22
Suds on the Shore
Ludington, Michigan

The first annual brew festival and homebrew competition. Entry deadline is July 31. Email info@sudsontheshore.com or visit http://www.sudsontheshore.com/.

BEGINNER'S block

Summer Belgians

by Betsy Parks

When the thermometer pushes into the outer limits during the summer months, it is not a time to lament the inability to lager — it is a time to try brewing beers that like warmer fermentations, including many Belgian styles.

What's warm

Many Belgian-style beers are fermented using temperatures ranging anywhere from the low 70s to the mid 80s °F (21 to 30+ °C). Generally, a "warm" fermentation is one that takes place above about 72 °F (22 °C). For example, at Brewery Ommegang in Cooperstown, New York, Ommegang Abbey Ale is fermented in the high 70s °F (~24 °C) with a house-propagated Belgian ale yeast. And brewers at Duvel Moortgat in Belgium brew Duvel, the classic golden ale, by allowing the fermentation temperature to free rise into the 80s (27+ °C) during primary fermentation. These warm temperatures are important for developing the classic characteristics of all types of Belgian styles such as saisons, pale ales, golden and strong ales, blondes, dubbels and tripels.

Why warm

The key to Belgian-style beers is choosing the yeast, and each strain possesses specific characteristics and requirements — including a fermentation temperature range. Many Belgian-syle beers, especially those that favor warmer fermentations, are fermented with top-cropping ale yeasts that prefer warmer fermentations. These kinds of yeasts, when fermented in the recommended warm temperature ranges, produce more fruitiness and esters than strains developed for cooler fermentations, such as lagers. It is those fruity, estery qualities of Belgian-style yeasts that are the hallmarks of many Belgian-style beers.

How it's done

When the weather is warm, it's easy to ferment at higher temperatures as soon as the wort is cool enough to pitch the yeast by keeping your primary fermenter in a warm location and monitoring the temperature. Many brewers, such as the aforementioned Ommegang and Duvel brewers, choose to pitch at a low temperature and let the temperature of the fermentation "free rise." The free rise method is when the brewer pitches the yeast at a cool temperature, then allows the heat to increase from the action of the yeast until it reaches a specific temperature. For instance, Duvel brewers pitch the yeast at around 60 °F (16 °C), and Ommegang brewers let many of their beers free rise to 78 °F (26 °C).

To experiment with warm Belgian-style fermentations and the free rise method at home, start out by choosing all-purpose, Belgian-friendly strains of yeast that can tolerate temperature variations such as Wyeast 1214 or White Labs WLP550. For specific strain characteristics, suggested beer styles and temperature guidelines, visit the manufacturer's websites or www.byo.com/resources/yeast.

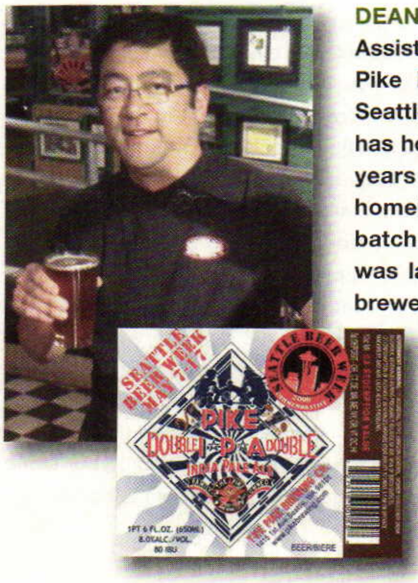
When brewing Belgian styles — warm fermenting or otherwise, once you've pitched the yeast be sure to keep the fermentation temperature under control — just because you want it to be warm doesn't mean you can leave the beer unattended in the heat. Keep the fermenter in a place with a constant temperature. If you don't have a location that stays warm, try insulating the fermenter with a cover or a blanket. If the fermentation gets too hot, try cooling it off by placing the fermenter in a shallow container of water and covering it with a t-shirt. The fabric of the shirt will wick the water from the pan and evaporate from the surface of the fermenter, keeping it cool.

The Air in There

Achieving optimum aeration

by Betsy Parks

Is there any difference between aerating commercial-sized batches and homebrew-sized batches of beer? We found three professional brewers who also homebrew to explain why oxygenating wort is just as important for 5 gallons (19 L) as it is for 30 barrels (3,520 L), and how to get commercial results at home.



DEAN MOCHIZUKI, Assistant Head Brewer at Pike Brewing Company in Seattle, Washington. Dean has homebrewed for eleven years and still actively homebrews, including a batch of double IPA that was later reformulated and brewed on Pike's 30-barrel system as 2009's Seattle Beer Week beer. Dean has worked for Pike for the past six years and as the assistant head brewer for two years.

To oxygenate our beers at Pike, we use an inline oxygen stone located on the output side of our heat exchanger using medical grade oxygen. The main difference in aerating on a commercial scale and doing it at home in small batches is the amount of oxygen used and the delivery system used. At the homebrew level there are in-line oxygenation systems that should work very well for small batches.

Generally speaking, beers with a higher starting gravity require more oxygen due to wort density and yeast pitching rates. We try to aim for 8–10 mL of oxygen per liter of wort in our beers. We don't measure ppm as we do not have a DO (dissolved oxygen) meter. For higher gravity beers we do try to go a little higher. Homebrewers in a club can invest in a meter to share as they are around $250 to $350 each.

Over oxygenation and under oxygenation are the most common mistakes brewers make. Over oxygenation can stress the yeast and under oxygenation can lead to too long a lag time and sluggish fermentations. Repetition and knowing the requirements of your yeast are vital to achieving consistent results.

On the homebrewing level, using a small aeration stone available from your homebrew store and an oxygen tank purchased at your local home improvement store would work very well, as would an aquarium pump with an in-line filter and an aeration stone. Shaking or stirring your cooled wort does work but your results could be more hit and miss.

LUTHER PAUL, Head Brewer at Lakefront Brewery in Milwaukee, Wisconsin. Luther started out as a homebrewer and apprenticed his way into a professional brewing career. Before coming to Lakefront five years ago he and a partner started (and sold) Onopa Brewing Co., which is now Stonefly Brewing Co. He has been working with Lakefront for the past five years.

At Lakefront, the cooled wort traveling from the whirlpool to the fermenter has pure oxygen injected inline through a cintered metal candle. Shortly after, yeast is pitched in-line. Everything has a chance to mingle on the way to the fermenter. A flow meter controls the rate of oxygen that is injected.

Every beer is different and requires its own level of aeration. We adjust the amount of aeration depending on temperature, wort flow rate and gravity. All of these factors have an effect on the amount of oxygen that dissolves. We can measure the amount of oxygen both in-line and in the fermentation tank using a dissolved oxygen meter. The standard is 8–10 ppm. We tend to repitch our yeasts up to ten generations depending on the yeast. Adequate oxygen during pitching keeps our yeast healthy. However, this is probably not as important on a homebrew scale if the yeast is not being repitched.

There really isn't a difference between aerating commercial-sized brews and homebrewing. Batch size doesn't matter. It's all about having adequate dissolved oxygen to promote healthy yeast growth. Homebrewers are innovative. I've seen setups that rival pilot-scale breweries complete with miniature oxygen-injecting candles. But there's nothing wrong with shaking a carboy or using an aerating racking cane.

Remember — the only time oxygen is introduced is in the early stages of fermentation. Yeast can quickly consume it. In any other stage of the brewing process, oxidation can really deteriorate the quality of the beer. Also, keep it sanitary. The yeast will reward you.

KYLE LARSEN, brewer at Double Mountain Brewery and Taproom in Hood River, Oregon. Kyle is an active homebrewer of seven years who turned his hobby/obsession into a career three years ago. He is pursuing a master's degree in brewing and distilling through the International Centre of Brewing and Distilling (ICBD) at Heriot-Watt University in Endinburgh, UK.

At Double Mountain we use pure oxygen which is pumped through a stainless steel diffusion stone once the wort is cooled. It is pumped into the wort for the entire process of filling the fermenter.

Every beer you produce should garner the same vital attention to oxygenation. Healthy fermentation is a key concern in brewing. Without healthy fermentation you risk contamination, under attenuation and off flavors. Oxygenating your wort is one of many important steps you can take to ensure healthy fermentation. It helps yeast synthesize essential substances, mainly fatty acids and sterols, needed for optimum cell division. Generally, the more yeast cell growth the cleaner, faster, and more complete the fermentation will be.

At Double Mountain we don't measure dissolved oxygen content. The amount of oxygen added has been adjusted according to fermentation results. We watch a sight glass, which is inline after the diffusion stone, to ensure that the wort is fully saturated with oxygen. We adjust the flow of oxygen according to the look of the wort running through the sight glass.

As a homebrewer you can essentially oxygenate your wort the same way as we do at Double Mountain. The simplest way to replicate this process is to flow oxygen through a diffusion stone into the wort of your full fermentation vessel. Run the oxygen for a couple of minutes, give or take, depending on the initial gravity. I'm not too concerned with over oxidizing the wort. It is possible and levels over 40 ppm could affect the outcome of the final product. As long as you remember to turn the oxygen off in a timely manner you should have no problems.

The biggest mistake you can make when oxygenating is using dirty equipment. Pay extra attention to cleaning your diffusion stone; it is an ideal place for bugs and bacteria to grow. Always clean and sanitize your stone after each use to avoid problems. I store my homebrew diffusion stone in sanitizer to ensure it remains sanitized in-between batches. You can store your stone dry, just be sure to clean and sanitize it before using it again.

Brewing Well

Funny fermentation and preventing freezing

"Help Me, Mr. Wizard"

by Ashton Lewis

Water wellness?

Do you have any info on using well water? I have made a couple 5-gallon (19-L) batches at home by boiling 3 gallons (11 L) on the stove and then cooling it by adding ice and water from our tap (well water). I had no problems but it has been suggested that I am running the risk of contaminating the batch with bacteria from the well water. This is really good well water and I find it hard to believe that the stuff we drink everyday with no apparent harmful effects is contaminated with bad stuff that will ruin my beer.

D. Schut
Williamston, Michigan

As cities expanded and population density increased around the world, concerns regarding the safety of drinking water became very real as illness and death were direct results of contaminated drinking water. In such vulnerable areas beer became recognized as a safe beverage because wort is boiled prior to fermentation and, until recently, water was not added after wort production. So historically there is a strong link between beer and food safety, and beer is one of many food stuffs that do not support the growth of pathogenic microorganisms.

There are homebrewers today that no longer fear of illness and death from their water faucets, rather they are paranoid that some critter lurking in their water will spoil their prized elixirs. From my perspective this fear is based more on speculation than on case studies about beer spoilage in real situations. I suppose it is possible that your well water could contain the relatively few organisms that are known to spoil beer, but find it very unlikely. Lactic acid bacteria, such as *Lactobacillus* and *Pediococcus* require rich nutrient sources and safe drinking water is not likely to be contaminated with these bacteria. If you had water contaminated by coliform bacteria, such as E. *coli*, then you could have some spoilage issues. But you would also have other issues and would not be describing your water as "really good well water that we drink everyday with no apparent harmful effects." If you have safe drinking water and make good beer with it, I suggest ignoring your fear-mongering homebrewing buddies. They are probably just jealous that you have good well water and they do not!

Cold kegerator

My kegerator is in my insulated, but unheated garage, which is convenient since I love to be outside. I live in Wisconsin. Are there any ways to keep my taps and attached beverage lines from freezing during the winter?

Travis Berg
De Pere, Wisconsin

The problem here is pretty obvious. You have your kegerator located in your insulated, but chilly garage and during the nasty winters you have in sunny Wisconsin the temperature dips below freezing. And from what I have noticed about winter weather patterns in Wisconsin, you may have sustained freezing temperatures that bring the average temperature of your garage below freezing, meaning that the inside of your kegerator will also dip below freezing. This is clearly a problem, not just for the beer lines, but for the keg itself.

This situation is not unique to kegerators and people who have refrigerators in their garages run into similar challenges. The short answer to the question is that you need to put a heater in your kegerator to prevent freezing in the winter. Perhaps not the greenest suggestion to make in the environmentally sensitive world we live in, but a viable option. In fact, this probably uses less energy than simply moving your kegerator indoors since the difference in temperature between the ambient Wisconsin winter and the desired temperature of the kegerator is probably less in the garage than it would be if the kegerator were inside your home. The heater can be as simple as a light bulb or heat lamp controlled by a thermostat in the kegerator set to a temperature greater than the freezing point of your beer. Most beer freezes somewhere around 28 °F (-2 °C).

This may keep the beer in the keg from freezing, but your beer lines going to the tap still may freeze. The easiest way to solve this problem is to drain the beer from the draft line after use. If you drink beer from your keg on a regular basis this could become a pain in the neck and also lead to considerable beer waste. If your heater puts out enough heat you may be able to insulate the beer tower, but I wouldn't hold out too much hope since the beer tap itself is a big heat-sink and will probably freeze if it is exposed to the cold. Another option is to use a cobra head tap like those used at keg parties so that the keg, draft line and tap are all contained in the kegerator. Although you lose the convenience and style of a tap tower, you do have a system that is entirely contained in your heated kegerator.

Stuck restart

I'm writing this note to see if you can offer any hope for me to save my brew-in-process for Samiclaus Bier. I used the recipe from the Szamatulskis' *Clone Brews* book. It seems to be stuck after the primary fermentation and I can't get the champagne yeast to do its thing and finish the fermentation. Here are some particulars:

- I brewed on October 21
- My OG was 1.125 versus their target of 1.145
- I fermented at 55 °F (13 °C) for about three weeks then gave it a 3-day diacetyl rest at 58 °F (14 °C). The gravity was 1.074
- Transferred to the secondary on November 18 and held it in the refrigerator at 42–44 °F (6–7 °C)
- Removed it from the refrigerator on January 10 and let it warm up to 67 °F (19 °C). The gravity was 1.062
- Added a packet of rehydrated Red Star champagne yeast on January 12 and

maintained temperature at 67 °F (19 °C)

- Very little signs of fermentation and the gravity was still 1.054 on February 1
- Added a packet of rehydrated Lalvin EC-1118 champagne yeast on February 1 and maintained temperature at 67 °F (19 °C)
- Gravity was still 1.052 on February 10 with very little signs of fermentation

I may be impatient, but this seems like it will take forever to get to the targeted FG of about 1.031! I did not try to oxygenate the beer during the addition of either packet of yeast for fear of spoiling the beer. Any suggestions would be greatly appreciated.

Jim Fullerton
Lancaster, Pennsylvania

Most brewers cringe when brewing is compared to cooking. I really don't know why this comparison evokes such strong feelings. I am a big fan of cooking and enjoy watching cooking shows and even I cringe at the comparison! Yet, for certain discussions the similarities between the two practices are undeniable and recognizing these common traits can be helpful, especially for the recreational brewer. You probably can see where this is going . . . I am going to use a cooking analogy to address your problem.

Here are a few rhetorical questions to ponder. When baking a cake do you remove it from the oven according to time and temperature or do you check it for doneness by sticking a tooth pick into it? When grilling meat do you remove all of the cuts from the grill and bring them in the kitchen after grilling for a set time or do you check for doneness first? Most good cooks always check to make sure cooking is complete instead of relying on a timer. To me, the proper use of a timer is to remind me when I am supposed to start checking my food.

Brewers don't like the cooking analogy because brewing is far more complex than most food dishes. This is not an ego-based statement; it's a fact. If you have consistent raw materials then you can cook based on time and temperature. Most commercially prepared foods rely on this fact to control their operations. But in a brewery there are simply too many variables that cannot be controlled with clock-like precision to follow a strict procedure based on time.

I'll pause here and take a moment to address a thought I detect developing in the minds of some and that involves the reviled large brewer. As much as many craft brewers and homebrewers want to believe that big brewers are evil . . . I can attest to the fact that even the largest breweries in the world don't rely on a timer and a computer to automatically shepherd the process. The biggest breweries also monitor the process in their labs because even in the most tightly controlled breweries, the conditions and results still vary from batch to batch.

> "Egg timers are pretty handy inventions; fermentation timers don't exist."

I will assume that you somehow brewed your behemoth wort from all-grain. The purpose of mashing is to produce wort. One of the main features used to describe wort is its fermentability, or what percentage of the original gravity is lowered by fermentation. Fermentability is mainly influenced by the enzymatic content of malt and the time and temperature profile of the mash. Other factors affecting fermentability are malt modification, mash thickness, water chemistry, stabilizing ions in water such as calcium, mash mixer design, mill type, grist assortment and some factors that Mr. Wizard is forgetting or is unaware.

Fermentability is a wort property and has absolutely nothing to do with yeast. My assumption when brewing is that wort fermentability is probably going to vary when a recipe from one brewer is used in another's brewhouse. Take your pick of reasons, be it malt, water, brewhouse design or mash thickness, something is probably going to introduce a difference. When brewing mongo brews like your 1.125 yeast crusher this assumption becomes more like a certainty.

Next there is fermentation. I don't have to write a novella on how a living fermentation may not behave like an egg in a pot of boiling water. Egg timers are pretty handy inventions; fermentation timers don't exist. The most important factors in fermentation performance are wort aeration, yeast pitching rate, yeast viability, yeast vitality, zinc concentration and temperature. Change any one of these components and you will see a change in fermentation performance.

So here is what I think your "problem" is; you produced wort with a far different fermentability than the wort described by the recipe in the Szamatulskis' book. I don't think your fermentation was stuck, it just ended at a different point. And the behavior of your fermentation after adding champagne yeast strengthens my assessment. Sometimes adding fresh yeast can reignite a stuck fermentation, and sometimes different strains can ferment carbohydrates that are unfermentable by others. In your case the additional yeast did nothing. By the way, I am assuming that the original recipe did not call for chilling the beer prematurely, warming it up and adding champagne yeast. I have interpreted this action as intervention in an attempt to drive the gravity home.

In the future I suggest viewing a recipe as a road map. If you come upon an obstacle and are forced into a detour don't worry that your path has deviated from the recipe, just stay focused on the brew you are brewing and not the description of what someone else brewed. The other thing you need to do is to monitor the progress of your brew so that you have a good idea of where you are. It seems that you used your brewing compass when monitoring fermentation, but you really did not know your destination.

While forced fermentations are not practical for most homebrew batches they do provide a target end point (a forced fermentation is a small fermentation usually conducted at elevated temperature with a high pitching rate used to determine the end point of fermentation). Your target ending gravity of 1.031 may or may not have been possible based on the fermentability of the wort you produced. From the information provided in your question your actual destination was probably around 1.052.

I have a hang up about incomplete

fermentations and like to know that fermentation is truly complete before going onto further steps in the process such as racking to the secondary or, in the case of our uni-tank fermenters, turning on the cooling. Once you go to the next step it is awfully hard to turn around. If you don't like to think of cooking analogies, take a lesson from carpenters and measure it twice and cut once!

Hop pellet problem

I was reading a publication from 1978 on homebrewing that suggested that when using hop "pellets," you only need to boil them for about ten minutes to release all of their flavors into the wort. The publication explained that this was due to the process of making the hops into pellets. What do you think?

David Scott
via email

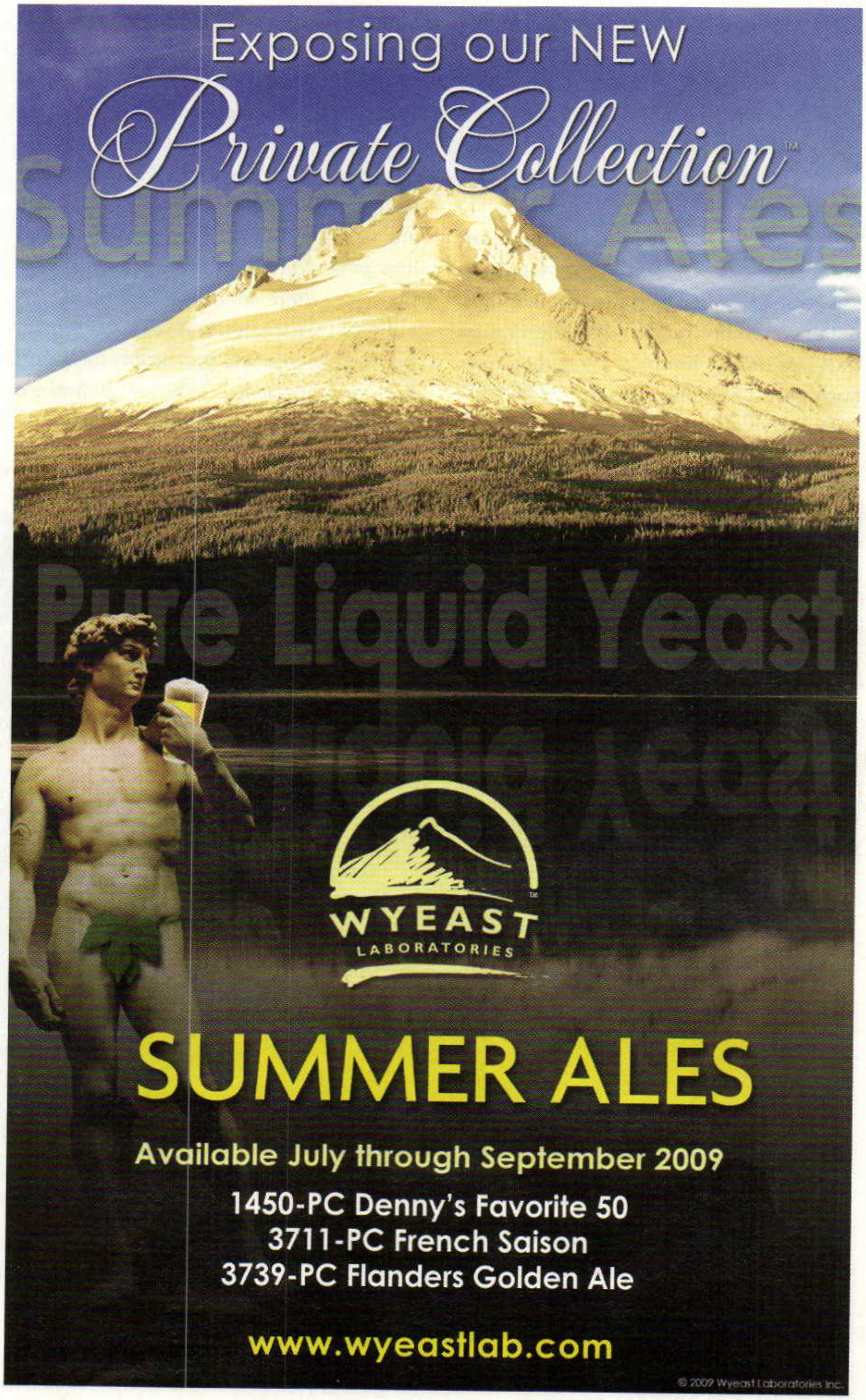
One thing I have learned over the years is that communications are not always clear and that two different meanings can be taken away from the same conversation. Remember the famous quote, "it depends on what the meaning of the word is, is?" In your question I am focusing in on the definition of flavor, a word that really is used in many different ways, and what is actually meant by "hop pellet."

Most people who use sensory evaluation methods in their research use the following definitions in order to clarify their communications. "Taste" is the sensation you have when the taste buds of the tongue and mouth are stimulated. "Aromas" are detected by the olfactory bulb of the brain and the term "flavor" describes the combination of taste and aroma, since the two are usually difficult to separate by the average person, especially when food and drink are consumed normally. Aromas can be attenuated in sensory studies by pinching off the nose, for example, so that the sensation of taste is the main focus of the panelists. However, most sensory panels are not conducted in this manner.

So when I read your question there are a few valid interpretations of the statement. If the author meant that all of the hop aromas are released within ten minutes this statement could simply be chalked up to the incorrect use of the term flavor. But I don't think this statement is so easily dismissed, especially when you consider that for best aroma retention ten minutes of boiling may be excessive.

I believe that the author of this statement meant that hop taste, or bitterness, and hop aroma, that nice piney, citrusy hoppy smell that hops have, are released into the wort after ten minutes. This certainly seems contrary to what brewers know about isomerization of alpha acids because most references indicate that about 60 minutes of boiling is required to maximize the isomerization of alpha acids.

But this statement is not necessarily incorrect, especially considering the date of the citation. Hop pellets have really not been around that long and one neat thing that hop processors quickly figured out is that the alpha acids in the pellets could be isomerized during processing by



adding a little bit of this-and-that to the mix. For example, magnesium oxide can be added to hop powder prior to pelletizing. The magnesium salts of alpha acids isomerize more readily than alpha acids and this method is used by some to improve hop utilization. If the same hop pellets are stored at an elevated temperature for about two weeks the alpha acids isomerize.

The 70s were a time in brewing history where these sorts of ideas had a lot more curb appeal to brewers than today. Although I have no objection to improving raw material yields using innocuous compounds, many consumers, especially from today's sophisticated and educated beer market, find these "chemical" creations less than appealing.

My guess, and that is all that I can offer, is that the author of the statement was probably familiar with stabilized hop pellets and his quote was referring to these products. Keep in mind that cone hops were commonly used by US brewers until fairly recent days and many of the hop products on the market, such as extracts, oils and pellets are often "enhanced" (read: changed by processing) in some way. To the surprise of many homebrewers who seem to take great pleasure in criticizing large brewers, Anheuser-Busch only recently replaced cone hops with pellet hops after many, many years of internal studies. While the vast majority of the beer world concluded some twenty-five years ago that pelletized hops are in many ways superior to hop cones, AB stuck to their traditional ways until they were satisfied with their research. Sierra Nevada remains unconvinced and continues to brew hoppy beers with the old-fashioned hop cone.

Enough of this digression, let's get back on point. When brewing today you are very unlikely to find pre-isomerized hop pellets at your local homebrew supply store. There are only a handful of varieties that are treated and sold in this manner and the intent is specifically for bittering. Whether using cone or pelletized hops you should boil your bittering addition for at least 60 minutes. If you are an all-grain brewer you probably boil that long anyhow and one of the benefits of adding hops to boiling wort is that they do help minimize foaming during the boil . . . but any brewer who has had a boil-over will certainly testify that hops do not prevent foaming during boiling.

Brew Your Own Technical Editor Ashton Lewis has been answering homebrew questions as his alter ego Mr. Wizard since 1995. A selection of his Wizard columns have been collected in "The Homebrewer's Answer Book," available online at brewyourownstore.com.

Do you have a homebrewing question for Ashton? Send inquiries to *Brew Your Own*, 5515 Main Street, Manchester Center, VT 05255 or send your e-mail to wiz@byo.com. If you submit your question by e-mail, please include your full name and hometown. In every issue, the Wizard will select a few questions for publication. Unfortunately, he can't respond personally. Sorry!

Mild Ale

Malt-focused British beer

by Jamil Zainasheff

Five hundred years ago, almost all British beers existed as both stale and mild ales. From its earliest use through the 18th Century, the term "mild" referred to an entire class of ales. These beers were much bigger than today's mild (perhaps 20 °P or more) and they were served young and sweet with residual malt sugars. Any beer could be called mild as long as it lacked the sourness of aged beers, such as stale or stock ale. Publicans would blend various amounts of stale and mild beer for their customers, to balance the sweet with the sour. While it was just a matter of time before all beers turned sour, there was no time limit on calling ale mild. If an ale remained sweet, it was still considered mild. As brewing technology advanced and the use of hops became standard, long term aging of beers and sourness began to disappear. Over time the strength of mild waned. Through market forces, increasing taxation, and rationing during two world wars, the starting gravity of mild fell further. Beers that were 8% alcohol 500 years ago have become 3 to 4% ABV today. Eventually the term mild took on a different meaning, referring to a beer with a slightly sweeter balance from low hop bitterness. Today, mild refers to the style's malt focus and relative lack of hop bitterness. At one time, mild was the most popular beer style in Britain. Unfortunately, other than in a few areas of England, mild has all but disappeared from the British beer scene.

Mild ranges in color from copper to a very dark, ruby-highlighted brown, with a low, off-white to tan head. There are a few examples of pale colored mild with a color of light amber or dark golden up to a light brown, but darker versions are the norm. Mild is a flavorful, malt-focused beer. It can include a wide variety of malt based flavors and aromas. Caramel, chocolate, roasted, toasted, biscuit, dark fruit and more flavors are common. I've even come across examples with a definite wet tobacco character that was surprisingly delicious. Hops play only a supporting role with just a balancing bitterness, maybe a hint of hop flavor, and no hop aroma at all. The darker versions are similar in many ways to a small brown porter. The finish can be slightly sweet or slightly dry, the body will be light to medium, and the overall impression should be refreshing. Fermentation character includes low to moderate fruitiness, similar to many other British beers.

In any beer the base malt plays a big role in the malt character and this is critical in mild. British pale ale malt is a good choice for mild as it provides a background biscuit-like malt character that people associate with fine British beers. British pale ale malt is kilned a bit darker (2.5 to 3.5 °L) than the average American two-row or pale malt (1.5 to 2.5 °L) and this higher level of kilning brings out the malt's

Continued on page 21

MILD ALE by the numbers

OG:	1.030–1.038 (7.6–9.5 °P)
FG:	1.008–1.013 (2.1–3.3 °P)
SRM:	12–25
IBU:	10–25
ABV:	2.8–4.5%

RECIPE

Dark Mild Ale

(5 gallons/19 L, all-grain)
OG = 1.036 (8.9 °P)
FG = 1.011 (2.8 °P)
IBU = 17 SRM = 22 ABV = 3.2%

Ingredients

6.25 lb. (2.83 kg) Crisp British pale ale malt or similar (3 °L)
5 oz. (142 g) Great Western crystal malt (60 °L)
5 oz. (142 g) Great Western crystal malt (120 °L)
4 oz. (113 g) Great Western black patent malt (525 °L)
4 oz. (113 g) Crisp pale chocolate malt (200 °L)
3.5 AAU East Kent Goldings hops, (0.7 oz./20 g at 5% alpha acids) (60 min.)
White Labs WLP002 (English Ale), Wyeast 1968 (London ESB Ale) or Fermentis Safale S-04 yeast

Step by Step

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 154 °F (68 °C). Hold the mash at 154 °F (68 °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 5.9 gallons (22.3 L) and the gravity is 1.030 (7.6 °P).

Once the wort is boiling, add the bittering hops. The total wort boil time is 1 hour after adding the bittering hops. During that time add the Irish moss or other kettle finings with 15 minutes left in the boil. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is

6 grams of properly rehydrated dry yeast or 1 package of liquid yeast.

Ferment around 67 °F (19 °C) until the yeast drops clear. With healthy yeast, fermentation should be complete in a week or less. Allow the lees to settle and the brew to mature without pressure for another two days after fermentation appears finished. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 1 to 2 volumes depending on your packaging. Serve at 50 to 55 °F (10 to 13 °C).

Dark Mild
(5 gallons/19 L, extract with grains)

OG = 1.036 (9.1 °P)
FG = 1.011 (2.9 °P)
IBU = 17 SRM = 22 ABV = 3.3%

Ingredients

4.25 lb. (1.92 kg) Edme Maris Otter English pale liquid malt extract
5 oz. (142 g) Great Western crystal malt (60 °L)
5 oz. (142 g) Great Western crystal malt (120 °L)
4 oz. (113 g) Great Western black patent (525 °L)
4 oz. (113 g) Crisp pale chocolate malt (200 °L)
3.5 AAU East Kent Goldings hops, (0.7 oz./20 g at 5% alpha acids) (60 min.)
White Labs WLP002 (English Ale), Wyeast 1968 (London ESB Ale) or Fermentis Safale S-04 yeast

Step by Step

Always choose the freshest extract that fits the beer style instead of focusing on the brand name. If you can't get fresh liquid malt extract, it is better to use about 3.4 lb (1.5 kg) dried malt extract (DME) instead.

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 5.9 gallons (22.3 L) and a gravity of 1.031 (7.7 °P). Stir thoroughly to help dissolve the extract and bring to a boil.

Once the wort is boiling, add the bittering hops. The total wort boil time is 1 hour after adding the bittering hops. During that time add the Irish moss or other kettle finings with 15 minutes left in the boil. Follow the fermentation and packaging instructions for the all-grain version.

Pale Mild
(5 gallons/19 L, all-grain)

OG = 1.036 (9.0 °P)
FG = 1.011 (2.8 °P)
IBU = 18 SRM = 10 ABV = 3.3%

Ingredients

6.6 lb. (3 kg) Crisp British pale ale malt or similar substitute 3 °L
6 oz. (170 g) Great Western crystal malt 120 °L
6 oz. (170 g) Great Western Carastan malt (30 °L)
2.1 AAU Challenger hops (0.42 oz./ 12 g at 8% alpha acids) (60 min.)
1.25 AAU East Kent Goldings hops, (0.25 oz./7 g at 5% alpha acids) (15 min.)
White Labs WLP002 (English Ale), Wyeast 1968 (London ESB Ale) or Fermentis Safale S-04 yeast

Step by Step

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 154 °F (68 °C). Hold the mash at 154 °F (68 °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 5.9 gallons (22.3 L) and the gravity is 1.031 (7.7 °P).

Once the wort is boiling, add the bittering hops. The total wort boil time is one hour after adding the bittering hops. During that time add the Irish moss or other kettle finings and the last hop addition with 15 minutes left in the boil. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is 6 grams of properly rehydrated dry yeast or 1 package of liquid yeast.

Ferment around 67 °F (19 °C) until the yeast drops clear. With healthy yeast, fermentation should be complete in a week or less. Allow the lees to settle and the brew to mature without pressure for another two days after fermentation appears finished. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 1 to 2 volumes depending on your packaging. Serve at 50 to 55 °F (10 to 13 °C).

biscuity flavors. A few malt companies (Crisp Malting is one) still produce British pale ale malt from cultivars such as Maris Otter using a traditional floor malting method. The result is malt with a slightly darker color (3.5 to 4.0 °L) and more flavor than other pale ale malts. It is the malt of choice for many English beer fanatics. If you can find mild malt, you can use it as the base for your mild ales with excellent results. However, you'll need to adjust your specialty grains to compensate for the darker color of the malt (~5 °L) and the increased toasted, nutty flavor.

These highly modified malts are perfectly suited to single infusion mashes, which is typical for all British beers. A higher mash temperature of 154 °F (68 °C) or higher increases the amount of non-fermentable, complex sugars created during the mash. It is these polysaccharides which add to the residual gravity and body to keep the beer from being thin and watery. If you find that the beer ends up too thin, try brewing it again with a higher mash temperature, raising it 2 °F (1 °C) with each new attempt, until you achieve the proper result.

If you're brewing with extract, your best choice is an extract made from British pale ale malt. There are some British style malt extracts currently on the market made from 100% Maris Otter malt and they are an excellent choice for English beers. If you end up using domestic two-row malt or extract made from it, you'll need to compensate with some additional specialty malts such as Biscuit or Victory, but use restraint. For a 5-gallon (19-L) batch, add no more than 0.75 pound (0.34 kg) total.

While there are some examples of mild brewed without any highly kilned malt, my feeling is that a proper English mild should be on the darker side and must have at least a touch of roasted malt character. A moderate portion of chocolate or black malt gives a mild a delicate touch of roast flavor and lots of color. I like to break up the highly kilned malt addition into more than one color type. Using different color roasted malts, such as pale chocolate (200 °L) along with a dark roasted malt or grain adds some complexity and depth of character. You can experiment with various colors and maltsters, but don't go overboard and end up turning your mild into a stout or robust porter.

Crystal malt adds caramel and other flavor notes to a beer and helps build body. The type of crystal malt also makes a difference. Darker color crystal malts add richer colors, as well as some dark caramel, toasty, roasted, and raisin flavors. Lighter color crystal malts add sweeter caramel notes. Like the highly kilned malts, you can experiment with different colors and amounts in the range of 30 to 150 °L. Overall, the roasted grains and the caramelized grains should comprise about 10 to 15% of the grist. Specialty malts are a big part of what differentiates one mild from another, so feel free to play around with the amounts or types, but remember to heed the limits.

While corn, cane sugar and other adjuncts are traditional in brewing many English beers, I usually omit them, unless I'm crafting a big beer and I want to increase wort fermentability, thin the body, or reduce the intensity of the base malt flavors. None of those apply in the case of brewing mild. The fact is simple sugars ferment fully, thin the beer and provide very little in the way of flavor contributions. I've seen recipes that use brown sugar, but don't count on it to add much in the way of flavor. If you want to add brown sugar/caramel type flavors, use caramel malts. Corn and other non-barley adjuncts also reduce the overall malt flavors, when used in place of the base malted barley. For me, I want as much base malt flavor as possible, so I don't use adjuncts in my mild. The one exception I make is black treacle or blackstrap molasses, where a small amount can add an interesting dimension to a dark mild.

Pale mild can be very simple in terms of grain bill. Some commercial brewers use only pale ale malt and caramel coloring, but most homebrewers add some crystal malt and other character grains to give the beer some caramel notes and malt complexity.

> "Mild is best brewed with English hops, such as East Kent Goldings, Fuggles, Northdown or Challenger . . ."

Mild is best brewed with English hops, such as East Kent Goldings, Fuggles, Target, Northdown or Challenger, though US hops such as Willamette can be used for bittering in a pinch. The bittering level is in the range of 10 to 25 IBU. What you're targeting is enough hop bitterness to provide a near even balance without overwhelming the malt sweetness. Keep in mind that there are many factors at play in the final impression of bitterness for the drinker and the highly kilned malt used in a dark mild will add a touch of dryness which can accentuate the perception of bitterness. For mild, a bitterness to starting gravity ratio (IBU divided by OG) between 0.4 and 0.6 gives good results. The bulk of the hopping should be as a bittering addition at 60 minutes. If you want a touch of hop flavor, a small addition, around 0.25 to 0.5 ounce (7 to 14 g) for a 5-gallon (19-L) batch, at 15 minutes is acceptable. Keep in mind this style shouldn't have more than a low amount of hop flavor and no hop aroma, so don't use larger or later hop additions.

Fermentation creates much of the flavor and aroma in most British beers. "English" yeast strains provide a variety of interesting esters and tend to be low to moderately attenuating, leaving some residual sweetness to balance the bitterness and help fill out the beer. They are also extremely flocculent, which makes them ideal for cask conditioning. These yeasts produce a fairly low level of esters at cool fermentation temperatures (<65 °F/18 °C) and abundant fruity esters and alcohol notes at high temperatures (>70 °F/21 °C). In general, it is better to start in the middle of this range, letting the temperature rise a few degrees, slowly over a couple days. This creates the expected level of esters and also keeps the amount of diacetyl in the finished beer at a minimum.

There are quite a few excellent yeast strains available, each providing characteristic yeast flavors and aromas appropriate to mild. In general, try to select English yeast that attenuates less than others (about 66%), accentuates the malt rather than the hops, and provides some fruity or woody esters, even with a cool fermentation. White Labs WLP002 English Ale, WLP005 British Ale, WLP017 Whitbread Ale or Wyeast 1968 London ESB Ale, 1318 London Ale III and 1099 Whitbread Ale are all good choices. If you prefer using dry yeast, use Fermentis Safale S-04. Ferment any of these strains at around 67 °F (19 °C).

With such a low starting gravity, restrained carbonation is important in mild. Beers with a lighter body suffer from carbonic bite much more readily than bigger beers, impacting drinkability. Mild needs just enough carbonation to impart a bit of mouthfeel and to drive the aroma out of the glass and up to your nose. Too much carbonation and the beer becomes dry, harsh and acidic. Gentle carbonation can make the beer feel creamy. Target a carbonation level of 2 volumes for bottled, 1.5 volumes for kegged and just over 1 volume of CO_2 for cask conditioned beer.

Serving mild at cellar temperature, around 50 °F (10 °C) to 55 °F (13 °C), allows the character of the beer to blossom. Colder temperatures prevent the drinker from picking up the interesting fermentation and malt flavors and aromas of this style, so don't go below 50 °F (10 °C).

Jamil Zainasheff is host of Can You Brew It, *a show about cloning your favorite commercial beers and* Brew Strong, *a show that answers technical questions about brewing. Both can be found on* The Brewing Network *(www.thebrewingnetwork.com). He writes "Style Profile" for every issue of* BYO.

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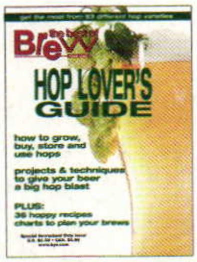

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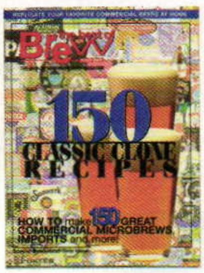

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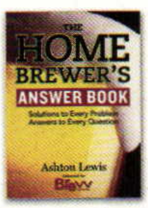

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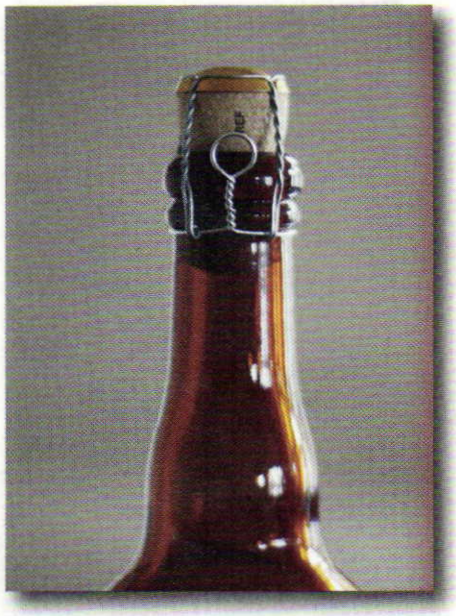
Story by **DAVE LOUW**

CORKING BELGIANS

PUT THE FINISHING TOUCH ON YOUR BELGIAN-INSPIRED MASTERPIECE

One recent Christmas, **I DECIDED TO BREW A SPECIAL BATCH OF BEER FOR MY FRIENDS AND FAMILY**.



Since I had recently read "Farmhouse Ales," by Phil Markowski (2004, Brewers Publications), I decided to brew a Bière de Noel. To complete the package, I wanted to use bottles that matched the style. After a fruitless Internet search for the procedure to cork a Belgian beer, and with little luck talking to my local homebrew shop (LHBS), I decided to figure it out myself. The technique I came up with is straightforward and the equipment and supplies are easy to obtain. Since the right presentation can significantly affect the enjoyment of a beer, I am happy to share the details with the homebrew community.

Tools and Supplies

The total outlay to get into corking Belgian-style ales is quite modest. You need the following in order to bottle a 5-gallon (19-L) batch:

Colonna Capper/Corker (~$60)
I got mine from my local homebrew shop, but have seen these available online as well.

Belgian Style Beer Bottles (two cases of 12 for ~$30 each)
Alternatively, you can use recycled bottles from your favorite Belgian brews or put the word out to your friends, family, and brew club that you would like people to save these for you.

Belgian Corks (~$6 for 25)
These are corks designed especially for bottling Belgian-style ales. In other words, ordinary wine or Champagne corks will not work. These corks are straight-sided when inserted in to the bottle. With time, the length of cork in the neck of the bottle compresses, making the mushroom shape you are familiar with.

Belgian Bottle Wire Hoods (~$4 for 25)
The single biggest expense is the bench corker/capper, but you can use this to cap regular beer bottles as well. I had heard on at

1. The Colonna corker can accommodate bottles of various sizes, thanks to the adjustable shelf the bottle sits on. Once you find the right height for your favorite sized bottle, mark the level with a permanent marker.

2. You can fill your bottles with flat beer, primed with sugar, or use a special filler — such as this BeerGun — to fill your bottles with carbonated beer from a keg.

least one website that you could use a floor corker, but when I tried this down at my LHBS I found the process to be awkward, and I was not really interested in dedicating the storage space or money towards a single-use tool.

It is possible that other models of corkers will work with this procedure, but I have not experimented with them. The key feature of any corker you want to use is that it needs to be able to handle the Belgian corks — which have a larger diameter than wine corks — and it needs to be able to leave some of the cork sticking out of the bottle.

The Process

The process of corking beer in Belgian bottles is very similar to the bottling procedure you already know. The biggest difference with corking Belgians is that, instead of using a standard bottle with crown caps, you are using a Belgian bottle with corks and wire hoods.

Before starting, be sure to clean and sanitize your bottles. Prepare your beer by either priming or carbonating in a keg to whatever level is appropriate for the beer style.

STEP 1: Adjusting Your Corker

Start by setting the base height so that the top of a Belgian bottle is just below the cork holder. Next, experiment with both different base heights and handle rotation distances to get the right amount of cork sticking out of the bottle — roughly ⅝ of an inch (1.6 cm). It is not critical that you get this perfect right now because you can adjust these factors at a later step after trying out some test bottles. I highly recommend performing a dry run with an empty bottle so you can practice your technique and get the settings right. Assuming that all of your bottles are the same size, you only need to do this adjustment step once. Mark the base height with a pen for quick setup in the future.

STEP 2: Fill Your Bottle

If you are planning to bottle condition your beer, you have probably mixed the beer with the priming sugar in a bottling bucket and have a bottle filler hooked up with some tubing. If you carbonated in a keg, then you likely have either a BeerGun or counter pressure filler for filling bottles.

In either case, fill the bottle to about two and a half inches (6.4 cm) below the top of the bottle. This may seem like a lot of head space, but I surveyed a significant number of commercial Belgian beers and this is consistent with their fill levels.

If you are filling your bottles from a keg, cork each bottle immediately after filling. Do not fill several bottles, then proceed to the corking stage. Given that you will lose a small amount of

"... turn the handle about
the cork into the
inch (1.6 cm)

carbonation during capping, you may want to slightly overcarbonate your kegged beer prior to bottling.

STEP 3: Inserting the Cork

Prepare a bowl of Star San and have it at hand for sanitizing the corks. Star San is ideal for this application as any liquid that squeezes out of the cork will not affect the flavor of the beer (unlike bleach) and will not discolor or destroy the corks (unlike iodophor and boiling water, respectively). Dunk the cork in the bowl to get it thoroughly wet. You can put a new cork into the bowl as you pull out one to put into the corker as part of your overall bottling rhythm, which provides plenty of sanitizing time.

Drop a sanitized cork into the cork holder and then turn the handle about 180 degrees to push the cork into the bottle with about ⅝ of an inch (1.6 cm) still sticking out. You should not have to use an unnatural amount of pressure to get the cork in there. It should be well within the working capacity of the corker.

If you do choose a floor corker for corking your Belgian-style ales, some sources report that making a spacer — often from a drilled stopper — to fit over the corker's shaft can help you get consistent spacing. A correctly-sized spacer would block the downward motion of the plunger once the cork was inserted to the correct depth.

Commercial breweries, of course, do not sanitize their corks. However, for homebrewers there is the added benefit to doing so — Star San is a slippery solution — a brief soak in it makes the cork easier to insert.

STEP 4: Removing the Cork from the Corker

Okay, here is where it gets interesting. The cork holder on the corker is like a funnel so that it compresses the cork before pushing it into the bottle. When you only press the cork in part of the way, you are left with the cork still in the funnel. How do you get the cork out without pushing it into the bottle? Simple; remove the base from under the bottle so the corking mechanism no longer has leverage to push the cork into the bottle. Hold the bottle to prevent it from falling and then turn the lever to its full extent, turning the handle to push the cork through the cork holder without pushing it any further into the bottle. If you hold the bottle at the neck, you can also use your hand to support the cork holder to prevent it from flexing excessively.

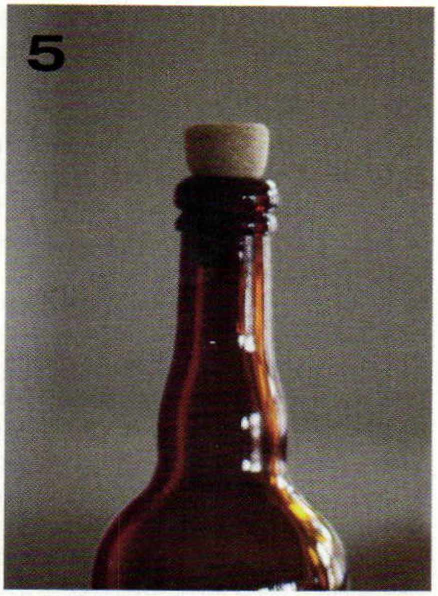
STEP 5: Admire the Result

Take a look at the bottle you just corked. If you are adjusting the corking settings for the first time, now is when you measure how much cork is sticking out the bottle and either change the base height or amount that you are turning the handle. Remember, you

180 degrees to push bottle with about ⅝ of an still sticking out."

3. The cork holder on the Colonna corker is a funnel that compresses the cork so that it can slide into the bottle. You should not need to apply an excessive amount of force to insert the cork.

4. To release the bottle, remove the stage below and press the cork the rest of the way through the funnel.



5. When inserting the cork, leave ⅝" (1.6 cm) exposed. Pressure from the carbonated beer would eventually displace the cork, so you next need to cage it.

are looking for about ⅝ of an inch (1.6 cm) of cork sticking out of the bottle.

STEP 6: Cage the Cork

Before the pressure has built up in the headspace, the cork will stay in the bottle on its own. Beer is much like sparkling wine, though, in that the cork will fly out at some point if not secured with a cage.

Slip a wire cage over the cork. If you inserted the cork to the correct depth, the bottom wire on the cage should fall just below the ridges on the neck of the bottle.

Tighten the cage with a pencil, ball-point pen or something of similar diameter — a short section of keg dip tube works well. There is even a fancy Champagne wire tightener available from many wine supply stores if you are going to be doing a lot of bottles on a regular basis.

One good trick when tightening the cages is to pull away from the bottle while twisting the wire. This tension ensures that you get a nice, even twist on the wire. If you want to be totally authentic, you should use 6 half turns, as the commercial examples do. Using more turns or a twisting tool of a smaller diameter will make it less comfortable to open the bottle later. In any case, make sure that the wire is securely seated under the ridges on the bottle neck.

At this point, you are done and can put the bottle away for cellaring.

The Finished Product

Once you have everything dialed in it should take about two minutes to fill, cork, and cage each 750 mL bottle. That is not much longer than you would spend filling and capping a 22-ounce (651-mL) standard bottle. People will assume, though, that you spent a lot of time and care on each bottle. That, of course, makes corked Belgians an ideal present.

I still have bottles from the first batch I corked and they are holding up very well. I have made some minor adjustments such as the amount the cork sticks out and how I tighten the cages, but overall my process is largely unchanged.

Storing Your Bottled Beer

As with corked wine bottles, you will want to store Belgian bottles on their sides so the corks remain hydrated. I have not seen a Belgian with a problematic cork, but I am not one to tempt fate. Unlike wine, you are going to get yeast settling out (especially if you bottle condition.) Many people will store bottles upright for several days before serving so that the yeast settles on the bottom rather than the side. In any case make sure whoever is pouring the bottle knows to be careful to not stir the yeast up.

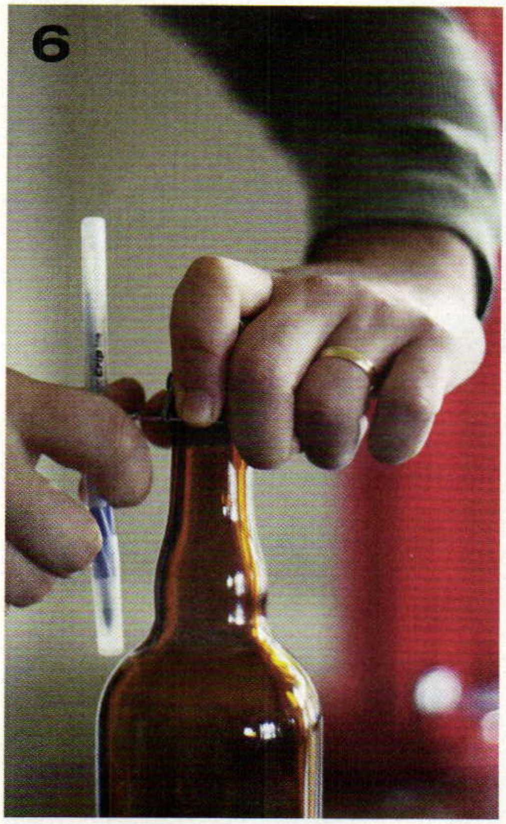
I also recommend experimenting with various strains of yeast. As noted in Stan Hieronymous's "Brew Like a Monk," (2005, Brewers Publications) some Belgian brewers centrifuge out their fermentation yeast strain and inoculate with a suitable bottling strain. For yeast such as White Labs German Ale/Kölsch (WLP029,) which generates significant fluffy sediment when bottle conditioning, I prefer to carbonate in a keg rather than priming. My absolute favorite yeast strain, White Labs Abbey IV Ale (WLP540)/Wyeast Abbey II (1762,) is an excellent choice for bottle conditioning as it drops out quickly to form a tight yeast cake at the bottom of the bottle.

Cork Questions

Since coming up with this technique, I have fielded a few common questions, mostly relating to the corks themselves.

Q. Is a Belgian cork different than a Champagne cork?

A. Yes. The composition of the two types



6. Put the wire cage over the cork. The bottom wire should fall just below the raised part on the neck. Use a pen, or similarly-sized object, to give the wire 6 half twists. If you pull gently away from the bottle as you twist, the twists will be evenly spaced. Age the beer with the bottle laying horizontally, to keep the cork moist.

of corks is different, but most importantly, a Champagne cork has a much larger diameter. This is to hold up to the tremendous pressure of sparkling wines. Next time you are in your local homebrew shop, see if they have any Champagne corks on hand and compare them to the Belgian corks.

Q. Would a Champagne cork work for Belgians?

A. No. A Champagne cork is much too big to fit in the Colonna capper/corker used for the procedure described above. If you used a proper floor corker designed to work with Champagne corks, you could probably get the cork into the bottle, but you would be stuck with another problem. It may not be obvious, but different types of corks are designed to resist different forces from the contents of the bottle. Simply put, a Champagne cork takes the pressure you only get with a sparkling wine in order to reasonably push out the cork. With typical beer carbonation levels, you would have to pull like crazy to get that cork out.

Q. Do those straight-sided corks result in a mushroom shaped cork coming out later?

A. Absolutely. After a month or so in the bottle neck,

the cork comes out looking just like it would with any other Belgian beer (e.g. Chimay.) So just to be 100% clear, all corks start out as straight-sided cylinders. Any cork that sticks out of a bottle will develop some degree of mushroom character over time. The more the cork is compressed to get it into the neck, and the more time the cork is in the bottle, the greater the mushroom character.

Final Notes

While the Colonna capper/corker clearly is not designed for this procedure, it works quite well. I have corked a few hundred bottles this way without problems. Most importantly, I am able to easily get repeatable results so that, across two cases of bottles, there is very little variation in the cork placement.

For me, the best part of corking Belgians is that people really enjoy receiving these bottles as gifts. The results are indistinguishable from commercially corked Belgians. It is clear to anyone receiving the bottle that the brewer put in extra time on this batch. As with other visual queues — such as brilliant clarity and a nice frothy head — a properly corked beer sets the expectation that the drinker is in for something special. Just be careful to not leave this issue of BYO sitting around or your loved ones may discover that it is nearly as easy as bottling with crown caps.

You are probably aware that Belgian ales come in a wide variety of carbonation levels and recommended serving temperatures. You're also probably aware that most Belgian breweries have glassware specific to their beers. If you do give your beers as a gift, a small card explaining the proper serving temperature — and how to decant the beer — can be a big help to the recipient. And, if you also give them a Belgian goblet or tulip glass, you may receive some corked bottles from a newly-minted Belgian beer fan next year.

Dave Louw maintains the website www.slobrewer.com. This is his first article for BYO.

Web extra:

Get some expert tips for brewing Belgian-style beers at BYO.com

http://byo.com/component/resource/article/284

2009 label winners CONTEST

If a picture is worth a thousand words, then we say a good homebrew label is worth a million bucks. Each year we collect the hundreds of entries for our annual homebrew label contest, waiting patiently to open the boxes and envelopes to see what homebrewers have been up to all year besides mashing, boiling, hopping and fermenting. Just as in years past, 2009 did not disappoint. This year we fell in love on a Dubbel Date, got geeky for an certain cephalopod, cooked up a mighty thirst for an old whaling ship and developed a major crush for a crazy cider. Winners — you wowed. Congratulations! And to everyone who entered the contest, thank you for sharing all your hard work and imaginative entries with us. A big thanks also goes out to all of the companies who generously donated prizes. Cheers!

GRAND CHAMPION

Kasey Loman • Fayetteville, Arkansas
When Kasey and his wife Jenifer Royer wanted something special for their big day, they decided to go Dubbel (instead of Dutch). "We thought it would be a good beer snob thing to toast our wedding with a Belgian-style dubbel instead of champagne," Kasey said. To create an image that not only evoked the spirit of the Belgian brew in the bottle, but also the unusual addition of dates in the mash, Kasey crafted a couple of monk-and-nun couples. "Which two are paired together on the date is subject to the imagination."

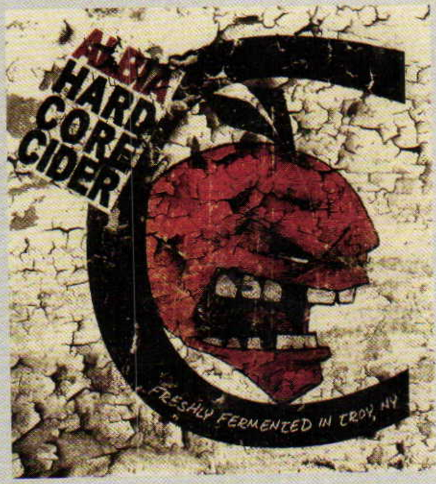
Prizes: Basic Brewing "Trippel" DVD combo from **Active Voicing/Basic Brewing Radio**; Weldless stainless steel spigot from **Do Your Brew**; Gift certificate from **Grape and Granary**; Brew kettle and spoons from **Polar Ware Company**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **Quality Wine and Ale Supply**; Gift certificate from **Above the Rest Homebrewing Supplies**

GOLD PRIZE

Brian Walbridge and Graham Kelman
Takoma Park, Maryland
When Brian brewed a foreign extra stout, he asked his friend Graham to help him imagine a design to describe the strange, inky concoction. "We made the connection to a deep sea octopus. It best captured the stout's duality and odd nature," said Graham.

Prizes: Ten sheets of custom labels from **Bottle Your Brand**; Gift certificate from **The Flying Barrel**; Gift certificate from **High Gravity Homebrewing and Winemaking Supplies**; Gift certificate from **Maryland Homebrew**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Wine bottle opener from **Rubino's Homemade Wine & Beer Supply**; Gift certificate from **Quality Wine and Ale Supply**

BRONZE PRIZE



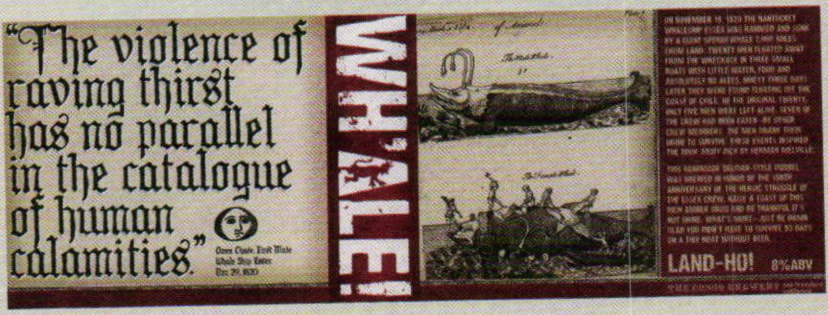
Sean Savaria, M.C. Mortikai, DJ Stokes, Greg Henry, Zane DeFazio • Troy, New York
Five cider-loving friends agreed that commercial hard cider just didn't make the mark — so they made their own. To describe that extra homemade oomph, they needed a, "drawing of a bad ass apple," said Sean. "We believe our label accurately depicts the flavor and style of our hard cider."

Prizes: 50 lb. pail of Straight-A cleanser from **Logic, Inc.**; Gift certificate from **Grains Bean & Things**; *The Homebrewer's Answer Book* from **Rubino's Homemade Wine & Beer Supply**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **Quality Wine and Ale Supply**

SILVER PRIZE

Damian Fagan • San Francisco, California
After reading *In the Heart of the Sea: The Tragedy of the Whaleship Essex*, Damian was moved to make a Belgian-style dubbel. "I was so inspired by the story I decided to brew a beer in honor of the ship's crew," he said.

Prizes: Gift certificate from **Bader Beer & Wine Supply, Inc.**; Gift certificate from **The Beverage People**; Gift certificate from **High Gravity Homebrewing and Winemaking Supplies**; Gift certificate from **Homebrewers Outpost & Mail Order Co.**; Gift certificate from **Quality Wine and Ale Supply**



label winners 2009 CONTEST

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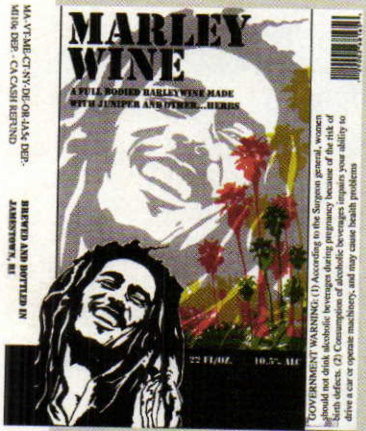
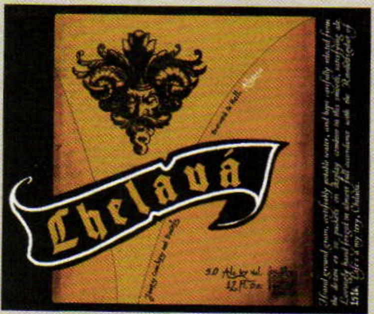


Will Wilson • Jamestown, Rhode Island
Prize: Gift certificate from **Beer and Wine Hobby**



Luis Concha • Montreal, Quebec
Prize: *The Homebrewer's Answer Book* from **Brew Your Own magazine**

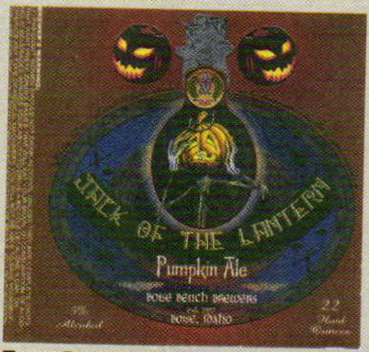
Stephen Singleton
Indianapolis, Indiana
Prize: Gift certificate from **Quality Wine and Ale Supply**

Rob Hoover • Franklin, Pennsylvania
Prize: Hat & T-shirt from **How Do You Brew?**

Steve Schalekamp • Seattle, Washington
Prize: Gift certificate from **Bader Beer & Wine Supply**

Ryan Lynd • Snoqualmie, Washington
Prize: Gift certificate from **The Beer Essentials**

Jonathan Sharp • Cincinnati, Ohio
Prize: Homebrew shirts and The Adapter from **Adventures in Homebrewing**



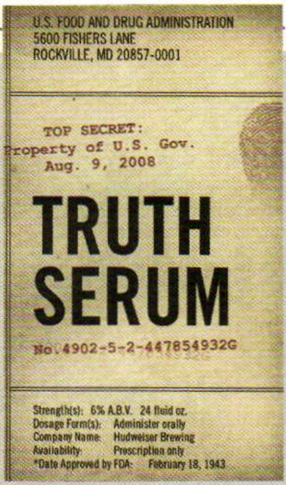
Tarey Potter • Boise, Idaho
Prize: Beach Blonde ingredient kit from **O'Shea Brewing Company**

Joseph Myers • Sheboygan Falls, Wisconsin
Prize: Gift certificate from **Point Brew Supply & O'so Brewing Co.**

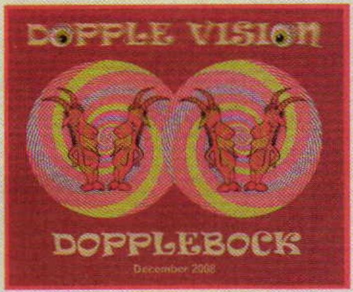
HONORABLE MENTION

Byron Ives • Pueblo, Colorado
Prize: Party Pig set-up package from **Quoin Industrial**

Brandon Jones
Franklin, Tennessee
Prize: Gift certificate from **Quality Wine and Ale Supply**

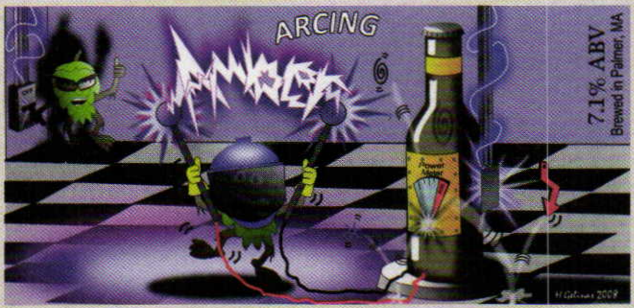


Becca Hudson
Minneapolis, Minnesota
Prize: Gift certificate from **WindRiver Brewing Co., Inc.**



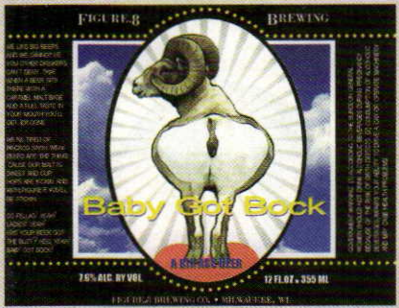
John Greer • Newark, Delaware
Prize: Gift certificate from **How Do You Brew?**

Brian Law • Campbell, California
Prize: Gift certificate from **Original Home Brew Outlet**

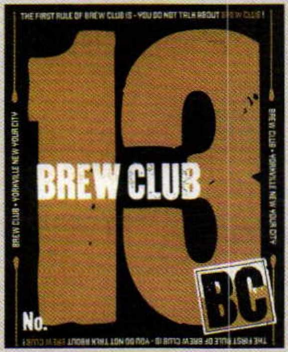


Heather Gelinas • Vernon, Connecticut
Prize: Gift certificate from **Strange Brew Beer & Winemaking Supplies**

Tyler Waterhouse • Stamford, Connecticut
Prize: Gift certificate from **Maltose Express**



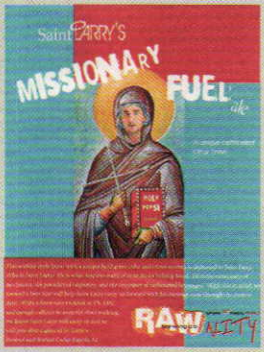
Katie Kregal • Milwaukee, Wisconsin
Prize: Extract plus grains homebrew kit from **Briess Malt and Ingredients Co.**



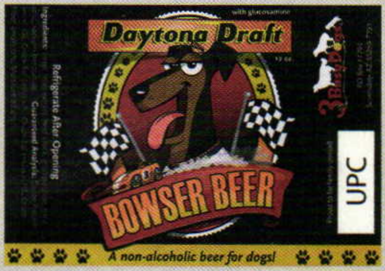
Liana Zamora • New York, New York
Prize: Polo shirt from **Yardwear.com**

HONORABLE MENTION

label winners 2009 CONTEST



Travis Savchenko • Cedar Rapids, Iowa



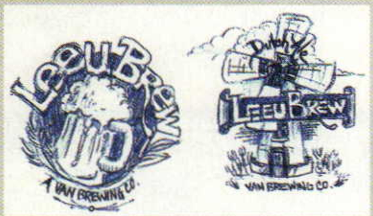
Maura Houston • Pleasant Hill, California

Adam Halon • Crown Point, Indiana

Leah Dienes • Louisville, Kentucky

Charlie Fonville • Los Angeles, California

Brian Parda • Concord, New Hampshire

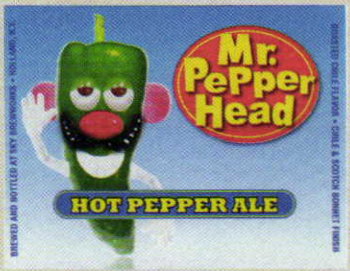


Joseph J. Van Leeuwen • Bartlett, Illinois

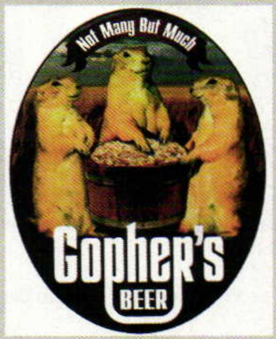
Matt Franck • Fredonia, Wisconsin

Matthew J. Horney • Atlanta, Georgia

Robert Sherrill • Springfield, Virginia



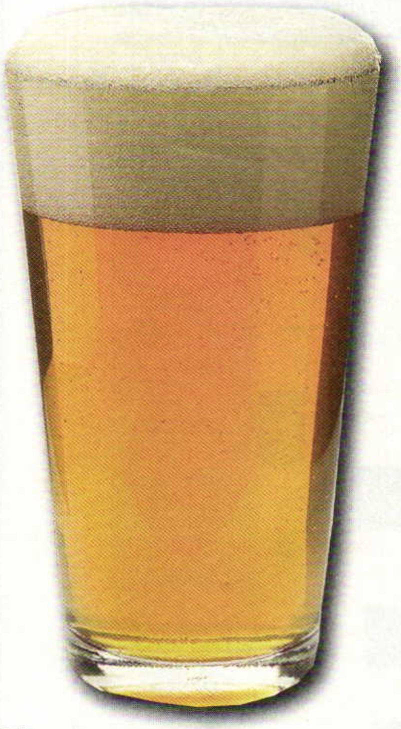
Neal Steward • Springville, New York



Alex Kanovich • Kfar Saba, Israel

EDITOR'S CHOICE

Story by **GLENN BURNSILVER**



6 SUMMER BEER CLONES

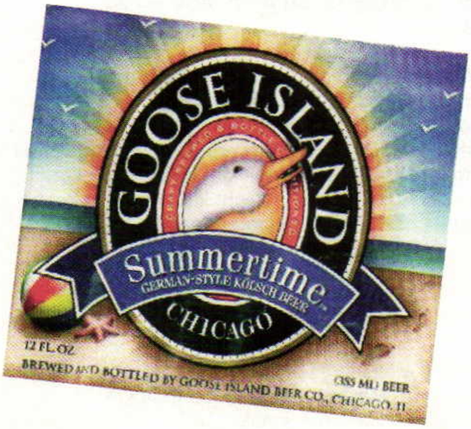
When you think about it, beer drinkers are a lot like grizzly bears. In the winter we hibernate at home, often on the couch, with books or movies and drink "warming" brews like stouts, strong seasonal ales, mead or barleywine that lull us into sleepy states of mind. But come summer, we emerge from our dens into the sunlight with hope and exhilaration. We become active again. But rather than scouring the earth for fresh shoots and berries, we seek fun, recreation and social settings.

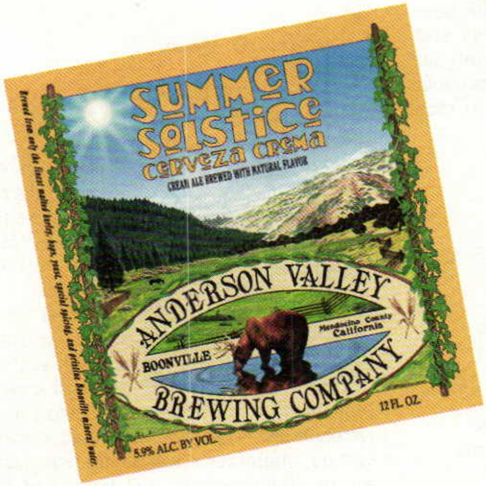
We also want beer that is light, won't slow us down, works well with barbecue and is refreshing to boot. So what makes a beer right for summer? *Brew Your Own* tracked down several master brewers of summer seasonals in an attempt to uncover the meaning of summer beer — and some brewing tips applicable to all light ales as well.

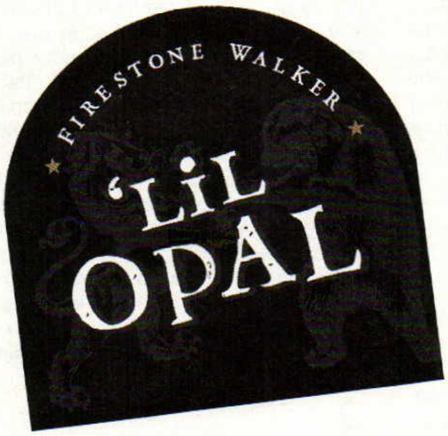
One thing all the brewers agreed on is that summer beers should be light, airy and joyous, like summer itself.

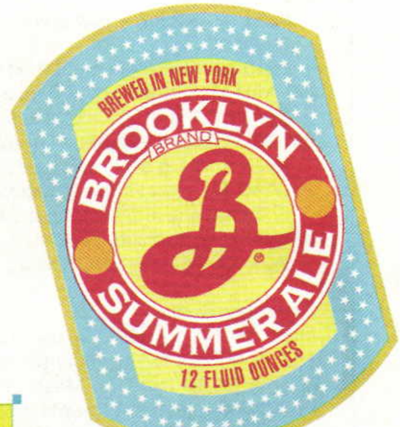
"Summer beers are unique because they demand liveliness and balance," says Justin McCarthy, Lead Brewer at Magic Hat Brewing Company in Burlington, Vermont. "These beers must be able to provide relief from the heat and humidity that many of us experience in the summer time."

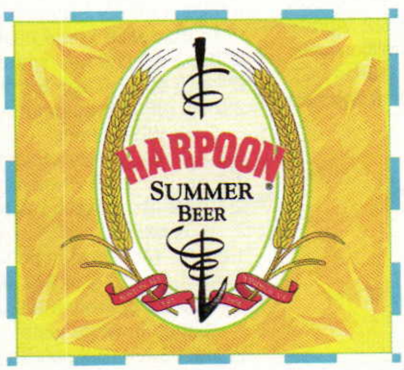
This, of course, doesn't mean watered-down, over-chilled "lite" beer, but a beer with a solid flavor profile that balances hops and malts with just enough body and still provide refreshment. Getting the right balance is the tricky part.











Continued on page 45

"A brewer must work hard to achieve an overall flavor profile that reflects the delicate nature of a summer beer while providing his/her drinkers with a brew that is interesting and flavorful," McCarthy adds.

"In today's brewing world of imperial/double/triple IPAs, etc., summer brews allow a brewer to create a beer that balances the blend of malt and hop flavors. Too much of either ingredient will take away from the light, thirst-quenching profile of a summer beer."

The nice thing about summer beers is that they are not limited to any one style. Anything cool and refreshing works, but typically many summer beers tend to be — or borrow from — lagers, Pilsners, German Kölsch, Belgian saison, Belgian wit, Bavarian hefeweizen and American wheat beer styles. These styles tend to

THE CURE FOR THE SUMMERTIME BLUES

1

Goose Island Summertime Kölsch

(5 gallons/19 L, all-grain)
OG = 1.046 FG = 1.010 IBU = 18
SRM = 4.5 ABV = 4.7%

Gregory Hall, Brewmaster, Goose Island Beer Company: "Summer beer … I think refreshment. I think session beers and matching summer beers with summer foods. For instance, having the acidity to cut through a nice grilled sausage."

Ingredients

7 lb. 11 oz (3.5 kg) 2-row pale malt (1.9 °L)
1 lb. 15 oz. (0.87 kg) wheat malt (2.5 °L)
2.0 AAU Mt. Hood hops (60 mins) (0.4 oz./11 g of 5% alpha acids)
3.0 AAU Czech Saaz hops (15 mins) (0.75 oz./21 g of 4% alpha acids)
2.5 AAU Mt. Hood hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
Wyeast 2565 (Kölsch) or White Labs WLP029 (German Ale/Kölsch) yeast

Step by Step

Mash at 145 °F (63 °C) for 40 minutes, 152 °F (67 °C) for 45 minutes and 170 °F (77 °C) for 10 minutes. Mash pH 5.4–5.5. Boil for 60 minutes. Wort pH = 5.2. Aerate to 8 ppm O_2. Pitch rate = 20 million cells per mL. Ferment at 56–58 °F (13–14 °C). (Note: Goose Island adds the final two hop additions in their whirlpool.)

Goose Island Summertime Kölsch

(5 gallons/19 L, extract with grains)
OG = 1.046 FG = 1.010
IBU = 18 SRM = 4.5 ABV = 4.7%

Ingredients

1.0 oz (28 g) 2-row pale malt (1.9 °L)
1 lb. 15 oz. (0.87 kg) wheat malt (2.5 °L)
1 lb. 10 oz. (0.74 kg) light dried malt extract
3.3 lbs. (1.5 kg) light liquid malt extract
2.0 AAU Mt. Hood hops (60 mins) (0.4 oz./11 g of 5% alpha acids)
3.0 AAU Czech Saaz hops (15 minsl) (0.75 oz./21 g of 4% alpha acids)
2.5 AAU Mt. Hood hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
Wyeast 2565 (Kölsch) or White Labs WLP029 (German Ale/Kölsch) yeast

Step by Step

Place crushed grains in a steeping bag. In a large soup pot, submerge bag in 3.0 qts. (2.8 L) of water at 159 °F (71 °C). Steep at 148 °F (64 °C) for 45 minutes. Begin heating 2 gallons (7.6 L) of water in your brewpot. Also, heat 1.5 qts. (1.4 L) of water to 170 °F (77 °C) in a small soup pot. After steep, lift grain bag into colander placed over brewpot. Pour "grain tea" through grains (to strain out grain solids), then rinse with water from small soup pot. Stir in dried malt extract and bring to a boil. Boil for 60 minutes, adding hops at times indicated. Stir in liquid malt extract at end of boil and let brewpot sit, covered, for 5 minutes before cooling wort. Transfer wort to fermenter and top up to 5 gallons (19 L). Aerate well and pitch yeast. Ferment at 58 °F (14 °C).

2

Firestone Walker 'Lil Opal

(5 gallons/19 L, all-grain)
OG = 1.043 FG = 1.010 IBU = 15
SRM = 5 ABV = 4.2%

Matthew Brynildson, Brewmaster, Firestone Walker Brewing Company: "Summer is all about outdoor activity and the beers of summer typically fit this theme and should provide refreshment. That doesn't mean bland or without character. A refreshing beer can be full of character and still be a part of a sunny summer day."

Ingredients

4.0 lbs. (1.8 kg) Pilsner malt or domestic 2-row pale malt
2 lbs. 3 oz. (1.0 kg) wheat malt
2 lbs. 3 oz. (1.0 kg) torrified wheat
3.0 oz. (86 g) Weyermann Cara-Wheat malt
3.0 oz. (86 g) Weyermann acidulated malt
1.0 oz. (28 g) Mt Hood whole hops (mash)
2.7 AAU Mt. Hood hops (60 mins) (0.54 oz./15 g of 5% alpha acids)
1.8 AAU Mt. Hood hops (30 mins) (0.36 oz./10 g of 5% alpha acids)
1.0 oz. (28 g) French oak chips soaked in white wine
Wyeast 3724 (Belgian Saison) or White Labs WLP565 (Belgian Saison I) yeast

Step by Step

Rice hulls or mash hops (whole) can be added to aid in run off. In the case of mash hops, this can add hop complexity to the finished beer without additional bitterness. Mash in at 145 °F (63 °C) for 30 min and raise mash temperature up to 156 °F (69 °C) to finish sachharification. Ramp up to 168 °F (76 °C) before running off. Mash at 5.2–5.4 pH (acidify if needed). Adjust finished wort to 5.2 pH with lactic or phosphoric acid. Boil time is 75 minutes. Pitch yeast at 72 °F (22 °F) and allow to free-rise up to 80 °F (27 °C). Age with French oak chips soaked in white wine.

Firestone Walker 'Lil Opal

(5 gallons/19 L, extract with grains)
OG = 1.043 FG = 1.010
IBU = 15 SRM = 5 ABV = 4.2%

Ingredients

1 lb. 10 oz. (0.75 kg) wheat malt
3.0 oz. (86 g) Weyermann Cara-Wheat malt
3.0 oz. (86 g) Weyermann acidulated malt
1.5 lbs. (0.68 kg) light dried malt extract
3.0 lbs. (1.4 kg) light liquid malt extract
2.7 AAU Mt. Hood hops (60 mins) (0.54 oz./15 g of 5% alpha acids)
1.8 AAU Mt. Hood hops (30 mins) (0.36 oz./10 g of 5% alpha acids)
1.0 oz. (28 g) French oak chips soaked in white wine
Wyeast 3724 (Belgian Saison) or White Labs WLP565 (Belgian Saison I) yeast

Step by Step

Place crushed grains in a steeping bag. In a large soup pot, submerge bag in 3.0 qts. (2.8 L) of water at 159 °F (71 °C). Steep at 148 °F (64 °C) for 45 minutes. Begin heating 2 gallons (7.6 L) of water in your brewpot. Also, heat 1.5 qts. (1.4 L) of water to 170 °F (77 °C) in a small soup pot. After steep, lift grain bag into colander placed over brewpot. Pour "grain tea" through grains (to strain out grain solids), then rinse with water from small soup pot. Stir in dried malt extract and bring to a boil. Boil for 60 minutes, adding hops at times indicated. Stir in liquid malt extract at end of boil and let brewpot sit, covered, for 5 minutes before cooling wort. Transfer wort to fermenter and top up to 5.0 gallons (19 L). Aerate well and pitch yeast. Ferment starting at 72 °F (22 °F), but allow to rise up to 80 °F (27 °C). Add oak chips after primary fermentation.

3

Harpoon Summer Beer

(5 gallons/19 L, all-grain)
OG = 1.047 FG = 1.010 IBU = 28
SRM = 5 ABV = 4.8%

Frederick Hamp, Brewer/QC Tech, Harpoon Brewery: "A summer beer needs to be compatible with the mindset of a beer consumer in the summer; ie beaches, barbecues, lots of skin revealing outfits, etc. Served cold and thirst quenching but still flavorful."

Ingredients

8.0 lbs. (3.6 kg) 2-row Pilsner malt
1 lb. 7 oz. (0.65 kg) wheat malt
6.5 AAU Nugget hops (75 mins) (0.5 oz./14 g of 11% alpha acids)
2.5 AAU Willamette hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
0.5 oz. (14 g) Vanguard hops (whirlpool)
1.0 oz. (28 g) Vanguard hops (dry hop)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast

Step by Step
Single infusion mash at rest temperature of 149 °F (65 °C). 75 minute boil. Whirlpool for 20 minutes (or move whirlpool hops to final 15 minutes of boil). Ferment at 66 °F (19 °C). Dry hop in secondary or keg.

Harpoon Summer Beer
(5 gallons/19 L, extract with grains)
OG = 1.047 FG = 1.010
IBU = 28 SRM = 5 ABV = 4.8%

Ingredients
9.0 oz. (0.26 kg) 2-row Pilsner malt
1 lb. 7 oz. (0.65 kg) wheat malt
1.75 lb. (0.79 kg) light dried malt extract
3.3 lbs. (1.5 kg) light liquid malt extract
6.5 AAU Nugget hops (75 mins) (0.5 oz./14 g of 11% alpha acids)
2.5 AAU Willamette hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
0.5 oz. (14 g) Vanguard hops (15 mins)
1.0 oz. (28 g) Vanguard hops (dry hop)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast

Step by Step
Place crushed grains in a steeping bag. In a large soup pot, submerge bag in 3.0 qts. (2.8 L) of water at 160 °F (71 °C). Steep at 149 °F (65 °C) for 45 minutes. Begin heating 2 gallons (7.6 L) of water in your brewpot. Also, heat 1.5 qts. (1.4 L) of water to 170 °F (77 °C) in a small soup pot. After steep, lift grain bag into colander placed over brewpot. Pour "grain tea" through grains (to strain out grain solids), then rinse with water from small soup pot. Stir in dried malt extract and bring to a boil. Boil for 75 minutes, adding hops at times indicated. Stir in liquid malt extract at end of boil and let brewpot sit, covered, for 5 minutes before cooling wort. Transfer wort to fermenter and top up to 5.0 gallons (19 L). Aerate well and pitch yeast. Ferment at 66 °F (19 °C).

4
Brooklyn Summer Ale
(5 gallons/19 L, all-grain)
OG = 1.044 FG = 1.007
IBU = 26 SRM = 5 ABV = 4.8%

Garrett Oliver, brewmaster, Brooklyn Brewery: "'Summer Ale' is not a beer style, but a concept. To me, anything which is brisk, light, and drinkable but still interesting enough to work with summer foods can be a 'summer ale.' It shouldn't be too strong, because you want to drink plenty of them and still be able to catch a Frisbee."

Ingredients
6 lb. 5 oz. (2.9 kg) British pale ale malt
2 lb. 11 oz. (1.2 kg) German Pilsner malt
3.8 AAU Cascade hops (60 mins) (0.75 oz./21 g of 5% alpha acids)
3.8 AAU Cascade hops (30 mins) (0.75 oz./21 g of 5% alpha acids)
3.8 AAU Cascade hops (0 mins) (0.75 oz./21 g of 5% alpha acids)
0.88 oz. (25 g) Amarillo hops (dry hop)
Nottingham ale yeast

Step by Step
Protein rest at 122 °F (50 °C). Saccharifacation rest at 152 °F (67 °C). One hour boil. Ferment at 68 °F (20 °C) with British ale yeast. Dry-hopped with Amarillo at 6 oz. per barrel. Carbonation to 2.6 volumes.

Brooklyn Summer Ale
(5 gallons/19 L, extract with grains)
OG = 1.044 FG = 1.007
IBU = 26 SRM = 5 ABV = 4.8%

Ingredients
1 lb. 5 oz. (0.60 kg) British pale ale malt
11 oz. (0.31 kg) German Pilsner malt
1 lb. 10 oz. (0.74 kg) light dried malt extract
3.0 lbs. (1.4 kg) light liquid malt extract
3.8 AAU Cascade hops (60 mins) (0.75 oz./21 g of 5% alpha acids)
3.8 AAU Cascade hops (30 mins) (0.75 oz./21 g of 5% alpha acids)
3.8 AAU Cascade hops (0 mins) (0.75 oz./21 g of 5% alpha acids)
0.88 oz. (25 g) Amarillo hops (dry hop)
Nottingham ale yeast

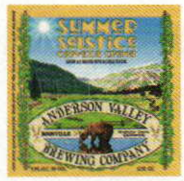
Step by Step
Place crushed grains in a steeping bag. In a large soup pot, submerge bag in 3.0 qts. (2.8 L) of water at 161 °F (72 °C). Steep at 150 °F (66 °C) for 45 minutes. Begin heating 2 gallons (7.6 L) of water in your brewpot. Also, heat 1.5 qts. (1.4 L) of water to 170 °F (77 °C) in a small soup pot. After steep, lift grain bag into colander placed over brewpot. Pour "grain tea" through grains (to strain out grain solids), then rinse with water from small soup pot. Stir in dried malt extract and bring to a boil. Boil for 60 minutes, adding hops at times indicated. Stir in liquid malt extract at end of boil and let brewpot sit, covered, for 5 minutes before cooling wort. Transfer wort to fermenter and top up to 5.0 gallons (19 L). Aerate well and pitch yeast. Ferment at 68 °F (20 °C).

5
Anderson Valley Summer Solstice Cerveza Crema
(5 gallons/19 L, all-grain)
OG = 1.053 FG = 1.011
IBU = 5 SRM = 19 ABV = 5.6%
David Galtin, head brewer, Anderson Valley Brewing Co.: "It's a different brew, that's for sure."

Ingredients
7 lb. 14 oz. (3.6 kg) 2-row pale malt
13 oz. (0.38 kg) crystal malt (40 °L)
11 oz. (0.30 kg) crystal malt (80 °L)
2.3 AAU Cascade hops (15 mins) (0.45 oz./13 g of 5% alpha acids)
Wyeast 2112 (California Lager) or White Labs WLP810 (San Francisco Lager) yeast

Step by Step
Mash at 150 °F (66 °C). 90 minute boil. Ferment at 65 °F (18 °C). (Note: Anderson Valley adds the hops at knockout and lets them steep in the whirlpool. If you do this, let them steep for at least 20 minutes.)

Anderson Valley Summer Solstice Cerveza Crema
(5 gallons/19 L, extract with grains)
OG = 1.053 FG = 1.011
IBU = 5 SRM = 19 ABV = 5.6%



Ingredients
3.0 oz. (85 g) 2-row pale malt
13 oz. (0.38 kg) crystal malt (40 °L)
11 oz. (0.30 kg) crystal malt (80 °L)
2.0 lbs. (0.91 kg) light dried malt extract)
4.0 lbs. (1.8 kg) light liquid malt extract
2.3 AAU Cascade hops (15 mins) (0.45 oz./13 g of 5% alpha acids)
Wyeast 2112 (California Lager) or White Labs WLP810 (San Francisco Lager) yeast

Step by Step
Place crushed grains in a steeping bag. In a large soup pot, submerge bag in 3.0 qts. (2.8 L) of water at 161 °F (72 °C). Steep at 150 °F (66 °C) for 45 minutes. Begin heating 2 gallons (7.6 L) of water in your brewpot. Also, heat 1.5 qts. (1.4 L) of water to 170 °F (77 °C) in a small soup pot. After steep, lift grain bag into colander placed over brewpot. Pour "grain tea" through grains (to strain out grain solids), then rinse with water from small soup pot. Stir in dried malt extract and bring to a boil. Boil for 45 minutes, adding hops at times indicated. Stir in liquid malt extract at end of boil and let brewpot sit, covered, for 5 minutes before cooling wort. Transfer wort to fermenter and top up to 5.0 gallons (19 L). Aerate well and pitch yeast. Ferment at 65 °F (18 °C).

6
Magic Hat Hocus Pocus
(5 gallons/19 L, all-grain)
OG = 1.045 FG = 1.010
IBU = 21 SRM = 4 ABV = 4.6%
Justin McCarthy, Lead Brewer, Magic Hat Brewing Company: "When I think of summer and beer, I think of beers that will quench my thirst and appease my palate at the same time. Light, refreshing, lively carbonation, and the ever-scary word of drinkability."

Ingredients

5 lbs. 10 oz. (2.6 kg) 2-row pale malt
3 lb. 6 oz. (1.5 kg) white wheat malt
6 oz. (0.17 kg) acidulated malt
2.5 AAU Cascade hops (60 mins)
(0.5 oz./14 g of 5% alpha acids)
2.5 AAU Cascade hops (45 mins)
(0.5 oz./14 g of 5% alpha acids)
1.5 AAU Cascade hops (30 mins)
(0.3 oz./8.5 g of 5% alpha acids)
0.5 oz. (14 g) Cascade hops
(whirlpool)
0.5 oz. (14 g) Columbus hops
(hopback)
Wyeast 1187 (Ringwood Ale) yeast

Step by Step

Single infusion mash at 150 °F (66 °C). Boil for 60 minutes. Fermentation temperature is 70 °F (21 °C). "We filter our version of Hocus Pocus bright, but a bit of yeast won't hurt if filtration isn't possible. Also, we run our wort through a hop-back prior to the wort chiller to achieve maximum hop aroma. We use rice hulls to aid in the lautering process because the large percentage of wheat. This will depend on brewhouse design. Be sure to give the brew a proper diacetyl rest; a large fermentation with Ringwood (150 bbls) needs 24 hours to reduce the buttery character." If you don't have a hopback or use a whirlpool step, see the extract recipe for an alternate hopping schedule.

Magic Hat Hocus Pocus

(5 gallons/19 L, extract with grains)
OG = 1.045 FG = 1.010
IBU = 21 SRM = 4 ABV = 4.6%

Ingredients

1 lb. 10 oz. (0.73 kg) white
wheat malt
6 oz. (0.17 kg) acidulated malt
1.5 lbs. (0.68 kg) light dried
malt extract
3.3 lbs. (1.5 kg) light liquid
malt extract (late addition)
2.5 AAU Cascade hops (60 mins)
(0.5 oz./14 g of 5% alpha acids)
2.5 AAU Cascade hops (45 mins)
(0.5 oz./14 g of 5% alpha acids)
1.5 AAU Cascade hops (30 mins)
(0.3 oz./8.5 g of 5% alpha acids)
0.5 oz. (14 g) Cascade hops
(15 mins)
0.5 oz. (14 g) Columbus hops
(0 mins)
Wyeast 1187 (Ringwood Ale) yeast

Step by Step

Steep at grains 150 °F (66 °C) for 45 minutes. Add dried malt extract and boil for 60 minutes, adding hops at times indicated. Add liquid malt extract at emd of boil. Hold for 15 minutes, then cool. Ferment at 70 °F (21 °C). Let beer rest on yeast one day after fermentation.

have lower IBUs (which ultimately complements fresh summer foods), but also have a refreshing quality of light mouthfeel, pleasant carbonation and a high drinkability factor.

"With these (summer) styles, the hops are typically low and the carbonation is high," explains Matthew Brynildson, Brewmaster at Firestone Walker Brewing Company in Paso Robles, California. "The tactile effect of high carbonation on the palate replaces the bitterness of the hops and results in a more refreshing session beer."

Brynildson's 'Lil Opal is what he calls a "Belgian farmhouse style" that borrows components from both Bavarian wheat and Belgian saison styles. Brynildson says he thinks wheat is an excellent choice for summer beers, adding both flavor and body.

"Wheat brings a soft texture to beer and a rich flavor that works great in summer beers," he says. "It also has a higher protein content that enhances foam, which is very important as well."

Frederick Hamp, Brewer/QC Tech at Harpoon Brewery in Boston agrees: "I don't see one particular ingredient as vital to producing a summer beer. However, a significant proportion of summer seasonals tend to be styles which incorporate wheat malt in the recipe."

Hops are also an important component of summer beers, even if they tend to remain more in the background. If a gentle, though noticeable, hoppiness is desired, Pacific Northwest hops like Cascade, Mt. Hood or Centennial can add a nice aroma and flavor, while something like Czech Saaz will add subtle spicy notes. Again, most summer beers tend to shift the focus away from hops and more on a balanced flavor.

When brewing lighter styles, however, it is crucial that the brewer perform well on all levels.

With lighter-bodied beers, off-flavors can be much more apparent. Therefore, it's important to attain a good, steady, rolling boil, which reduces the propensity for dimethyl sulfide (DMS), the chemical that imparts cabbage or rotting food-like flavors, to form. It's also important to cool the wort down to pitching temperature as quickly as possible for the same reason. Summer tap water temperatures tend to be warmer than in winter, and will result in slower cooling periods. Here, a counter flow wort chiller can be a valuable investment.

"A good rule of thumb is from the time that you cut flame (stop boiling) to the time you have completed cooling the wort should be less than an hour," Brynildson adds.

Summer beers should have a refreshing "zing" to them. Carbonation, and a little wheat in the grist, contributes to this, but you also need to get your pH right. This means both hitting a reasonable mash pH (for all-grain brewers) and kettle pH.

Mash pH levels are usually in the 5.2 to 5.6 range and you generally want your kettle pH to drop to around 5.2 by the end of the boil. Avoiding water with levels of carbonate over 50 ppm and ensuring that your brewing liquor has sufficient calcium (over 100 ppm) should give you a good chance of hitting your target mash pH in a pale beer. However, it is possible to achieve a decent mash pH, but still end up with a boil pH that is too high. If you don't have a pH meter, take a look at the hot break in your kettle. If you see big, fluffy bits of break material, you are likely in the right pH range. If the wort simply looks murky, your wort pH is likely a bit high. Try adding 0.5 tsp. of calcium chloride ($CaCl_2$) per 5 gallons (19 L) to your boil.

A light summer beer should be as clear as possible. Using the right fining agents will help. Adding 1 tsp. of Irish moss per 5.0 gallons (19 L) of wort during the last 15 minutes of the boil will help you coagulate the hot break. You could even bump this level up by about 20% if you routinely encounter haze in your pale beers. Likewise, cold-conditioning your beer after fermentation and adding a little less than half an ounce (~10 g) of PVPP (Polyclar) to 5.0 gallons (19 L) of the finished beer will also help. Boil the PVPP in a small amount of water and stir it into your beer (or add it when you rack to secondary). The PVPP will bind haze-causing agents and settle out within a few hours. Then rack the beer off the sediment and into a keg or bottling bucket.

Extract brewers may have some difficulty getting the right color in their summer clone. Three things can help in this respect. First and foremost, use only fresh malt extract. Secondly, when you add malt extract to your kettle, cut the heat and make sure to stir it in thoroughly before you resume heating. Finally, boil the biggest volume of wort you can manage. A full-wort boil, if you can manage it, is your best bet. The less dense your wort is when you boil it, the less color you will develop.

"Remember, it is the summer and there are organisms everywhere that would love to feast on all your hard work," Hamp adds.

A note of caution when brewing summer beers in the summer: those nice warm outside temperatures can adversely affect the fermentation process. It's important to prevent overly-high fermentation temperatures. This can cause the beer to finish out too quickly before the yeast can fully complete the fermentation and may leave "hot" estery or banana-like flavors familiar in higher alcohol beers, but not suited for refreshing summer brews. This could also leave a beer with malty or "green" flavors from unfinished fermentations.

The best preventative measure is to find a cool spot in the house, such as a basement, garage or ground level closest to set up the fermenter. A wet T-shirt draped over the fermenter and a small fan that keeps the air circulating can help keep things cooler as well. (Make sure to change the shirt frequently, however, so it doesn't start to mildew.)

However, if keeping things cool is a difficult task, consider making a beer that utilizes a yeast strain adapted to higher fermentation temperatures, like English ale yeast, which is used in Magic Hat's Hocus Pocus, or a saison yeast, as in 'Lil Opal.

"I consider saison yeast to be advanced yeast when it comes to getting a good fermentation completed," Brynildson says. "The good news is that it likes elevated temperatures like so many of the Belgian yeasts do, so it's a perfect yeast to work with in the summer months."

Belgian yeasts will also add fruity components to beers. Wheat beer yeast strains, on the other hand, typically impart a dry, yet tangy profile.

If it's a drier finish you're after, consider a traditional German Kölsch, similar to what Chicago's Goose Island Beer Company uses in their Summertime Kölsch.

"It's a very traditional Kölsch yeast that is only used for that style of beer," says Gregory Hall, Goose Island's Brewmaster. "It produces a very dry body with some extra acidity for a nice tart finish."

All the brewers recommend that an active yeast starter be prepared to help jump-start the fermentation. Even though most of these clones are fairly low in gravity, they are fermented in the low end of the ale temperature fermentation range. Plus, you are expected to achieve a fairly high level of attenuation. If you don't make a yeast starter, and aerate your chilled wort well, you may encounter a sluggish fermentation. Or, you may not reach a final gravity low enough to give the beer a dry finish.

Reaching a suitably low FG depends not only on fermentation conditions, however, you also need the right grist and mash profile. You'll notice that most of these summer beer clones are made from base malts only — no specialty malts. This is because the more specialty malt in your grist, the less fermentable your wort is. They also either use a step mash or a single infusion mash at the low end of the saccharification range (148—152 °F/64–67 °C). Any low temperature step before the main saccharification rest is going to improve fermentability. A rest in the 140–145 °F (60–63 °C) range is especially helpful for this, because this is the low end of beta-amylase's range.

A final note on fermentation. Although these beers ferment quickly, it doesn't hurt to let them sit on the yeast for a few days after primary fermentation has finished. This will give the yeast an opportunity to clean up any residual diacetyl — which you definitely don't want in a crisp, summer beer — and generally help condition the beer. In the case of the Magic Hat clone, this is especially important because of their yeast strain.

Remember that summer beers are typically more spritzy than normal beers. Add around 1 to 1.25 cups of corn sugar for priming 5 gallons (19 L) of beer or turn the CO_2 pressure up slightly on your keg. Shoot for at least 2.5 volumes of CO_2 for a typical summer brew.

Finally, one advantage in brewing summer beers is the time from fermentation to glass tends to be fairly short. So, if you find a recipe you like, brew a lot of it. It will be nice to have when friends drop over, or when throwing an outdoor barbeque. And it might just be nice to have a hint of summer sunshine in that dark winter den during next winter's hibernation.

Glenn BurnSilver is a regular contributor to Brew Your Own *and lives in Alaska where, if needed, he's prepared to fend off grizzly bears with pepper spray and save his special summer beer—Purple (W)heat—for more appropriate uses.*

Story by **CHRIS BIBLE**

Few things are more pleasing to a beer enthusiast than pouring a brew with a thick, foamy head and lofting it skyward to observe the wonderful clarity of a well-made beer! A brilliantly-clear beer is truly a thing of beauty. Although there are several styles of beer for which the presence of haze is an accepted and necessary component of the style — a hefeweizen is just not a hefeweizen if it is not cloudy — for most beers, haze is not a desirable or acceptable thing.

FILTRATION

I CAN SEE CLEARLY NOW, THE HAZE IS GONE

The removal of haze from beer can be accomplished in several ways. Clarification by sedimentation is a tried and true way to obtain a beer with high clarity. Using this method, beer is allowed to sit undisturbed for a period of time that is sufficient to allow the colloidial compounds, suspended yeast or particulate matter to sink to the bottom of the container. The driving force for this approach is gravity and the basic idea can be explained mathematically. If you are not mathematicaly inclined, the basic idea is that the biggest particles settle out the fastest, followed by the next biggest and so on. In a few weeks, a well-brewed beer that is stored cold will show a very respectable level of clarity. For crystal clarity, however, filtration is required.

A discrete particle settling in water (or fermented beer) accelerates until the drag force reaches equilibrium with the driving force. Once this happens, the settling velocity becomes constant. This equilibrium velocity is referred to as the "terminal velocity". At terminal velocity the settling velocity of a discrete particle is given by the equation:

$$v = \left[\frac{2g(\rho_s - \rho)V}{C_D A\rho}\right]^{0.5}$$

Where:

v = settling velocity (m/s), g = acceleration due to gravity (9.8m/s^2), P_s = density of the particle (kg/m^3), P = density of the wort (kg/m^3), V = volume of the particle

> For a spherical particle that is 1 micron in diameter to settle 1 meter, it takes approximately 952,000 seconds (264 hours or 11 days)!

(m^3), A = projected area in the direction of motion (m^2) and C_D = drag coefficient

If we assume that the settling particles are spherical, and that the settling occurs under laminar (non-turbulent) conditions, then this equation simplifies to:

$$v = \frac{g(\rho_s - \rho)d^2}{18\mu}$$

Where:
v = settling velocity (m/s), g = acceleration due to gravity ($9.8 m/s^2$), P_s = density of the particle (kg/m^3), P = density of the wort (kg/m^3), u = dynamic viscosity of the fermented beer (kg/m-s) and d = settling particle diameter (m)

As an Example:

Assume the density of the settling particle = 1984 kg/m^3, the density of the fermented beer = 1012 kg/m^3, the diameter of the settling particle = 1 micron (1×10^{-6} m) and the viscosity of the fermented beer is 1.5 centipoise (1.51×10^{-3} kg/m-sec). Then we get:

$v = [(9.8\ m/s^2)(1984\ kg/m^3 - 1012 kg/m^3)(1 \times 10^{-6}\ m)^2]/[18(1.51 \times 10^{-3}\ kg/m\text{-}sec)] = 1.05 \times 10^{-6}\ m/s$

For a spherical particle that is 1 micron in diameter to settle 1 meter, it takes approximately 952,000 seconds (264 hours or 11

Table 1: Typical Diameters of Substances

Substance	Diameter (microns)
Colloidal Matter	0.1
Bacteria	1
Yeast	2-8
Silt	10
Fine Sand	100

DIFFERENT BEER HAZES

THERE ARE SEVERAL DIFFERENT TYPES OF HAZE AND DIFFERENT REASONS WHY HAZE MIGHT BE PRESENT IN BEER:

Biological Haze

Biological haze results from microorganisms suspended in the beer. Ordinary beer yeast is the most common cause, but biological haze can also be due to bacterial contamination or the presence of wild yeast.

Carbohydrate Haze

Carbohydrate haze is a permanent haze that is caused by the presence of high molecular weight carbohydrates in the finished beer. The presence of high levels of beta-glucans in the malt is often responsible for this. Starch haze can also be caused by incomplete starch conversion during the mash, or by using sparge water that is too hot.

Chill Haze

Chill haze is the result of the formation of an insoluble colloid-complex from soluble proteins and tannins (polyphenols) during the fermentation process. This colloidal-complex (haze) is relatively soluble at room temperature, but is much less soluble at the cooler temperatures at which beer is typically served. Chill haze goes away once the beer warms up, but may become permanent if the beer is cooled and heated repeatedly.

Oxidation Haze

Oxidation haze may occur over time as proteins and polyphenols within the beer undergo chemical changes.

Figure 1: Illustration of Filtration Mechanisms.
Larger particles remain on the filter's surface, while smaller particles pass into the filter before becoming trapped.

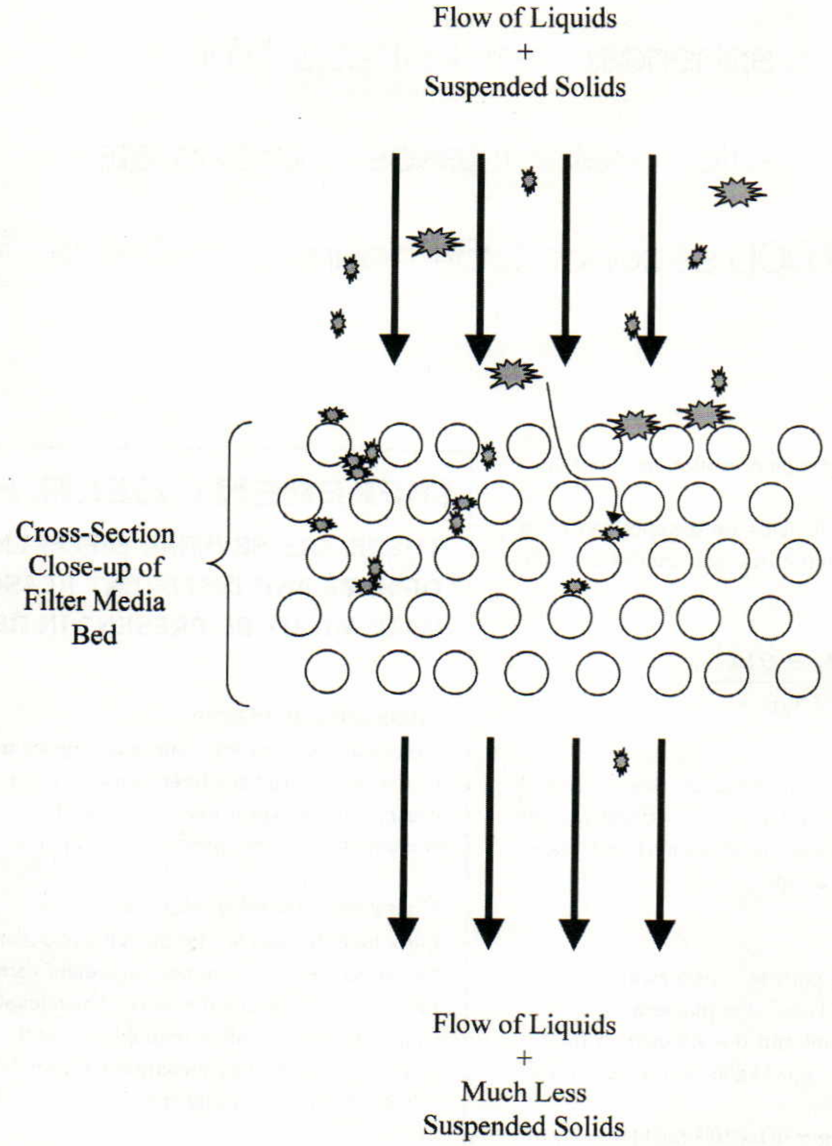
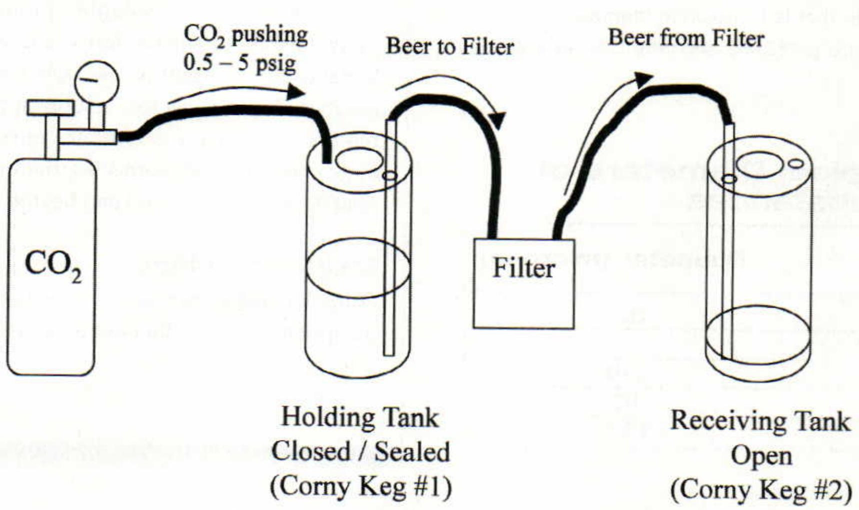


Figure 2: Typical Homebrew Filtration Setup



days)! Of course, carbohydrates that cause haze, if present, are much smaller than 1 micron and are not spherical, allowing them to stay in solution much longer. And, finally, if you fine your beer — with isinglass, gelatin or PVPP, molecules that stick to different haze-causing particles — you are effectively making the particle size bigger to increase the rate of settling.

If, however, your beer has a permanent haze that doesn't settle out in a reasonable amount of time, or for which you can't find a fining agent that works — or if you simply wish to clarify your beer more quickly than with sedimentation — you have the option of filtration.

Filtration

Many brewers believe that the flavor and character of a beer is best preserved using the settling or sedimentation method, but filtering is extremely useful when you need your beer to be at its very best and you don't have a couple of weeks to let it drop clear. Filtering is also a good option if you are making a beer style that is very light in color and has a delicate flavor profile (e.g. a Kölsch). Filtration, if done properly, can be an excellent way to quickly produce a brilliant, high-clarity beer.

Filtration Theory

Filters operate on the principle of forcing a liquid containing supended solids to flow through a bed of filter media.

There are many different types of filters, but the filters that are used to filter homebrewed beer almost always work based on two primary filtration mechanisms: surface filtration and depth filtration. Surface filtration occurs when particles that are too large to enter the filter media body are retained at the surface of the filter media. Depth filtration occurs when particles are small enough to enter the filter media, but are too large to exit.

The removal efficiency of suspended solids from the liquid depends on several factors, including the diameter of the solid and the size of the openings in the filter media. A filter with smaller openings will be more effective at removing smaller particles, but will tend to become clogged more quickly than a filter with larger openings. Conversely, a filter with larger openings will be less effective at removing smaller particulate matter, but will not clog as quickly.

Filter Types

There are two types of filters that are readily available to the home brewer: cartridge type and flat plate, dual-pad type.

Cartridge filters are comprised of an outer housing that is somewhat cylindrical in shape, and an inner cartridge of filter media through which beer is forced. These are exactly like the filters that are used in household water filtration applications. Filter cartridges are commonly available with 5.0, 1.0 and 0.5 micron effective openings. The 5.0 micron filter is intended to be used to remove sediment from the beer. The 1.0 micron filter can remove most suspended solids from the beer and produces a brilliantly clear beer. The 0.5 micron filter is capable of removing colloidal-sized material from the beer and

Table 2: Filtration vs. Sedimentation - Factors to Consider

Factor to Consider	Filtration	Sedimentation
Cost	\$40-\$100 for filter housing and filter media. Also need CO_2 tank, regulator, 2 Corny kegs, hoses and fittings.	No incremental cost. No additional equipment required.
Time Required	5 gallons of beer can be filtered in less than one hour.	It can take 1-2 weeks to obtain a high level of clarity.
Desired Beer Clarity	Crystal clarity possible. Can even remove compounds that cause chill haze (if cold filtered).	Very high clarity possible, but will take much longer to accomplish. Chill haze will remain in beer stored warm.
Levels of Effort	Higher than sedimentation. Additional step in the home brewing process, plus additional equipment cleaning, sanitation and maintenance required.	No incremental increase in work for the homebrewer.
Effect on Beer Flavor	Can remove a small, but discernable, amount of flavor. No undesirable yeast flavor will remain in beer.	Might allow undesirable yeasty flavor (from still suspended yeast) to remain in beer.
Effect on Beer Body	Can remove a small, but discernable, amount of body.	None
Effect on Beer Color	Can remove a small, but discernable, amount of color (good for a low SRM beer style).	None
Contamination Potential	Higher than sedimentation.	Lower than filtration.
Oxidation Potential	Higher than sedimentation.	Lower than filtration.

can eliminate the potential for development of chill haze.

Flat-plate filters are comprised of a flat outer housing that contains two filter pads. The beer enters the housing, gets forced through the pads to the center, then is pushed out into a receiving vessel. Filter pads are typically classified as either rough (about 2 micron effective opening diameter) or polishing (about 0.7 microns), but coarser filter pads are also available.

How to Filter Homebrew

A homebrewing filtration system typically uses pressurized CO_2 to push beer from a holding tank through the filter, and then into a receiving tank. Cornelius kegs work very well as holding and receiving tanks. A typical setup for filtration of homebrew is shown in Figure 2. Note that the filtered beer enters the receiving tank through the dip tube, to minimize splashing and potential oxidation of the beer.

The procedure for filtering your beer:

1. Chill the beer prior to filtering by placing the beer to be filtered in the fridge overnight. This allows any potential chill haze to form and be filtered out. Keep the beer as cold as possible during filtration.

2. Sanitize all components of the filter assembly including pads, cartridges, hoses and fittings. Re-assemble them while submerged in sanitizer. Try to minimize the amount of air that is retained within the system.

3. Sanitize (boil) about 2 gallons of water for use to flush sanitizer from the system.

4. Sanitize and rinse two corny kegs.

5. Flush sanitizer from the filter system using the previously-boiled water

6. Purge the holding and receiving corny kegs with CO_2.

7. Assemble filtration system and, lastly, connect the CO_2-filled receiving keg to the filter outlet

8. Set CO_2 tank discharge pressure to between 0.5 and 1 psig. Open the valve on the CO_2 tank and allow the CO_2 to push the beer from the holding tank, through the filter and into the receiving tank. Target a filtration rate of about one gallon every 5–10 minutes (0.1–0.2 gpm). Increase the CO_2 pressure to a level that allows you to maintain a slow, steady flow rate of beer through the filter. Filtering slowly will help to minimize the chance for oxidation. Some filter manufacturers specify allowable filtration rates of 1–2 gpm. This will not damage the filter, but it will increase the likelihood of oxidation.

9. Watch the receiving keg carefully. Stop the flow of CO_2 when you see the first signs of bubbling.

10. When filtration is complete, close up the receiving keg and refrigerate. Force-carbonate as you normally would, then enjoy the beer!

Conclusion

Filtration can allow you to produce brilliantly clear beer much more quickly than the traditional sedimentation method. But, as with all things in life, there are potential tradeoffs that should be considered by the brewer before deciding that filtration is the better choice.

Chris Bible, a bright homebrewer from Tennessee, is a frequent contributor to Brew Your Own *magazine.*

Wort Oxygenation

Adding air at the right time

by Jon Stika

Oxygen in beer is undesirable except at one point (and only one point) in the brewing process. That lone point is when the post-boil wort has been chilled down to fermentation temperature, but before the yeast has been pitched into it.

Oxygen dissolves into wort as a function of temperature and specific gravity. As such, the colder and less concentrated the wort, the more oxygen will be able to enter into solution. All the bubbling and splashing that occurs during the boil drives most of the oxygen out of solution because the wort is too hot while boiling. Therefore, oxygen must be replenished after the wort is cool and able to retain the oxygen in solution again.

Oxygen is essential for yeast growth and reproduction. Yeast must grow and reproduce first, before actually fermenting the wort to make beer. Yeast needs oxygen to synthesize the material for expanding cell walls; namely sterols and fatty acids. Overlooking proper wort aeration can lead to problems such as long lag times before the start of fermentation, stuck or incomplete fermentation, or excessive ester (fruit flavor) production, any of which would produce less than desired results. Now that we understand the "when" and "why" of wort aeration, let's examine how homebrewers can supply oxygen to chilled wort to meet the needs of their chosen favorite fungi.

Commercial breweries typically shoot for 8 to 10 ppm dissolved oxygen in wort prior to fermentation. Five ppm dissolved oxygen in wort is considered a bare minimum for proper yeast growth. Eight ppm of oxygen in chilled wort can be achieved using plain old air (which is 21% oxygen). Oxygen saturation above eight ppm in wort usually requires the use of pure oxygen. Again, as the specific gravity of wort increases, its ability to absorb oxygen decreases, thus making wort oxygenation of big beers even more critical to their successful production. Because it is difficult and expensive for homebrewers to measure dissolved oxygen in wort, experimentation will be needed in order to determine if the oxygenation method you perform is sufficient. If your fermentation temperature and yeast pitching rate are good, but fermentation is sluggish or incomplete, you should look at stepping up your oxygenation technique for future batches until you achieve success. There are three approaches homebrewers typically use to oxygenate wort; agitation, splashing and injection of either air or pure oxygen.

Agitation

After the wort has been chilled and transferred to the primary fermenter, there are a number of methods that can be employed to agitate the wort to introduce oxygen. If your wort is in a glass carboy, you can cover the mouth of the carboy with a loose fitting cap, get a firm grip and rock the carboy forth and back to slosh the wort around inside. Care must be taken to support the carboy on a cushioned surface and to maintain a secure hold on the carboy at all times while agitating.

If your wort will be fermented in a bucket or other vessel with a wide open top, a stainless steel whisk borrowed from the kitchen can be sanitized and used to whip the wort until it has at least a couple inches (several centimeters) of foam on top. If you don't think your arm will last long enough to manually whisk the wort, you can sanitize a (new) paint stirrer, attach it to an electric drill and agitate the wort accordingly. A word of caution if using an electric drill and paint stirrer: be sure the drill is connected to a ground-fault protected receptacle, take care not to damage the fermenting vessel (or yourself), and avoid splashing the wort out of the fermenter.

Oxygenating wort is made easy with an aeration stone attached to an oxygen tank. The stone makes tiny O_2 bubbles in the wort.

Regardless if your wort is in either a carboy or bucket, if you need to add cold water to make up the volume of wort to the desired level, splashing or spraying the cold water into the wort can also increase the amount of oxygen that will go into solution. Agitation is the simplest and least expensive method for aerating wort, but involves a little more time and elbow grease than splashing or injection.

Splashing

Another opportunity to add oxygen to your batch of homebrew is when the chilled wort is being transferred from the kettle to the fermenter. If the transfer is taking place through some type of hose or tubing, attaching a sanitized bent pen clip or other device (such as a Fermentap Siphon Spray) to the end of the tubing will cause the wort to spray and splash as it enters the fermenter. If you have two sanitized vessels, you can transfer the wort between the two (at least five or six times) with as much splashing as practical.

Pouring the wort through a sanitized wire mesh strainer can also increase splashing during the wort transfer process. As with agitation, splashing should result in at least a couple inches of foam on the wort surface. Be sure to brace the container receiving the wort so it cannot move and cause spilled wort. Also, be certain that containers and strainers are thoroughly sanitized before use. Splashing is a relatively simple and inexpensive approach to oxygenation, but if accomplished by pouring wort between vessels it may lend itself to contamination from airborne microbes.

Injection

Perhaps the most effective approach to

oxygenate wort is to directly inject air or pure oxygen into the wort. This can be done after the wort has been chilled in the kettle and conveyed to the fermenter, or during the delivery of wort from a wort chiller to a fermenter. While this technique is very effective, it usually involves more equipment and expense than both the agitation and splashing methods previously described.

The most common method of oxygen injection used by homebrewers is to infuse air or oxygen into the wort after it has been chilled and transferred to the primary fermenter. This technique uses either pressurized air or oxygen and some type of diffuser to bubble the gas into the wort to get oxygen into solution.

To accomplish oxygenation using air, an aquarium pump (or other air compressor) can be used to pressurize the air and send it through tubing and some type of filter to remove dust and/or microorganisms. A HEPA (High Efficiency Particulate Air) filter with a .023 micron sized filter, or a filter improvised from cotton balls wetted with alcohol is recommended to keep the air as contaminant-free as possible as it enters the wort. Many homebrew suppliers now carry air pumps, filters and diffusers for this method of wort oxygenation.

"The most common method of oxygen injection used by homebrewers is to infuse air or oxygen into the wort after it has been chilled and transferred to the primary fermenter."

Simply running air from the end of a section of tubing into the wort is not a very efficient means of gas transfer as the bubbles will be few in number and large in size. To get the most efficient transfer of oxygen into solution, some sort of diffusing apparatus is necessary at the end of the tube immersed in the wort. Diffusers range from very inexpensive aquarium-type air diffusion stones to sintered stainless steel diffusers.

Aquarium stones are inexpensive, but less efficient than a 0.5 micron stainless steel diffuser, which is preferred from both an efficiency and longevity standpoint. The small 0.5 micron holes in a stainless steel diffuser create a profusion of very tiny bubbles that create a larger gas to liquid surface area to dissolve oxygen into the wort with greater efficiency. A stainless steel diffuser can be sanitized by boiling it in water for 15 minutes prior to use. Artificial stones designed for use in aquariums can be sanitized by a quick soak in vodka, but after a few uses become fragile and tend to disintegrate quite easily (as has been my personal experience).

When using pure oxygen instead of air to oxygenate wort, filtration is not necessary as it is unlikely for microorganisms to survive in an atmosphere as reactive as pure oxygen. Otherwise, the technique for using oxygen is the same as that used for air, except for the amount of time the gas is bubbled through the wort. Since air is only 21% oxygen, it takes more bubbles of air to dissolve the desired amount of oxygen into solution. An apparatus diffusing air into chilled (< 70 °F/21 °C) wort typically needs to run for a minimum of 15 minutes to achieve adequate oxygenation, where the same set-up using pure oxygen would require only a minute or two at the most to achieve the same result.

The Oxynater™ is a ready-made apparatus for diffusing oxygen into a vessel of wort and includes a cylinder of oxygen, gas regulator, tubing and a stainless steel diffuser. Commercial or industrial grade oxygen is all that is necessary for use in wort oxygenation. Aviation or medical grade oxygen is more expensive, difficult to obtain and is not necessary for the purposes of brewing. A word of caution when using pure oxygen: there are few things as flammable as pure gaseous oxygen, so be sure there are no sparks or flames in the vicinity of where the gas will be used.

> "When using pure oxygen instead of air to oxygenate wort, filtration is not necessary as it is unlikely for microorganisms to survive in an atmosphere as reactive as pure oxygen."

A more sophisticated method of oxygenating wort is to inject air or pure oxygen into the wort as it passes from the kettle or chiller into the fermentation vessel. This is the approach commercial breweries commonly use to properly oxygenate their wort.

There are two basic techniques that can be used to inject air or oxygen into wort as it streams into the fermenter; by means of a simple venturi, or by injecting compressed air or oxygen into the flowing wort. The venturi approach can be accomplished by allowing the wort to flow through a section of tubing or pipe that has small (0.02 inches or 0.5mm) holes drilled through it to allow air to be drawn into the tube as the liquid passes through it. A commercial example of such a device is the Wort Wizard™ that uses a venturi in flowing water to draw wort from the kettle into a carboy and draw air into the wort at the same time (http://www.wortwizard.com/). A homemade venturi tube can be constructed as described at: http://www.kettlemoraine.com/mikesbeerpage/gadgets.php. One drawback of some venturi systems, however, is that they lack a filter for the air being drawn into the wort, which creates an opportunity for microbial contamination.

An alternative to the venturi tube technique is to use pressurized air or pure oxygen which is directly injected into the wort stream. This can be accomplished by placing a tee in the wort transfer line and injecting the air or oxygen through a diffuser inside the tee as the wort streams past. Such a project is described on page 61 in this issue. The injection process lasts for as long as it takes to run the wort between vessels, resulting in all of the wort being exposed to the injected gas.

Simple regulators that attach to disposable oxygen cylinders that are equipped with a ¼-inch barbed fitting are available from many homebrew suppliers. Disposable oxygen cylinders are available from most hardware stores. The gas regulators simply have a knob that is turned to adjust the pressure of the oxygen leaving the cylinder. This allows the user to release only enough gas to generate the desired degree of bubbling from a diffuser into the wort. Infusing air or oxygen into wort may generate a significant amount of foam that may overflow from a fermenter if left unmonitored. Anti-foaming agents made of food grade silicone are available from homebrew suppliers to control foaming during oxygenation without impacting head retention or flavor of the finished beer when they are used as recommended.

Oxygenation of cooled, post-boil wort is essential for proper fermentation by brewing yeast. To be successful, homebrewers must pay heed to this important step in the brewing process by selecting and implementing a successful wort oxygenation technique that fits their equipment and budget. Oxygen is critical for the growth of brewing yeast . . . and happy yeast makes for happy homebrewers! For more information about aeration, read "Keys to Aeration" in the "Advanced Brewing" column from December 2005.

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Web extra:

Not sure what's wrong with your homebrew? Check out our online troubleshooting guide:
byo.com/resources/troubleshooting

Attenuation

How to reach the proper FG

by John Palmer

Man: [Peering at his hydrometer, floating high in its jar] "That's funny"
His Wife: "What's wrong?"
Man: "My FG is low. I wasn't expecting Diminished Attenuation."
(The door flies open and three Cardinals wearing red robes enter. The first is tall with a dark scraggly beard, the second is wearing a scooter helmet and the third is heavily bearded with an eager gleam in his eyes...)

"NOBODY expects Diminished Attenuation! Our chief weapon is surprise . . . surprise and fermentability . . . Our two weapons are surprise and fermentability and poor yeast . . . Our three weapons are surprise, fermentability, poor yeast . . . and okay, you get the idea. (And if you don't, ask your local Monty Python fan about the Spanish Inquisition sketch. Or, find a comfy chair, search for "Python" and "Inquisition" on YouTube and see for yourself.)

Attenuation is defined as the decrease of a property of a substance, in this case density or specific gravity. Brewers most commonly refer to apparent attenuation — the decrease in the specific gravity of the wort during fermentation as the yeast convert the sugars to alcohol and carbon dioxide — when describing the degree to which a wort has fermented.

Achieving a proper level of attenuation is important for any beer, but there are some types for which it is particularly important. In big beers, proper attenuation is important because under attenuated beers can be cloyingly sweet. In beers such as Belgian Tripels, a low finishing gravity is required — despite the high original gravity (OG) — to get the proper character for the style. And finally, dry beers — including many thirst-quenching summer brews — need to attenuate beyond the level of most "normal" beers to be as refreshing as possible.

Poor attenuation is the bane of many homebrewers. Homebrew forums on the Internet and homebrew shop workers both get a steady stream of brewers complaining that they did not reach their expected final gravity (FG).

Generally, when brewers experience diminished attenuation, there are two likely causes: low wort fermentability or poor yeast performance. Low fermentability can be a result of the ingredients or, for all-grain brewers, hot side processes. It could be a malt extract with a high percentage of unfermentable dextrins, or too high of a mashing temperature. Poor yeast performance is generally a result of poor yeast preparation, but it can also be due to the wort environment.

How to measure attenuation

You can track your attenuation by using a hydrometer or a refractometer. A hydrometer measures the specific gravity — the density of a solution, relative to pure water — by buoyancy. The higher the specific gravity of a solution, the higher the hydrometer floats. A Brix refractometer measures the concentration of sugar (specifically sucrose) in a solution, based on the refraction of light. The higher the sugar concentration, the greater the angle of refraction.

The hydrometer is the more applicable device for measuring attenuation because it allows you to directly calculate the apparent attenuation of the beer. Apparent attenuation is calculated using the following simple equation:

$$AA = (OG - FG)/OG$$

where AA is apparent attenuation and OG and FG are the original and finishing gravities, respectively, expressed in "gravity points." For example, if a beer's OG is 1.050 and it finishes at 1.010, then the apparent attenuation is $(50 - 10)/50 = 80\%$.

The actual attenuation (called real attenuation) is less than the apparent attenuation because the density of alcohol is about 80% that of water. (In other words, the more alcohol in solution, the lower the hydrometer floats.) If you had a 1.040 beer and achieved 100% real attenuation — in other words, if the yeast consumed all the sugars (and other solids) in the wort, leaving only water and ethanol — the final gravity of the beer, as measured by a hydrometer, would be about 0.991. (This corresponds to the roughly 5% alcohol by weight.) The apparent attenuation of this beer would be 122%.

A refractometer measures the degree to which a solution refracts or bends light. Refractometers are a quick and easy way to measure wort density, but the instruments used by homebrewers are read in °Brix and this number has to be converted to specific gravity in order to calculate the apparent attenuation. Another twist to using refractometers in brewing is that the amount of refraction is based on solution of pure sucrose (table sugar). Wort typically consists of only about 6% sucrose, with the rest being predominately maltose, maltotriose and larger dextrins. Thus to convert the refractometer scale from °Brix to °Plato, you need to divide the reading by 1.04. To convert °Plato to specific gravity, the approximation equation is:

$$SG = 260/(260 - P)$$

Of course, another way to approximate specific gravity from °Plato is to simply multiply by 4, but that approximation gets worse at higher specific gravities, to the extent that it's not very helpful over 13 °P. Refractometers are great for measuring wort OG, but once fermentation has started, the rising alcohol percentage changes the reading and you won't get an accurate answer to your attenuation question. An equation to measure alcohol by volume with a refractometer still requires a hydrometer reading.

In short, measuring your wort gravity with a hydrometer before and after fermentation will allow you to easily calculate apparent attenuation. In most "normal," all-malt beers, apparent attenuation is in the neighborhood of 75%. This gives us an extremely quick and dirty way to estimate FG to within a few gravity points — just divide the OG by 4. (For example, for an OG 1.048 beer, the estimated FG would be 48/4 = 12, or an FG of 1.012.) For a better estimate, most yeast manufacturers give the typical range of attenuation for the strains they sell. The actual degree of apparent attenuation you achieve depends not only on the yeast strain, but on your wort fermentability, pitching rate and other variables.

How to control attenuation — fermentability

So, how can we control attenuation? There are two main causes: the fermentability of the wort and the performance of the yeast. Wort fermentability can be controlled by the ingredient selection or the mash process. In general, darker malts have lower fermentability and therefore a lower attenuation capability. Crystal malts, especially the darker crystal malts, have had their sugars cooked under higher temperatures, causing them to combine with amino acids to form Maillard products, which cannot be fermented by the yeast. Roast malts like chocolate malt have also had their sugars converted by Maillard reactions to unfermentable flavanoids and such. Sugar adjuncts like molasses can also contain a high proportion of dextrins and Maillard reaction products that contribute lots of flavor, but are not fermentable. It used to be common for malt extract beer kit manufacturers to include these type of adjuncts in their kits for flavor in anticipation of the brewer adding a couple pounds of very fermentable white table sugar; the two levels of fermentability balanced out this way. However, if a brewer were to try to brew an all-malt extract brew with these kits, the fermentability would be comparatively low and the beer would not attenuate as desired.

All-grain brewers can run into the same kind of problem due to their malt selection, but also due to their mash conditions. Some malts are specifically designed for low fermentability, such as Briess Carapils™ to enhance mouthfeel and improve head retention. As mentioned, the darker crystal malts and roast malts are less fermentable and a high proportion of these malts will produce a less fermentable wort. But malt selection aside, the mashing process can have a large effect on wort fermentability.

Beta amylase is the enzyme that produces the majority of completely fermentable maltose sugar in the mash. Alpha amylase also produces maltose, but many other less fermentable sugars as well. Beta amylase is denatured at temperatures above 150 °F (66 °C). The denaturing process is gradual, but the higher the temperature is above 150 °F (66 °C), the faster it will degrade. One study by Stenholm et. al., showed that the activity of beta amylase was reduced to 10% of its original value after one hour at 150 °F (66 °C). Beta amylase is also affected by mash pH – if the pH of the mash drops below 5, due to acid additions, acidulated malt additions, excess calcium additions and too low a residual alkalinity (RA) for the recipe, the beta amylase will be denatured as well.

Generally the mashing process is pretty robust, and the typical single infusion mashing temperature of 152–154 °F (67–68 °C) produces a good compromise of starch conversion speed and wort fermentability. But what if your thermometer calibration is off? Three degrees can make a perceptible difference in the fermentability of the wort. A greater temperature difference, like 6 °F (~3 °C), can have a profound effect if the target mash temperature was 154 °F (68 °C), but is 160 °F (71 °C), the beta will be more quickly denatured and the wort will be more dextrinous, leading to poor attenuation.

How to control attenuation — yeast performance

The health of the yeast and the fermentation environment is the other big factor when it comes to poor attenuation. If the yeast are not healthy or there are too few to do the job, then the wort will not be completely fermented. Yeast always eat the simple sugars first and save the larger sugars like maltose and maltotriose for later. Interestingly, if sucrose is present, the yeast will use an invertase enzyme to break down sucrose into its components of glucose and fructose first, before eating all the other individual glucose and fructose sugars that may be present. Once those sugars are eaten, the yeast will move on to maltose, which should be the majority of the sugar in the wort (>40%).

Maltotriose is a three glucose sugar that is fermented to different degrees by different yeast strains. Lager yeast strains generally ferment it more completely than ale yeast strains. Depending on the mashing schedule, maltotriose will make up 10–20% of the wort, and dextrins will make up about 20–25%. Right away you can see that if unfermentable dextrins make up 20% of the wort, that limits your attenuation to 80%, so if the yeast strain or the yeast's health prevents it from finishing the maltotriose, your total attenuation will be less than you expected.

The ability of yeast to completely ferment a strong wort depends on the health of their cell membrane. The cell membrane is different than the cell wall; the membrane is a semi-permeable membrane that essentially serves as the cell's mouth, allowing sugars to pass into the cell, and waste products to pass out. The membrane also allows the cell to bud and form new cells. As the cell ages, the membrane gets used up and yeast growth and function declines. To build a robust cell membrane, the yeast need oxygen and certain lipids to synthesize sterols for building blocks. So, poor oxygenation of the wort will impair the yeast's ability to synthesize sterols and ultimately their performance. As a side note, there has been talk of using olive oil to directly supply one of the unsaturated fatty acids that yeast would synthesize from oxygen and lipids in the wort. This would seem to eliminate the need for oxygenation, but olive oil only supplies one of the compounds that the yeast need, so while it definitely helps build yeast mass, it is not a complete replacement for oxygenation at the start of fermentation.

Zinc is another critical nutrient that yeast need to fuel their biochemistry, and one that is often insufficient in wort. Modern packaged yeast strains are grown at the manufacturer with complete nutrient blends so that fresh yeast should have sufficient zinc for their first, and probably second, fermentation. However, if you as a homebrewer are consistently repitching from batch to batch, you should add yeast nutrient to the wort to keep the zinc level in a healthy range. If you are fermenting a wort with a high amount of adjuncts, an addition of yeast nutrients might be wise even if your yeast is fresh and healthy.

Pitching rate goes hand in hand with yeast health. You need enough yeast to do the job, and if your yeast are only 50% healthy, then you would need to pitch twice as much to do the same job as yeast at peak health. Today's recipes assume that you are pitching fresh yeast that has been recently grown in a nutrient rich starter. If you are not making a starter and just pitching multiple packs to make up the count and those packs have been in the refrigerator for a couple months, then be prepared for less than optimum performance and a lower attenuation. The beer will probably still be good, it just won't be quite on target.

Yeast performance will also be affected by the fermentation environment. Conditions that are too warm will not impair fermentation and attenuation, but will affect beer flavor, generally creating more fusel alcohols, esters and phenols than desired. Conditions that are too cool will generally slow the fermentation, which may impact attenuation, but ultimately the beer should finish if the temperature is stable and all other yeast factors are being met. Fluctuating conditions, though, can definitely impact yeast performance, and cause them to stop before the beer is finished. Sometimes rousing the yeast by swirling the fermenter will get them going again, but the best way to restart a stalled batch is to pitch actively fermenting yeast at high kräusen from a small starter. The starter does not have to be big — you aren't trying to grow yeast, you just want them to be active. A single package should be sufficient to finish the job for most beers, but if it is a strong beer, then two packages may be necessary.

Summary

The ability of yeast to properly ferment a wort depends on the fermentability of the wort and the health of the yeast. Fermentability depends on ingredient selection and your mash conditions. Yeast health depends on pitching rate, levels of aeration, levels of yeast nutrients and yeast viability. As such, homebrewers have many ways to influence the FG of their beer. To achieve very high levels of attenuation, you need to address all of the relevant variables. To brew a beer with a lower level of attenuation, only one variable needs to be tweaked (most commonly, by adding lots of specialty malts or resting at a high mash temperature). Other variables, such as mash thickness, can also play a minor role, but I don't have the space to discuss that. I wasn't expecting some sort of Spanish Inquisition.

John Palmer is BYO's Advanced Brewing columnist and blogs regularly at www.byo.com.

At-Home Aeration

The DIY in-line oxygenator

Story and photos by Tony Profera

1 This homemade in-line oxygenator has gauges to make it easy to set the gas flow from the tank, as well as to measure the tank volume.

As homebrewers, we have control over many of the physical processes used to make our beer. It's been known for some time that after boiling (and then chilling the wort) it is highly beneficial for the yeast to be pitched to a well aerated/oxygenated media. The fermentation life cycle (and ultimately the beer quality) will benefit in the following ways:

1. Reduced total fermentation time
2. Shorter lag time (the time it takes for fermentation to start)
3. Better attenuation
4. Improved yeast life cycle

There are several common methods homebrewers typically use to aerate the wort. Most of us are familiar with the rock-and-roll method of vigorously shaking the fermenter to add air. This has the advantage of requiring no additional equipment. Although a plastic bucket is safer, there are concerns with repetitively rocking a full glass carboy.

There are various adapters (both commercially sold and homebuilt) that when installed on the end of a hose leading into the fermenter will "splash" the wort to aid in aeration. Another method makes use of an aquarium air pump and air stone. These assorted air introduction methods work to varying degrees. The downside to these methods is the air we breathe is mostly nitrogen and only 20.9 % oxygen. Also, air may contain contaminants if not properly filtered. If higher O_2 saturation levels are beneficial to the fermentation it makes sense to use pure O_2 for this purpose.

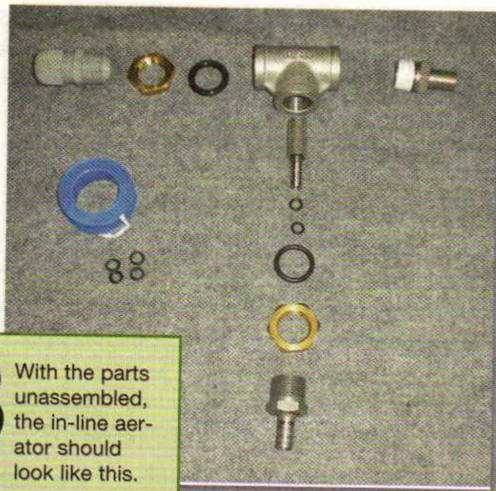
At the top of the performance list is direct injection of the wort from a 100% oxygen source. Although, over oxygenation is a concern, the general consensus is that there is little possibility of this occurring in homebrewed beer as homebrewers do not achieve commercial-level brewing temperatures and pressures. Typically a small O_2 canister and screw on regulator with a hose and air stone are used. The regulator is turned on low and the air stone is submerged into the fermenter containing the wort creating a steady stream of tiny O_2 bubbles. This infusion of pure O_2 raises the dissolved oxygen level to assist the yeast in their all important work. Personally, I use a steel 40 cu/ft tank with a dedicated O_2 regulator (see photo). This may seem like overkill, but it was obtained in a trade, and I was glad to make use of it. The volume of this tank makes it unlikely I will be running out of oxygen any time soon. The 2-gauge regulator has one gauge that makes it easy to see and set the gas flow consistently from batch to batch. The other gauge measures the gas volume in the tank (Photo 1).

PARTS LIST

1. (1) Kleinhuis Liquid Strain relief fitting NPT ½" (fit to outflow of counter flow chiller or kettle)
2. (2) large brass nuts (to fit ½" NPT)
3. (2) large O-rings sized to fit ½" NPT
4. (1) ½" NPT stainless steel tee
5. (1) stainless steel ½" NPT Male x ½" barb fitting
6. (1) 0.5 micron barbed (or shaft) stainless steel air stone
7. (2) small O-rings (R04) sized to barb of air stone (+ extras)
8. (1) ½" NPT male x ⅜" stainless steel barb fitting
9. teflon tape

Note: the above lists only the parts needed to build the inline oxygenation apparatus. It does not include: O_2 tank, regulator, hoses and sanitary air filter.

2 With all parts assembled, the in-line aerator should look like this.



3 With the parts unassembled, the in-line aerator should look like this.

A potential downside to this "dunk in fermenter" method is the stream of bubbles may not be equally dispersed throughout the fermenter and might not permit other areas of the fermenter to be oxygenated to the same concentration. Additionally, this method adds extra time to the brew session as it's performed after the wort is already in the fermenter.

4 Here is a closer look at the ½" NPT Kleinhuis strain relief fitting.

In an effort to improve on this (and because I am a gadget guy) a DIY in-line oxygenator was built. It is installed on the "out" side of the counter flow chiller (CFC). It injects oxygen into the wort as it moves from the CFC and into the fermenter. Adding oxygen to the wort as it moves to the fermenter ensures that a more even adsorption of oxygen is made, and saves a bit of time as well (Photo 2).

Unlike some commercially-sold versions available to homebrewers, this DIY In-Line oxygenator is designed for easy breakdown by hand or with an adjustable wrench. This makes the task of cleaning it after use relatively simple. Remove the apparatus from the CFC, disassemble, rinse thoroughly, soak in your regular cleaner, rinse and air dry until the next time. Note: it's recommended that air stones are only handled by the shaft. There is a possibility that the oil in our skin can be transferred into the stone reducing performance (and increasing the chance of contamination).

Building the inline oxygenator

•(Photo 3) Working from left to right (same as the flow of the wort) is a ½" NPT Kleinhuis strain relief fitting (Photo 4). These nylon fittings can be easily found if you search the internet for "Liquid Tight Strain Relief". This fitting's opening is matched to the copper tubing (wort out) from my CFC. Note: the screw down cap on this fitting needed a bit of additional clearance to fit over the CFC's tube so the hole was enlarged by filing to get a good fit. Hand tightening the cap is all it takes to get a leak proof seal. You will need to size this fitting accordingly to match your CFC or kettle. A compression fitting sized to your chiller or kettle out could be substituted. A brass ½" nut and a large O-ring are installed to achieve a tight seal to the SS Tee.

"Unlike some commercially-sold versions available to homebrewers, this DIY in-line oxygenator is designed for easy breakdown by hand or with an adjustable wrench. This makes the task of cleaning it after every use relatively simple."

The air stone's barb is pressed into two small O-rings and installed into the Tee with a brass nut and an O-ring (bottom) **5**

•At the other end of the Tee (on the outflow side) is a ½" NPT x ½" SS barb fitting installed with Teflon tape. A vinyl length of hose is fit over the barb and leads to the fermenter for filling.

•At the center of the Tee (facing down in the photo) is a SS ½" NPT Male x ⅜" Barb with two small O-rings pushed inside. The air stone's barb is then pressed onto these O-rings to make a seal. I originally had difficulty getting this point to seal well. It took a few tries with differing O-rings to get a leak-free seal. This fitting with the air stone installed is screwed into the Tee with a large ½" brass nut and O-ring making a liquid tight non-permanent connection to the Tee (Photo 5). The air stone is now captured inside the body of the SS Tee fitting.

•Attached to the barb is a flexible hose leading to a sanitary air filter. To the other side of the air filter is a hose that leads to the O_2 regulator. As these hoses are a larger diameter than the air filter barbs, a small ½" length of rigid polyethylene hose was installed on the filter barbs to take up the gap and allow a gas tight press fit.

6 A stick-on temperature gauge can be upgraded to a small digital thermometer.

7 When you have finished assembling your in-line aerator, attach it to your chiller and you're ready to go.

Cleaning prior to use

Boiling the air stone for 15 minutes prior to use ensures it is sanitary and no bacteria remains alive to adversely affect the brew. The rest of the parts are soaked in Iodophor or Star San and then reassembled for use.

Future upgrades

I am considering removing the two small O-rings and silver soldering the air stone barb into the ½" SS fitting. This will ensure there are never any leaks from this point. Caution: if you decide to do this be sure that the air stone itself does not get heated or the barb may become unsoldered/brazed from the stone and can pull out! Wrapping the stone with a small length of wet cloth should keep the stone cool enough to prevent this.

I plan to replace the brass nuts for SS. A planned future upgrade includes replacing the "stick on" temperature gauge (Photo 6) with a small digital temperature gauge.

Safety first

All fittings should be thoroughly degreased and cleaned prior to assembly. Any grease that remains that comes in contact with oxygen can cause a fire, and any grease or residue won't help your beer either. Additionally, any ignition source in the presence of pure O_2 is hazardous! Be certain all flames are out prior to using pure oxygen.

Tony Profera is a homebrewer, member of the Carolina BrewMasters (www.carolinabrewmasters) and frequent contributor to Brew Your Own.

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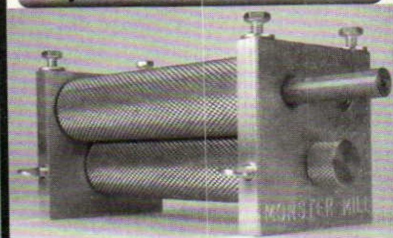

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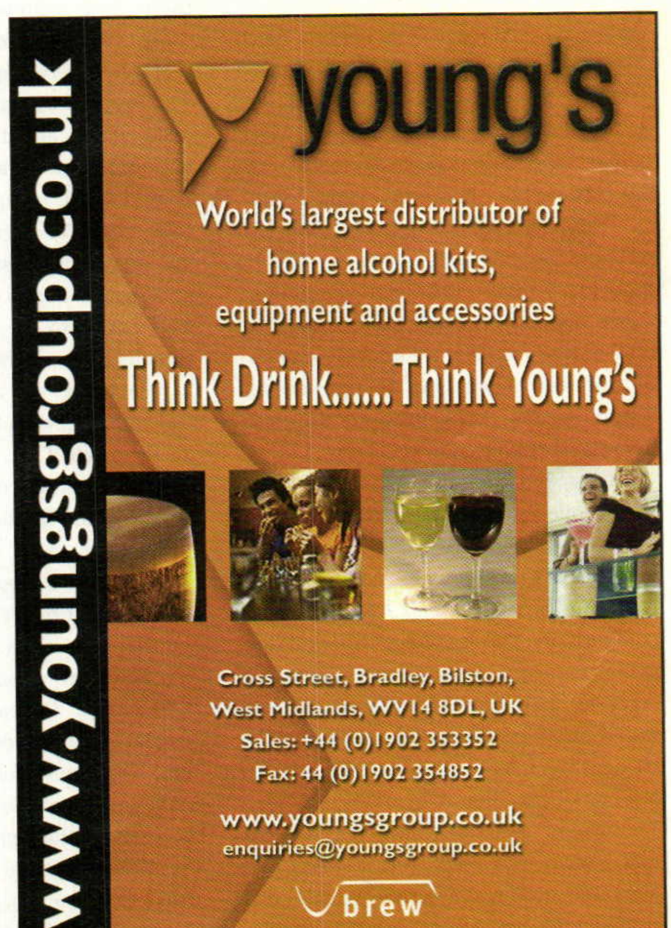

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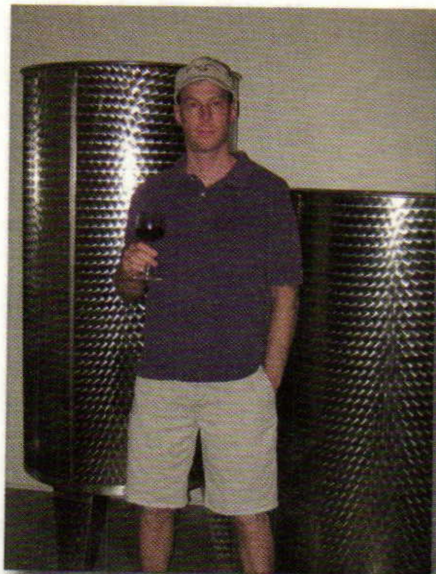
Mead Made Man

A homebrewer finds his calling in a meadery

Jason Russ • Asheville, North Carolina



Jason Russ knew he wanted to somehow brew professionally since making his first batch of homebrew in 1996.

Ever since making my first batch of homebrew in 1996, I wanted to work in the brewing industry. By 1999 I was determined to make it happen and had serious plans to start a brewery, brewpub or a homebrew supply store.

Then 2001 came along and I was laid off from an Internet company. "OK," I thought, "I think I'll brew some beer." I drove over to my local homebrew shop only to discover that it had just gone out of business! I smelled an opportunity. Within weeks, Jay's Brewing Supplies (www.jaysbrewing.com) was born.

I was in a great position to sell brewing supplies. Located in Northern Virginia, I knew tons of brewers personally, was a member of a few brew clubs, was a knowledgeable brewer — and had almost no competition. The business did well and selling brewing supplies was a fun job and I got to "talk beer" all day. Customers would often bring samples and we would try out their latest creations; then I'd usually crack open one of my beers.

Around 2003 life threw me a curve ball. I went to a brew club meeting one night and tried some mead. "What is this stuff? Didn't Beowulf drink it?" I thought. When I tasted it, I thought, "Wow, that is incredible!" My story would probably be quite different if I didn't have such a good mead to taste first, but it was great and I wanted to make it.

So make mead I did. My first dozen batches or so were not so great, but then I started doing better. Having homebrew customers available to me as guinea pigs was quite an asset — I had a near limitless well of tasters at my disposal. And, of course, many of my customers also made mead, so we swapped bottles, recipes and advice.

Sometime around when I started making good meads my future plans started changing too. Plans for owning a brewery had never been far from my mind but the idea was not quite as attractive as before. Sure, a brewery would be a blast, but there's already lots of great beer out there. With a brewery I could do something I enjoy, but could I make something that would be exceptional and stand out?

To me, making beer (or wine, mead, cider, etc.) is an art. And as such, it's very important that I make something special. That doesn't mean that I make maple cayenne Oktoberfest. In fact, when brewing I nearly always stick to basic styles. But my English Brown and my IPA are still works of art to me and I wanted them to somehow be separated from the pack.

From the "art" angle, I could see that making mead for a living would be a better fit for me than making beer. Despite being the world's oldest alcoholic drink, mead is a new frontier these days, which is appealing to me.

Now, if you brew beer, imagine you've made a great batch of beer and you have ten friends over to try it. Imagine further that these ten people have never had a beer before. (A leap, I know, but try to imagine such a horrible, horrible situation). Naturally your friends love your beer. They want more. They want to know more about this amazing drink and learn the history. You've just opened a new world to them! That's how I feel when I introduce mead to people.

My goal is to show folks how great mead can be. I'm not on a crusade to get mead in every pub (it would be nice, though). I love sharing this wonderful drink. Giving people tastes and seeing their reactions is my way of sharing my art.

So, a new plan was in place — a meadery instead of a brewery! My wife and I had always planned on moving from Northern Virginia to a place with more space and this seemed like the time to do it. After scouring the Southeast, we came upon Asheville, North Carolina and knew right away we had found our new home. We bought a house and several acres and set about building the meadery. According to state law, a separate building was necessary, so brewing in the basement was out.

After doing everything the federal, state, and local governments required us to do to operate legally, Fox Hill Meadery (www.foxhillmead.com) was born and batches of mead were finally started in January 2008 (after over two years of building and getting permits). As of summer 2008 we had a fermenting capacity of about 2,000 gallons (7,571 L) per year and a few more 185-gallon (700-L) fermenters.

While I have not been a professional meadmaker for long, so far I am having a great time. I have taken samples to Asheville wine shops, beer shops, pubs and restaurants, and the response has been fantastic. Everyone loves the mead and says they want to going to carry it when it's ready. And as always, I love seeing the reaction when they try mead for the first time.

I'd like to thank Jay's Brewing Supplies customers and the Northern Virginia brewing clubs of Worthogs, BURP and NoVA Homebrew. Everyone who tasted the hundreds of mead test batches and offered advice and encouragement were extremely valuable. More importantly, you are all good friends with whom I had the privilege of sharing good drink and good times. I raise my glass of test batch number 53.1b (Buckwheat Sack Mead) to you and say, "Wassail!"

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