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THE HOW-TO HOMEBREW BEER MAGAZINE

DECEMBER 2007, VOL.13, NO.8

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Brew Your Own
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DECEMBER 2007
Volume 13 Number 8

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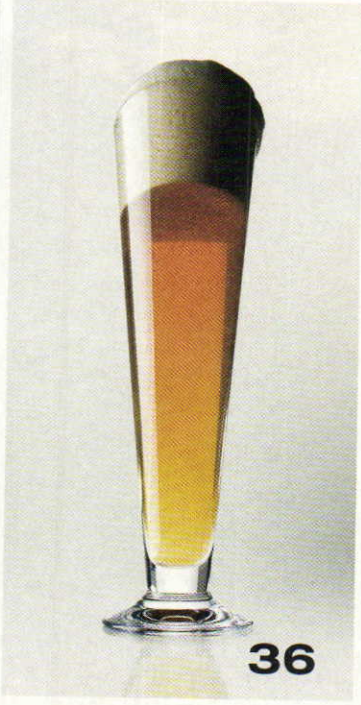

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How well do you really know your beer?

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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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Volume 13, Number 8: December 2007.

Cover Photo: Charles A. Parker

Mail

Kölsch Question

In the October issue, in the "Extract Excellence" article by Bob Hansen, there's a recipe for Honey of a Kölsch. In the ingredient list, for the first hop addition, it says 45 minutes. The step by step instructions say "Boil for 30 minutes. Add honey and Irish moss with 15 minutes left in boil." So, it sounds like a total boil time of 30 minutes. Is the boil 45 minutes or 30? Do you boil the first hops for 30 or 45 minutes?

Mike Behrendt
via email

The wording in that recipe is a bit confusing. Sorry about that. Boil the wort for 30 minutes, then add the honey and Irish moss and continue boiling for another 15 minutes. The total boil time and total hop boiling time is 45 minutes.

Mt. Dew Preservatives

For some reason, I think I might want to try the Mt. Dew recipe in the partial mash story ("Partial Mash Permutations," October 2007), but won't the preservatives in the soda stop the yeast from fermenting? Do I need to make a yeast starter?

Marty Schofield
Medway, Massachusetts

Story author and BYO editor Chris Colby responds: "I've made a few beers (or 'beers') with Mt. Dew now. Soda pop has enough preservatives in it to protect against the amount of contaminants that it might reasonably expect to encounter. It does not have enough preservatives to guard against the number of yeast cells found in a yeast starter. I have made two Mt. Dew beers in which roughly half the liquid was Mt. Dew and the other half was water — they both fermented fine.

"My latest 'Dew Brew,' Beelzeboss, is roughly three-quarters Mt. Dew and it fermented a bit more sluggishly. Whether that was due to the preservatives, the low pH, the yeast strain or what, I don't know. In any case, the fermentation ran a few extra days — and I gave it a few more beyond that before racking the beer. Making a starter is a good idea, although the recipe also includes dried yeast pitched alongside the yeast starter. Also, don't forget the yeast nutrients. (Note: this question was forwarded to me from James Spencer, host of the Basic Brewing Radio podcast.)

Mashing Minutes

Thank you for your articles on the partial mash method of brewing — I have had a lot

of fun and some great results with it! I have one question, though — what determines the length of time for the initial mash? Your recipes range from 30 minutes to an hour, and other mini mash recipes I have seen call for 90 minutes. What are the guidelines on this and why?

Gregory Hayes
Eugene, Oregon

Chris Colby responds: "Glad you've enjoyed partial mashing. It is a great way for extract brewers to incorporate base malts into their brewing.

"There are three things I consider when setting the length of a partial mash. The first is that some malts are "hotter" than others — they have more enzymatic power and convert the starches to sugars faster. Domestic malts are very enzyme-rich. European lager malts are less so and English pale malts have less power than any of the above (although, obviously, these malts still have enough enzymes to convert themselves and even a little adjunct on top of that).

"On the other hand, in a small partial mash, the mash loses temperature quickly. So, I like to go with a mash time that will allow plenty of time for conversion, but doesn't allow the mash to sit for a long time — losing temperature — after that. In partial mashing, shorter mash times mean that the mash temperature stays within a smaller band, which is important if you're trying to make a fuller-bodied beer. (For a dry beer, a longer mash time — with the corresponding dip into lower temperatures — is a good thing.)

"Also, the temperature plays a role. Higher temperatures lead to faster conversion. Partial mash brewers wishing to brew full-bodied beers,

Contributors

Chris Colby, editor of *Brew Your Own*, has been homebrewing since 1991 and lives in Bastrop, Texas with his wife Jennifer and a motley assortment of housecats. While studying for his PhD in biology at Boston University, Chris not only fell in love with his wife, he fell in love with craft beers like Harpoon, Sam Adams and Dock Street and started brewing more hoppy pale ales. These days, anything goes in his brewhouse — porters, dry stouts, amber lagers, sour beers and some experimental (mad scientist-type) creations. Read his stories about reiterated mashing on page 36 and Practical Porter on page 50.

Anita Johnson lives in Indianapolis, Indiana with her husband Jim, two boys and a dog. Anita and Jim started brewing about 10 years ago when Anita's coworker poured them a pint of homebrew from his kegerator. "We tasted the homebrew and exclaimed, 'Wow, you made this?" Anita says, "We were hooked." Anita owns the supply shop Great Fermentations of Indiana and sits on *Brew Your Own*'s Editorial Review Board.

Jamil Zainasheff has never met a beer style he hasn't brewed. He set out learning about beer styles by brewing every one of the styles recognized by the Beer Judge Certification Program (BJCP).

Jamil is also a BJCP judge and Assistant IT Director for the BJCP. He hosts an Internet radio show on The Brewing Network about beer styles, just released a new recipe book on styles and also writes our "Style Profile" column each issue.

and also shave a few minutes from their brewday, could perform an iodine test for every mash and start collecting the wort as soon as the test gives a negative result. The first wort would then be run quickly into the kettle, where it should mix with some already boiling water. This would stop any further enzyme action.

"Setting the amount of time a mash rests at is not brain surgery, though, so feel free to experiment with mash times if you want."

The Road to Gold

I very much enjoyed seeing the recipes in the "10 GABF Gold Medal Clones" article (September 2007). I was, however, disappointed that there was no information about the breweries beyond the brewers comments. I am very familiar with Flossmoor Station, given that I commute to work from the adjoining rail station. Other people are not as lucky (there's a top-notch brewpub on my way home every day!), so including the city and state would have been useful.

Greg Fleming
Flossmoor, Illinois

If space had been a little less tight for that story, we'd have been glad to have given the brewery locations. Since we have a little more space here on our Mail page, here you go:

Great Divide Brewing Co. is located in Denver, Colorado. www.greatdivide.com

Bend Brewing Co. can be found in Bend, Oregon. www.bendbrewingco.com

Barley Brown's Brew Pub is located in Baker City, Oregon. www.easy-finder.com/profiles/barleybrowns/pub.htm

Amherst Brewing Co. is located in Amherst, Massachusetts. www.amherstbrewing.com

Odell Brewing Co. is located in Fort Collins, Colorado. www.odellbrewing.com

Elk Grove Brewery and Restaurant is in Elk Grove, California. elkgrovebrewery.com

Ham's Restaurant & Brewhouse can be found in Greenville, North Carolina. www.hamsrestaurants.com

Great Basin Brewing Co. is in Sparks, Nevada. www.greatbasinbrewingco.com

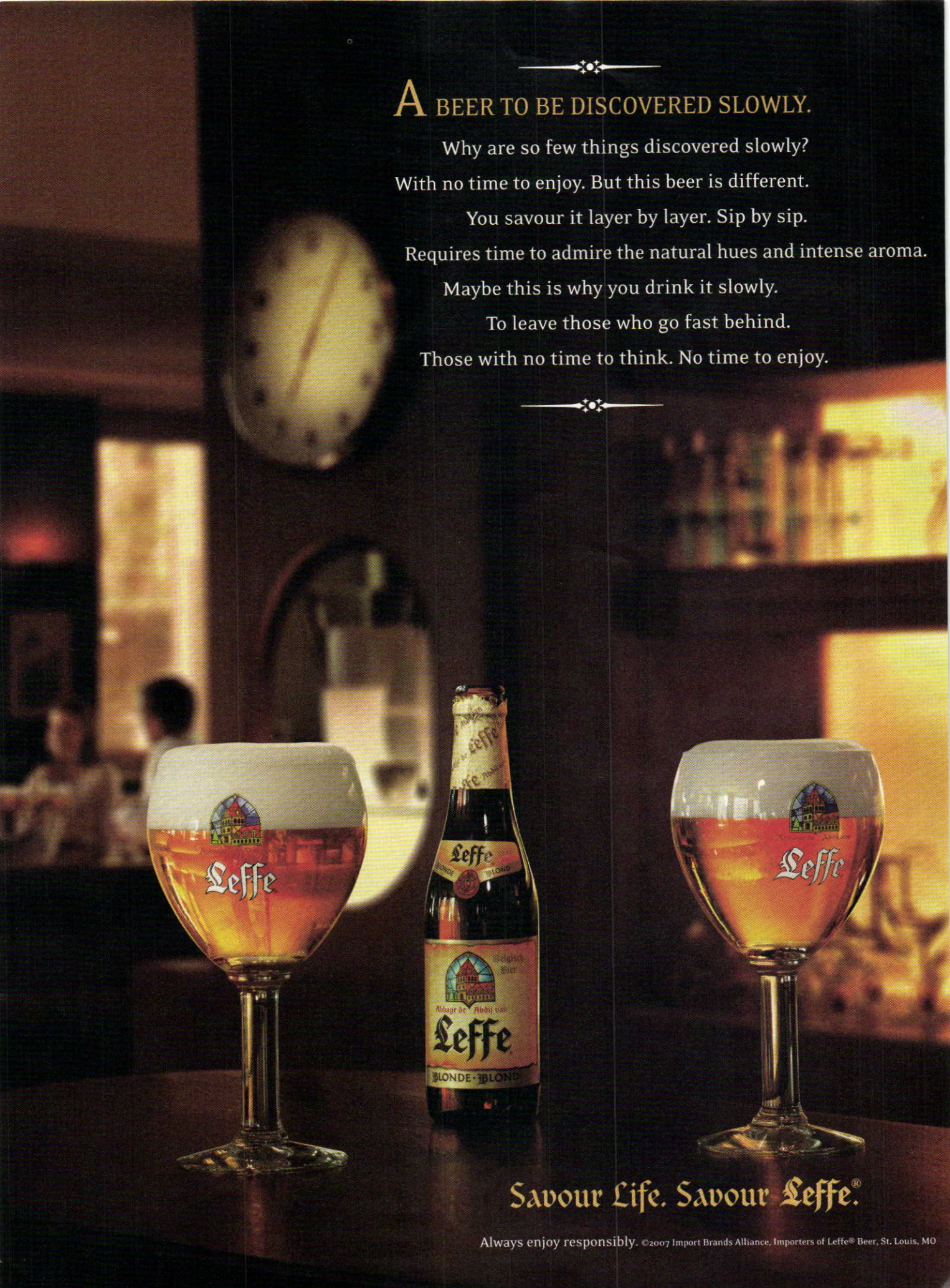
Big Time Brewing Co. is in Seattle, Washington. www.bigtimebrewery.com

Bottling a Brute

In his article "21% Alcohol All-Grain Beer" in the December 2006 issue, John McKissack said, "Bottle conditioning was out of the question due to the high alcohol level, so I kegged it and force carbonated." Why is bottle conditioning out of the question?

Terry Carlson
via email

Strong beers can be hard to carbonate and bottle condition because the yeast in the bottle are inhibited by the high alcohol level. In McKissack's very high-alcohol beer, there would be no way for the yeast to survive long enough to carbonate the beer. This beer will need to be kegged or bottled still (uncarbonated). Given the wine-like characters in the beer, bottling may not be so bad.


A BEER TO BE DISCOVERED SLOWLY.
Why are so few things discovered slowly?
With no time to enjoy. But this beer is different.
You savour it layer by layer. Sip by sip.
Requires time to admire the natural hues and intense aroma.
Maybe this is why you drink it slowly.
To leave those who go fast behind.
Those with no time to think. No time to enjoy.
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Leffe
Leffe
Savour Life. Savour Leffe®
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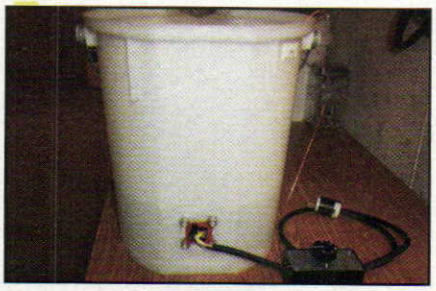
reader GADGET Boiling Bucket

Ken Kociolek • Naperville, Illinois



Ken's homebrew bucket can boil seven gallons without using his wife's stovetop.

I recently attended a beer brewing training class at my local homebrew shop, expecting to see about three gallons of wort being boiled in a stainless steel pot. Instead, the owner pulled out a plastic bucket with a heating element mounted inside and a temperature controller on the outside.

The bucket at the shop came from BruHeat in England, which you can't get in the states anymore because it operates at 240VAC and does not carry UL/CSA safety ratings. So, being an electrical engineer, I decided to build my own.

The hardest item to find was a suitably sized polypropylene container. High density polyethylene (HDPE) will not hold up to boiling temperatures and will get dangerously soft so it had to be be made of food grade polypropylene which stays rigid at 212 °F (100 °C). Gemplers sells a food grade 7-gallon polypropylene bucket that's perfect for this project. It's a little pricey at $44 but I wasn't able to find a comparable alternative.

I found a "screw in" electric water heater element from Grainger and it is a low watt density element. Model 2E301 is rated at 240VAC / 3000W. A 120VAC element will not produce enough heat to boil five gallons (19 L) of wort. It has to be a 240VAC element. This also means that you need to have an appropriately sized AC source. I ended up installing a 20A-240VAC breaker, 12AWG wire for the circuit and a 240VAC-20A outlet.

I used a screw in adapter (from Grainger) to mount the element in the bucket. The adapter comes with a rubber gasket and mounting plate. I also used a high-temperature silicon (used for transmission pan gasket sealing) on the gasket to guarantee against leaks. The last piece of the puzzle was a need to control the temperature so you can steep at sub boiling temps. Allied Electronics sells a bulb and capillary thermostat (CAP-85-230) that works great. If I had to build it again, I would also include a liquid switch in the design to prevent the element from getting hot when the kettle is empty.

The plastic boiler works great. I make sure the element is off when adding liquid malt extract to prevent scorching. I also use a plastic spoon to stir the wort, and never leave the bucket unattended.

reader TIP Mike Cohen • San Jose, California

It was a moment of serendipity. My wife and I needed a way to keep our yeast cool during an hour-long drive, and we just happened to be buying a 4-pack of Pilsner Urquell to try it out of the can for the first time. I figured the cans would stay pretty cool during the drive (they were fresh out of the display refrigerator), and the hole at top of the package seemed like a perfect fit — and it was! Voila!

Homebrew CALENDAR

December 1

9th Annual Palmetto State Brewers Open
Columbia, South Carolina
A participant in the Masters Championship of Amateur Brewing Competition and the final competition in the Carolinas Brewer of the Year circuit for 2007. Also includes the Just Good Beer Brewoff for those "house" beers (intentional or otherwise) which are outstanding quaffs but fit no category. Entry deadline is November 27. Visit http://www.sagecat.com/psbo9.htm for online registration and more information.

December 1–2

Walk The Line on Barley Wine and Strong Ale Stumble
Dunedin, Florida
The annual competition of really big beers returns. Don't miss out on your chance to walk the crooked path to notoriety (among your fellow brewers). Judging accepted for the following styles: Strong Scotch Ale, Russian Imperial Stout, Imperial IPA, Belgian Strong Ales: Blond, Dubbel, Tripel, Golden Strong, Dark Strong, Old Ale, English Barleywine, American Barleywine and all imperial versions of any style. More information at http://www.dunedinbrewersguild.com/WTL.htm.

December 8, 2007

The Happy Holiday Homebrew Competition
St. Louis, Missouri
The final qualifying event for the Tenth Annual Masters Championship of Amateur Brewing. Deadline is November 30. Registration, guidelines and more available at http://www.stlbrews.org/competition/hhhc/index.asp.

club PROFILE

SNOB • Cleveland, Ohio

In 1990, the *Cleveland Plain Dealer* ran a feature about a basement homebrewer working with homemade equipment and home-grown hops. The last commercial brewery in town had been silent for years, and nobody knew how many amateurs were making beer. So it was a surprise in October of that year when more than 100 people arrived at the fledgling Great Lakes Brewing Company to form a homebrew club.

SNOB members pose with Michael Jackson and Charlie Papazian in 2002.

The Society of Northeast Ohio Brewers (SNOB) attracted enthusiasts from throughout the region and quickly gained prominence alongside the local craft beer movement. Scores of homebrewers who had been operating in isolation now freely exchanged information, techniques, and beer.

When the brewing world came to Cleveland in April 2002, SNOB was highly visible and heavily involved. The club co-hosted the Masters Championship of Amateur Brewing (MCAB) and Craft Brewers Conference, providing organization and much of the brew for the hospitality suite at the Renaissance Hotel. SNOB also co-hosted a public lecture by Michael Jackson and Charlie Papazian, who were visiting Cleveland in connection with the World Beer Cup and AHA on the Road.

More recently, SNOB has worked with neighboring homebrew clubs to organize the National Homebrew Competition Eastern Regional. The NHC attracts a daunting number of entries, and members have served as event coordinators, judges and stewards.

The club hosts a number of events throughout the year, including Beer and No Sweat, a keg-only people's choice competition in the spring. Summer brings the annual campout, Brew 'n Canoe and fall includes our version of Oktoberfest that we call "Snobtoberfest."

Members also regularly gather for a SNOB night out at one of the area breweries, brewpubs, or big beer restaurants. On occasion the club organizes study sessions for the Beer Judge Certification Program exam or plans a bus tour pub crawl. Any activity of interest to the beer enthusiast is considered.

One year a Winterfest including a group brewing session and hop experiment involving eight hop varieties and eight brew kettles turned into an adventure in extreme brewing when the weather brought the coldest day of winter. Despite temperatures between 0 and 10 °F (-18 °C and -12 °C), dozens of SNOBs bravely spent the day facing the challenges of brewing and enjoyed beer in a bitterly harsh environment, believing that they must have set some kind of record.

The brewpub that served as club headquarters for many years has expanded into a major regional producer, operating on a scale to rival the output of Cleveland's long defunct breweries, so the club has moved its meetings to a location better suited to its requirements. Nonetheless, SNOB continues to enjoy a happy relationship with breweries in northeast Ohio. A number of SNOBs are brewing professionally from coast to coast, however, there's a strong feeling that, "Once a SNOB, always a SNOB."

No matter how far they've come, though, members are just as enthused about sharing their experience and expertise with beginners as ever. In fact, we take any opportunity to set up our equipment and banner for homebrew demonstrations, letting the aroma of malt and hops complement their enthusiasm for beer. Wherever craft beer is celebrated and poured in northeast Ohio, SNOB's winged hop logo may be found.

The club is always looking for new and potential homebrewers and is eager to assist at any skill level. SNOB meets the first Monday of each month at the Sachsenheim Bierstube in Cleveland, and visitors are welcome. For more information, newsletters, photos and event details, visit us at www.beersnobs.org.

byo.com BREW POLL

What is your brewpot made of?

Stainless Steel: 67%

Aluminum: 16%

Copper: 9%

Enamel: 8%

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

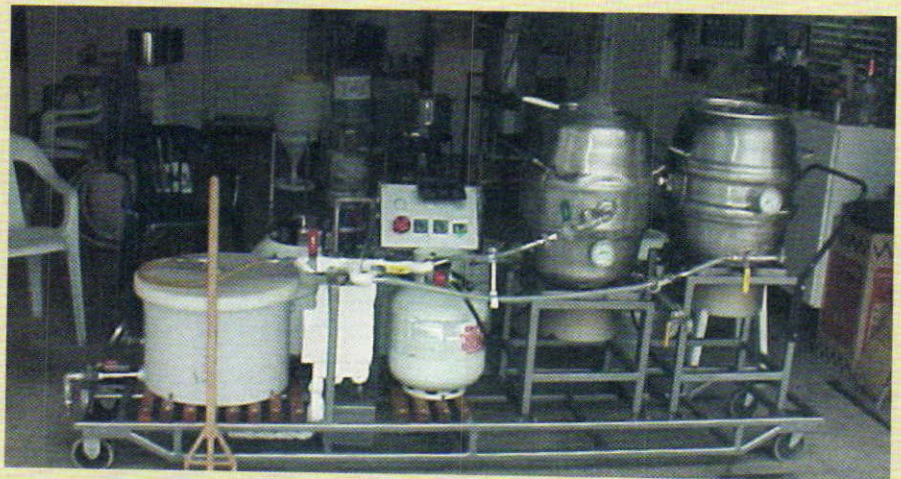
WE WANT YOU

Do you have a system or a homemade gadget that will make our readers drool? How about a killer recipe or tip? Want to profile your club? Email a description and photos to **edit@byo.com** and experience fame among 100,000+ homebrewers!

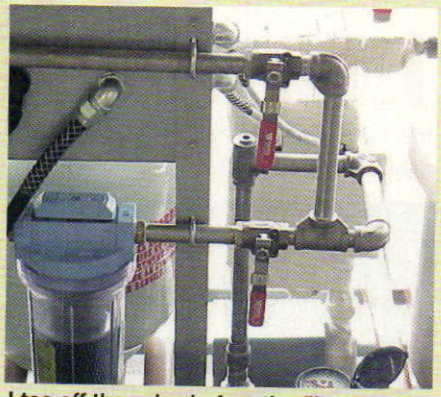
If we publish your article, recipe, photos, club news or tip in Homebrew Nation, you'll get a cool ½ Liter German Stein (courtesy of White Labs) and a *BYO* Euro sticker.

homebrew systems that make you DROOL

Ken Dodd • Lake Havasu City, Arizona

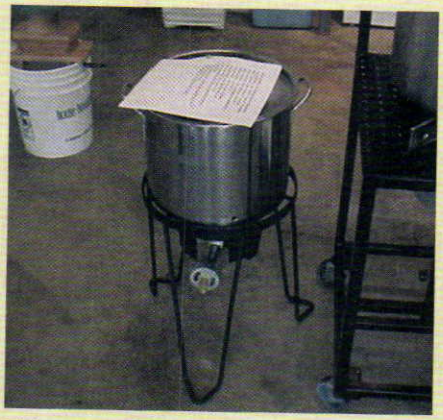


This is a frontal view of Ken's system. From right to left, kettle, hot liquor tank, control panel, RIMS heaters and mash tun. All the valves are stainless steel.

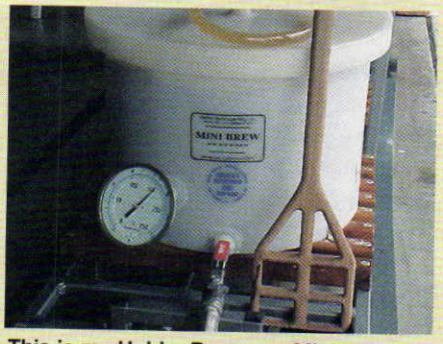


I tee off the valve before the filter to supply my custom made ½" immersion chiller (supplied by MoreBeer!). This bypasses the filter so no need to filter chiller water.

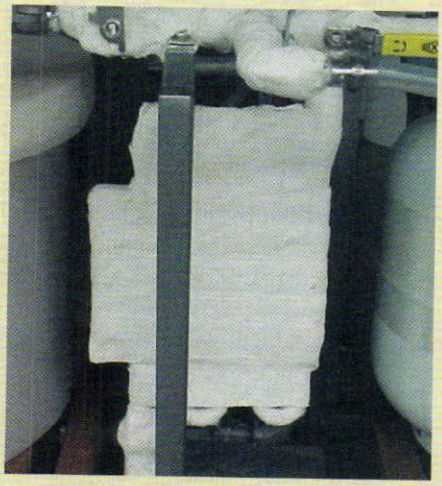
This is the hot liquor tank. There is a small sampling valve tee'd the other way in case I need extra water for the boil.



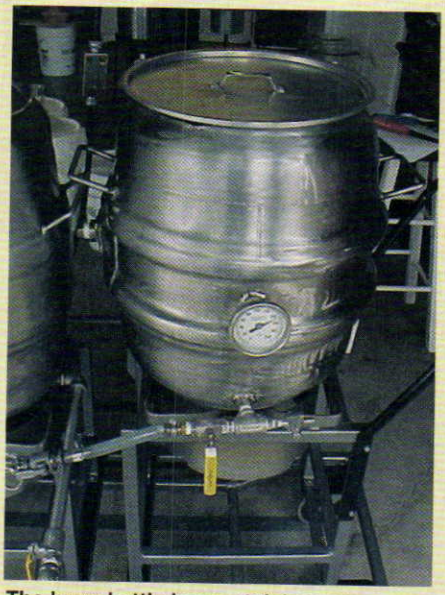
This system is for steeping specialty grains and spices for meads. Zymico's "no sparge thingie" keeps the grains held back.



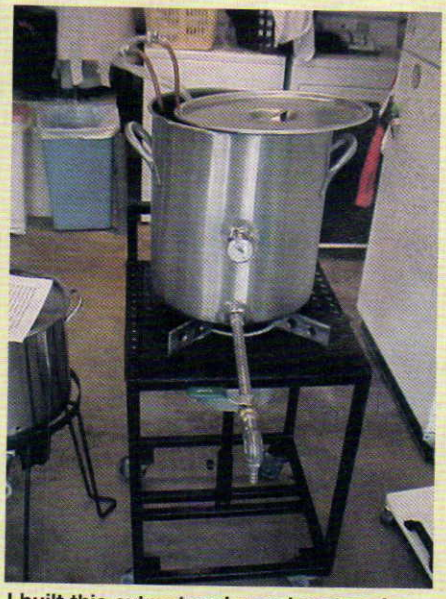
This is my Hobby Beverage Mini-mash tun. It has a false bottom with a sparge arm in lid. The basis for the RIMS comes from not being able to directly heat this tun. I keep an eye on the large thermometer for step infusion mashing. RIMS is turned on and off manually.



The heaters are similar to a heat exchanger. I use an aluminum plate which has 4 passes of wort flowing through ½" copper tubing.



The brew kettle has a stainless steel check valve and downstream is a valve to slow the sparge, which normally takes 30 minutes.



I built this extract and mead system for the days when I don't feel like using the main 15-gallon system. It also doubles for decoction mashes.

replicator

by Marc Martin

Dear Replicator,

I went to college in Erie, Pennsylvania between 1994 and 1998 and frequented a microbrewery there called Hopper's Brew Pub located in an old train station downtown. From what I have heard, Hopper's closed and the brewing continued under the Erie Brewing Company. I know that they still make Railbender Ale and an excellent stout called Drake's Crude. It was the best stout that I have ever had. Since that time I have tried to taste as many stouts as possible but have yet to find one that even comes close. One of the reasons I started homebrewing was so that I could make a stout that I like. However, I discovered that stouts can be very complicated and it is sometimes tough to figure out where to start. I don't even know what style of stout it was, i.e.: sweet, oatmeal, imperial, etc. Any information you could dig up for me would be greatly appreciated. This was a great beer and I would love to be able to brew it.

Jeremy Popp
Chardon, Ohio

Northwestern Pennsylvania is famous for two highly refined liquids contributing to our quality of life. These are sought after by people demanding only the finest. One is Pennsylvania sweet crude oil and the other is Drake's Crude Stout from Erie Brewing Company. Both are thick and black. Which one is more of a necessity is a point of debate, but I will go with the stout every time!

Erie Brewing Company was founded in late 1993 and became fully operational in November 1994. They started with a capacity of only 1,040 barrels. Popularity of their beers forced rapid growth to 2,100 barrels only two years later. At that time they also added a bottling line to help quench the high local demand. In 1999 they relocated from the old train station and boosted capacity to 6,000 barrels. They are now classified as a regional brewery with distribution in seven states from Michigan to Maryland.

Brewmaster Shawn Strickland has performed every job in the brewery since 2000 and was happy to discuss their operation and the beers. He had never homebrewed and has no formal brewing education. He started out keg cleaning and operating the bottling line and worked his way up to apprenticing as an assistant brewer and finally, Brewmaster. This year he will brew a projected 4,000 barrels on their 20-barrel system.

Shawn says their best seller is Railbender Scottish ale followed by Mad Anthony pale ale and Presque Island Pilsner. Drake's Crude, brewed from December through February, is one of their most popular seasonal beers. He says this beer isn't brewed to fit any defined style, but his best description is of a dry oatmeal stout. Roast barley and chocolate malts produce the opaque blackness while the high percentage of oats and Munich malts build a heavy body. Highly attenuative English yeast creates the dryness and accentuates the roasty finish.

Now we know which liquid you prefer Jeremy, so you can fire up your kettle and "Brew Your Own." For further information about the Erie Brewing Company and their other fine beers, visit the Web site www.eriebrewingco.com or call them at 814-459-7741.

Erie Brewing Company Drake's Crude clone

(5 gallons/19 L extract with grains)

OG = 1.062 FG = 1.012
IBUs = 37 SRM = 50 ABV = 6.5 %

Ingredients

3.3 lbs. (1.5 kg) Coopers light, unhopped, malt extract
1.3 lbs. (0.6 kg.) Coopers light dried malt extract
1.5 lbs. (0.7 kg) Munich malt
1.5 lb. (0.7 kg) crystal malt (80°L)
1 lb. (0.45 kg) chocolate malt
1.5 lb. (0.7 kg) flaked oats
12 oz. (0.3 kg) roast barley
9 AAU Columbus pellet hops (60 min.) (0.6 oz./ 17 g of 15% alpha acids)
2.25 AAU Northern Brewer pellet hops (5 min.) (0.25 oz./ 7 g of 9% alpha acids)
White Labs WLP007 (Dry English Ale) or Wyeast 1275 (Thames Valley Ale) yeast
¾ cup (150 g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain and flaked oats in 2 gallons (7.6 L) of water at 156 °F (69 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.9 L) of hot water. Add the liquid and dry malt extracts and bring to a boil. While boiling, add the hops as per the hopping schedule.

Next, add the wort to 2 gallons (7.6 L) of cold water in a 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. Cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete.

Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Let the beer condition for one week and then bottle or keg. Allow to carbonate two weeks and enjoy your Drake's Crude stout.

All-grain option:

This is a single step infusion mash. Replace the Coopers malt extracts with 7.5 lbs. (3.4 kg) 2-row pale malt. Mix the crushed grain and flaked oats with 3.5 gallons (13 L) of 172 °F (78 °C) water to stabilize at 156 °F (69 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the 60-minute hop addition to 0.5 oz. (14 g) 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.

BEGINNER'S block

Refraction Facts

by Betsy Parks

The refractometers most often used by homebrewers are hand-held devices that measure the density of sugar in a water-based solution. There are many models of these devices available in a range of prices. Be sure to purchase or borrow one that measures sugar density as others test different types of liquids. Also, choose one with a Brix range of at least 0 to 32 °Brix, which is standard for homebrewing.

Taking a sample of unfermented wort is simple. First, you must be sure your refractometer is calibrated. Models used by homebrewers are designed to measure the amount of sugar in a water-based liquid, so you can calibrate yours with distilled water. Place a few drops on the sample window side, close the glass cover making sure there are no bubbles, and wait 30 seconds. The refractometer and water should be room temperature, or around 68 °F (20 °C). Through the lens, the interior scale should have no visible measurement. If there is a line, turn the calibration screw until the upper and lower fields meet at zero. When you're finished, wipe the glass dry.

Next, to measure your unfermented wort, place a few drops onto the sample plate, close the cover and wait 30 seconds. Again, the refractometer and sample should be 68 °F (20 °C). Then, look into the lens again. Inside the tube is a prism that refracts light based on the amount of sugar in the sample. This shows how much light is bent as it passes through the liquid — the more sugar in the liquid, the more the light bends — which is expressed in the scale inside the refractometer as degrees Brix. Once you have that reading, you can convert Brix to specific gravity by using this equation: SG = 1 + (0.004 x Brix).

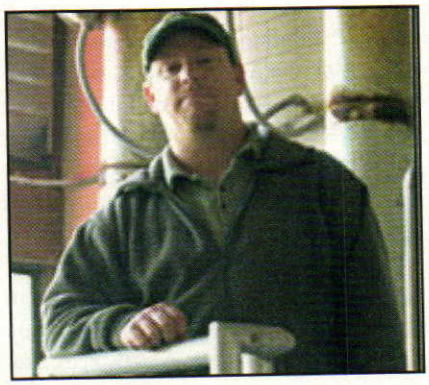
You may be tempted to sample your fermented wort the same way, however, the readings won't be the same as those you take with a hydrometer unless you are willing to do some higher math and take multiple samples, which is fairly advanced and no time saver. This is because once wort starts to ferment, it is no longer a water-based liquid. Fret not, however. Most commercial breweries, especially those with normal budgets, also measure their fermentations with a hydrometer — so don't toss yours!

Spicing Beer

Finding the right flavor balance

by Betsy Parks

This time of year, spiced beers like winter seasonals are abundant. But that doesn't mean there aren't plenty of opportunities to add a little flavor. Take some advice about adding spices from this issue's three professional brewers and you can make great brews (like witbeer) all year round.

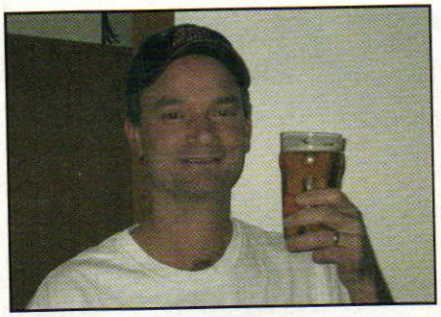


ARNE JOHNSON, Brewmaster at Marin Brewing Company in Larkspur, California began his career at the tender age of 13 when he started learning from his homebrewing parents. He has been at the helm of Marin's brewing operations since 1995 and often uses spices in his beers (as well as other concoctions) including Hoppy Holidaze, which earned a silver medal in the 2002 World Beer Cup.

My best advice to those of you making spiced beers is to experiment. Spices provide nearly endless opportunities for creativity, which is one of the greatest joys of brewing your own. Our Hoppy Holidaze is a winter seasonal spiced with nutmeg, mace, *canela* (Mexican cinnamon), orange peel and vanilla. I also make a saison with an Asian twist, spiced with lemongrass, *galangal* and Szechwan peppercorns. Almost any herb, spice or flower can enhance a beer.

Finding the right balance of spice in a beer merely requires taking chances. I've found that most people prefer a subtle contribution from the spice — so that it still tastes like beer. Most malt flavors seem to naturally meld with spices. It's the yeast and hop choices that make the difference for me. I tend to use noble European hop varieties that complement the spice flavors. Almost any yeast will work well with spices, but some Belgian strains tend to contribute a spicy character of their own, creating really interesting and complex flavors.

The biggest challenge in making spiced beers is figuring out the proper time to add each of the various spices in order to get what you want out of them. They can be added at most any point in the brewing process with quite different effects, depending on when and how they are introduced.



ERIC RODE, lead Brewer at Tommyknocker Brewery and Pub in Idaho Springs, Colorado has been brewing professionally since 1995. He joined Tommyknocker in 1998, where he oversees award-winning brews like the 2006 World Beer Cup herb and spice silver-medal winner, Jack Whacker Wheat.

Before using any spice, the brewer should decide what kind of role the spices should play within the beer. Ask yourself: Are you going for novelty or subtlety? I think spices should blend in with the malt and hops, rather than overpower them. For example, even something like a pumpkin beer should taste like more than just pumpkin and pumpkin spices!

For me, these beers are all about balance. I enjoy drinking a spiced beer that makes me think with my senses more than a beer that hits me over the head with its ingredients. I like to let the beer roll over my palate and reveal itself little by little. I get more of a thrill out of a beer's subtlety than any overt spiciness.

We brew a wheat beer with lemongrass at Tommyknocker, but I've also enjoyed experimenting with ginger, cinnamon, whole cloves, coriander and orange peel, among other things.

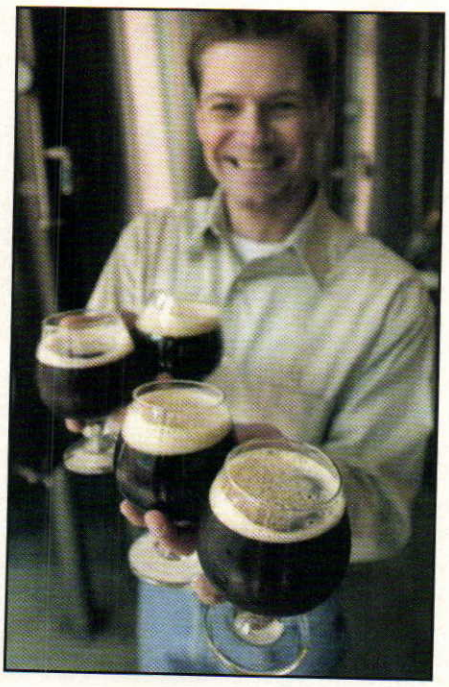
As far as yeast selection goes, a neutral strain usually works well with most spiced beers, unless you're brewing a Belgian wit. It pays to take a lesson from the Belgians: they use spices to enhance the other ingredients like yeast, malt & hops, not just for the sake of brewing a spiced beer.

In witbeers, the natural spiciness of wit yeast is the perfect complement to traditional witbeer spices such as coriander and orange peel. I think a good Belgian-style witbeer is a great example of a spiced beer that isn't overpowering. When done right, the spices are well balanced with a yeasty background, as well as a generous maltiness.

The biggest challenge can often be overcoming the initial excitement involved in trying something new. It's fun to experiment, but it's easy to let exuberance lead to excess. Don't overdo it!

Once you've decided what kind of spices you want in your brew, my advice is to err on the side of caution when adding them to the kettle — remember that you can always add more later to the secondary if you feel as though the beer isn't spicy enough.

You'll also get very different characteristics from your spices depending on when you add them during the brewing process, for example, hot side in the kettle, room temperature in the secondary fermenter or even a chilled fermenter.



WILL MEYERS, Brewmaster at Cambridge Brewing Company in Cambridge, Massachusetts started homebrewing more than 18 years ago and has brewed professionally for CBC for nearly 15. His beers have earned national and international recognition, including a GABF gold medal in 2006 for his Heather Ale. He also admits he regularly talks to his beer when no one is looking.

Spices are quite a challenge and I tend to focus on a combination of common culinary herbs and spices, with some odd things here and there. With our very popular Great Pumpkin Ale we use only cinnamon and nutmeg so that we don't overwhelm the subtle pumpkin flavor we get from our fresh, whole organic sugar pumpkins. In other spiced beers such as our saisons, I enjoy using the traditional coriander but also add things like cumin, star anise, black pepper and Szechwan red peppercorns. With my Executive Chef, Brian Roskow, I'm developing an IPA with fresh wasabi that includes crystallized ginger and black peppercorns. For our gruit ales, such as our Heather Ale, L'amour du Jour, and Weekapaug Gruit, we forage as much as possible for local wild herbs ourselves, then augment as needed.

The key to balance is in using your spices in the subtlest way. My personal preference in most of my beers is to keep everything at just below threshold, so that individual spices are hard to identify. Certainly you'll want to consider final gravity, residual sugar and hopping character. The lighter the finished beer, the lighter the touch needed with added spices.

I think the key to spicing is to keep subtlety in mind. Think about the fruitiness, the dryness of the finish, and what interesting contributions can be made from your available palette of spices. If you're using fresh culinary herbs or spices, such as rosemary or cardamom pods, keep in mind that age and freshness and seasonal variability will have an effect on the character imparted. Dried spices usually offer the most consistency, but again, freshness is key. With whole spices, toast them briefly and then grind to open up more complexities of flavor and aroma.

Hoppy Trails

Yeast nutrients, skunkiness and formulation

"Help Me, Mr. Wizard"

by Ashton Lewis

Backpack brew

I would like to start brewing small batches of beer while I am camping. I have most of the logistics figured out: set up camp next to a fresh water source, filter 1+ gallons, collect any local ingredients (e.g. blueberries), sleep, wake up and pack my campsite, brew a 1-gallon (3.8 L) extract recipe on a portable jetboil stove, filter into a jug and hike out. My question is, when should I pitch my yeast? I figure the hike out will aerate the wort but how much time (and movement of the wort) is too much?

Gabe Smoley
Spokane, Washington

I love the adventurous spirit of the West. Add this to the reflex for creative thinking common to homebrewers and out comes Gabe's Nuts and Berries Trail Ale. I must admit that this idea sounds like a relaxing start to a day in the woods and, as long as you don't have any grand plans to turn this into an all-grain endeavor, it should be fairly easy.

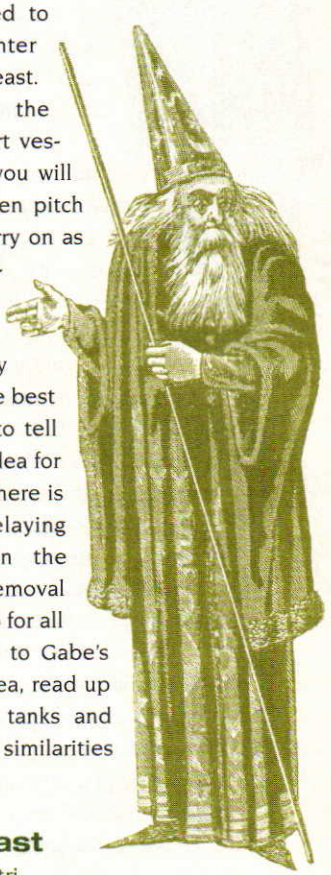
No matter the type of beer being brewed which relies on the introduction of yeast for fermentation (contrasting with beers like lambic that are inoculated with yeast and bacteria from the local area), it is extremely important to recognize the difference between the hot and cold sides of the brewing process. The hot side involves everything up to wort cooling and is notable with respect to sanitation because the penultimate step is usually wort boiling. The cold side involves handling cool wort and beer, both very good media for the growth of microorganisms, and success in the cold side of brewing really demands a clean and cleanable environment. The mountain trails around Spokane do not come to mind when I think of a cold cellar.

Wort boiling can correctly be referred to as a process that achieves commercial sterility, the semantics I will leave for personal research. In commercial breweries it is common to move the wort from the kettle to a whirlpool vessel before wort cooling and the hot wort is a form of sanitizer for the whirlpool, explaining why whirlpools, unlike fermentation vessels, are usually not sanitized after cleaning. Freshly boiled, scalding hot wort is not likely to become contaminated from the environment and wort contamination normally occurs during or after the wort chilling process. Wort cooling really does two things for beer. The most obvious achievement is that cooling permits the addition of yeast to the wort and subsequent transformation of wort into beer. Chilling also stops some of the chemical changes that happen to wort when it is hot, such as color development, conversion of S-methyl-methionine (SMM) to dimethyl sulfide (DMS) and isomerization of alpha acids into iso-alpha acids. The general rule is to cool wort quickly after boiling.

If I were serious about brewing out in the woods, I would disregard the rule about rapid cooling and take a lesson from the treatment of whirlpools before use. If you transfer your freshly boiled wort to a 1-gallon (3.8 L), heat resistant container that can be sealed, you are doing what food processors call "hot filling" the container. The hot fill process sanitizes the container with the heat of the product and is a common method of filling a variety of food packages. After hot filling you can then cool the wort to stop the reactions mentioned above. The one reaction I am most concerned about when holding hot wort after boiling is the transformation of SMM to DMS. You can use the fresh water source near your campsite to cool your hot-filled container of wort.

I wouldn't be too concerned about precise temperature control, just knock the wort temperature down below about 120 °F (49 °C) to prevent DMS formation, which really is more of an all-grain concern because during the production of malt extract most of the SMM in malt is converted to DMS and removed. But cooling the wort down also will make your hike out a bit more comfortable since you won't have a jug of hot wort strapped to your back! On your hike out I wouldn't spend any time thinking about wort aeration because you really won't have much of that happening if you follow my plan. You want the wort to remain commercially sterile after boiling. This will not happen if you aerate the wort because you would need to get air into your jug. You may get some air into the wort from the headspace, but hot filling works best when you minimize the headspace so aeration ideally will not happen on the hike out.

If you make it out of the woods, are able to avoid rush hour traffic and get back home within 2–3 hours, you probably will be successful in your endeavor. All you need to do is sanitize the outside of your jug. You also need to sanitize a fermenter and ready your yeast. After transferring the wort from transport vessel to fermenter, you will want to aerate, then pitch your yeast and carry on as usual. Some readers may be thinking I am reckless in my advice and that the best advice would be to tell you to take your idea for a hike! However, there is precedent for delaying yeast pitching in the method of trub removal called flotation. So for all of those opposed to Gabe's somewhat zany idea, read up on wort flotation tanks and you will find some similarities in the methods.



Feeding yeast

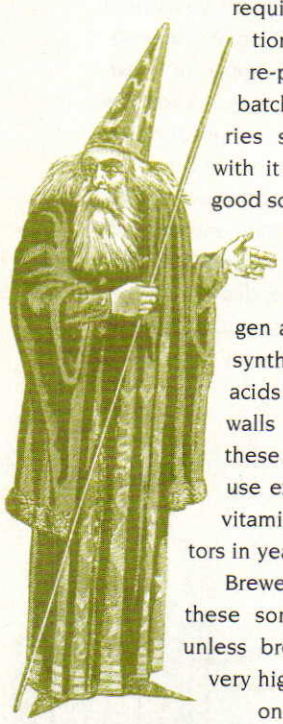
What are yeast nutrients and how are they used?

James Warren
Albany, New York

Most yeast nutrient blends contain amino acids, inorganic nitrogen (ammonia), B-vitamins, sterols, unsaturat-

ed fatty acids and oftentimes autolyzed yeast which gives a mixture of all of these components. These blends are typically used when making wine, cider or high adjunct beers to provide critical growth factors required by yeast. Fermentations lacking yeast nutrients are usually sluggish with a tendency to become stuck.

Brewer's wort is a very rich medium and has most everything that yeast require for a good fermentation. In fact, the practice of re-pitching yeast from one batch to another usually carries some autolyzed yeast with it and yeast extract is a good source of vitamins, amino acids and fatty acids. When yeast grows, amino acids and nitrogen are required for protein synthesis, sterols and fatty acids are used to build cell walls (yeast can synthesize these compounds as well as use external sources) and B-vitamins are used as co-factors in yeast metabolism.



Brewers typically do not add these sorts of nutrient blends unless brewing high adjunct or very high gravity brews. Zinc is one nutrient often added to wort, as yeast requires some zinc for growth. Wort zinc levels should be between 0.10–0.15 ppm. Zinc can come from copper when using copper brewing vessels, but most equipment is stainless steel, so zinc additions are helpful.

One problem with adding zinc salts, such as zinc sulfate, is that much of the zinc is lost in trub. Biologically available forms of zinc can be enhanced by growing yeast in a zinc-enriched media and then drying the yeast for use as a yeast nutrient. This form of zinc has lower trub losses when added to the brew kettle.

I use such a product for every batch of beer we brew at our brewery and have used this nutrient, called *Servomyces*, for the last eight years. If wort is low in zinc, lagging fermentations are seen as well as poorly flocculating yeast. A friend of mine working for a very large brewery told me that they have a target yeast density following primary before transferring to the lagering tanks and that this brewery adjusts wort zinc levels to influence cell density after primary. If the cell density is too low, they back off on the zinc to reduce yeast flocculation. If the cell density is too high, the zinc dose is slightly increased.

In my experience brewing all-malt beers and some beers with about 25% adjunct, I have never felt the need to add any nutrients to wort other than zinc since wort is really the ideal nutrient source for hungry yeast cells!

Hoppy Le Pew?

So beers in clear bottles get skunky because hops are affected by light. Why don't hops get skunky growing in their fields in Yakima?

Chris Bushman
North Hollywood, California

The hop-related compounds that become skunky when exposed to light are iso-alpha acids. Although these compounds are present in beer, they are not in the hops growing in the sunny fields of Yakima. Hops contain a mixture of aromatic oils that impart earthy, citrus-like and piney aromas to beer and also contain alpha acids. Alpha acids are bitter, but not soluble in water, wort or beer. However, when alpha acids are boiled in wort they are chemically isomerized into their soluble form, commonly known as iso-alpha-acids.

When iso-alpha-acids are exposed to ultraviolet radiation from light a portion of the iso-alpha-acid molecule is cleaved off. In general, this type of chemical reaction is called photolysis. The photolytic products of this reaction are a still-bitter remnant of the iso-acid-molecule and a hydrocarbon chain that readily reacts with sulfur in beer to yield isopentyl mercaptan. This aromatic compound smells just like the business end of Pepé Le Pew because it is chemically identical to one of the components found in a skunk's defense system.

The best way to prevent bottled beer from becoming skunky or light struck is to use brown bottles and keep your beer away from UV radiation sources, namely direct sunlight and fluorescent light. Green and clear (aka flint) glass bottles provide no protection from UV radiation and beer packaged in these types of bottles becomes skunky within minutes of exposure to light. Brown bottles are a much better UV filter, but sometimes are light enough in color to produce skunky beer after prolonged exposure to light.

Brewers who use kegs do not need to worry about any of this, making the keg and its little cousin, the can, excellent packages from the perspective of photolytic damage. One thing that all beer drinkers may experience is having a beer go skunky right in front of their noses. Serving beer in clear glasses on a nice sunny day can quickly result in a skunky brew. To guard against this phenomenon, you may want to be selective in the containers you choose for serving beer at picnics and barbecues.

If you are wondering why some commercial beers in clear and green glass bottles do not go skunky no matter how much light you expose them to, it is because of the hops. So-called reduced iso-alpha acids can be produced by chemically modifying either beta-acids or iso-alpha acids from hops using a variety of chemicals, mainly strong reducing agents. The alpha and beta acid fractions are usually isolated from hops using supercritical carbon dioxide in a method typically called supercritical fluid extraction. Although this method is not traditional, and some may look down on these hop products as another example of better living through chemistry, they work very well and are free of any chemicals used in the production process. They also do some pretty interesting things to foam.

The mystery batch

I recently attempted to force carbonate an American cream ale using a standard 5-gallon Corny keg. The keg was cleaned with bleach water and rinsed, as normal. The fresh beer was quietly racked into the keg, yielding about 4 gallons of beer total (about 5 inches head space in the keg). About 15 psi CO_2 was applied at about 40 °F (4 °C), and I shook the keg several times to force the CO_2 into it. The end result was a beer that had kind of a bitter and bland taste that did not include the Saaz hop/malt flavors that should have been recognized. My wife thought it had the impression of a baking soda flavor. If the tapped beer was left in open air for an extended period of time, the bland taste dissipated and the flavors started to open up. Is the off flavor coming from the

CO_2, possible residue bleach left in the keg, is it just contaminated, or is there something else that may have happened?

Christopher Schroeder
via email

I am a big fan of Click and Clack, The Tappit Brothers on National Public Radio's "Car Talk" and this question reminds me of the questions they get that just don't have sufficient information to give real answers. If I understand this question correctly, you have concluded that this problem is due to one of four things: carbon dioxide, bleach, contamination or the answer behind the mystery door. If I had a radio show I might take this opportunity to inject a little humor at your expense, but since this question has a good lesson about troubleshooting beer, I will be a nice guy and try to provide some useful information!

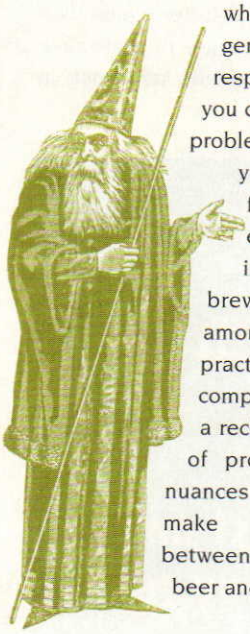
I think the answer lies behind door number four. It sounds to me like you brewed a lame beer that failed to live up to your expectations. This can happen to the best of us and, in my experience, usually lies in the formulation. I formulated and went onto brew a total dog last year, a spiced ale that was destined for the drain the minute I had a pint . . . all 500 gallons of it! If you expected a big, hoppy nose from the expensive Saaz hops sprinkled in during the boil that did not come through, you may have less than stellar hops or did not add enough to get the desired affect. Your wife's baking soda description makes me think of soda water. I think this may be in line with your comment about the lack of malt flavors. Whatever your expectations were from malt, they apparently failed to appear in the finished beer.

One of my boss' (yes, even wizards have bosses in real life) personal goals is to leave work at the end of the day doing something that either betters himself or the company. This can take all sorts of forms, from learning something new that can be of future value to identifying and making progress related to a current "problem." The definition of a problem changes as you approach excellence, which many believe to be a truly unattainable goal, thus giving merit to the idea of continual improvement.

When it comes to improving beer you need to first clearly identify the problem. In your case you have a beer that lacks the characteristics you expected. The first thing I would do is review my brewing notes to determine if my expectations are realistic. In simplistic terms, if you expect a nice lingering toasty malt finish from a recipe containing pale malt and rice, your expectations are out of sync with your recipe. Do the same thing with the hop schedule. Look at the mash profile if you are an all-grain brewer and consider that the wort fermentability may have been too high. If you take specific gravity readings you can see if the original and final gravities were in-line with what you wanted. A low final gravity can be related to wort fermentability as well as yeast strain.

Evaluating a real disaster is often fairly easy because the cause or causes are typically major and clearly stand out. In

some cases you may know the general cause but lack the tools to nail down the problem further. For example, you may know for certain that a beer is contaminated by bacteria and may even be able to see bacterial cells under a microscope, but you may not be able to determine what specific bacterial genus and species is responsible. As long as you can focus on the real problem you can improve your beers in the future. That's where experience comes into play. The art of brewing and cooking, among other technical practices, cannot be completely articulated in a recipe or a description of procedures and the nuances of technique can make the difference between brewing a good beer and a great beer.



If you still have some of this beer, grab a pencil, paper and a pint of the beer. Make some general notes on your expectations and then smell and taste the beer and compare what is in the glass to your expectations. Next, go to the recipe and see if the deficiencies seem likely to be related to the recipe. Then move onto the brewing process, then fermentation and onto the handling of the beer post fermentation. If you are serious about improving as a brewer develop a game plan on how you think this beer could be improved and brew it again. Even if your goal is not to brew the best American cream ale in the world, this exercise will give you practice in what I term tweaking a recipe. In my view, continual tweaking makes brewing an exciting and rewarding challenge and is also one of the keys to brewing great beer. And, by the way, consider using something other than bleach to sanitize your keg. Not only does bleach have the potential of imparting off-flavors, it can also corrode stainless steel! Good luck in your future brewing endeavors.

Web extra:

Want to know 10 tips for better brewing? Get them at:
http://www.byo.com/feature/1354.html

Brew Your Own Technical Editor Ashton Lewis has been answering homebrew questions as his alter ego Mr. Wizard for the last 12 years. A selection of his Wizard columns have been collected in "The Homebrewer's Answer Book," just released, available online at brewyourownstore.com.
Do you have a homebrewing question for Ashton? Send inquiries to *Brew Your Own*, 5053 Main Street, Suite A, 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!

Winter Spiced Ales

Rich, slightly-sweet celebration

by Jamil Zainasheff

I'm sure my mouth was hanging open as I stood in front of the wall of unusual and rare beers at Reno Homebrewer in Reno, Nevada. One group in particular caught my eye: Anchor Brewing Company's Our Special Ale from the past ten years. Every year since 1975 Anchor brews what they call a "Christmas Ale." Each year the recipe is different so they label them with the year brewed. I quickly grabbed one of each year, with the intention of doing a little vertical tasting.

In theory, you could take almost any base beer, add some "holiday" spices, and call it a holiday spiced beer. However, nine times out of ten it probably won't be a very good one. The best base beer for this style is one that has a full, rich malty sweetness with hints of caramel and chocolate, very similar to a dessert. English old ale, or any similar style, is a good base for making holiday spiced ale. I'm referring to rich, dark, figgy, fruity old ale. Not the hoppy, blonde, high alcohol beers sometimes sold as old or stock ale in the US. Holiday spiced beers are usually rich, slightly sweet beers with gentle warming alcohol and spices, which seems like a requirement for a beer to be enjoyed in the late fall or winter. The rich bready, fruity and caramel notes of the old ale and the holiday spicing are reminiscent of an English Christmas pudding or good, old fashioned molasses cookies. As in most spiced beers, hops do not play a big role in this style. Hop bittering should be firm enough to balance the beer, but hop aroma and flavor should be background notes at best. You don't want hops competing with or masking the spices.

Photo by Charles A. Parker/Images Plus

The proper base malt for this beer is British pale ale malt, which is kilned a bit darker (2.5 to 3.5 °L) than the average American 2-row or pale malt (1.5 to 2.5 °L). This higher level of kilning brings out the malt's rich flavors. British pale ale malt is also highly modified and well suited to single infusion mashes, typical for all British beers. A mash temperature around 152 °F (67 °C) creates wort with the proper balance between long chain, non-fermentable sugars and simpler fermentable sugars for this beer. 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 made from 100% Maris Otter malt which are an excellent choice for English beers. If you end up using domestic 2-row malt or extract made from it, you'll need to compensate with additional specialty malts such as Biscuit or Victory, but use restraint.

In this style, hops are best used for bittering only, as too much hop flavor and aroma can mask the spices. Why not just add more spices so they can compete with the hops? While that may be possible, too much hop and spice flavor in a beer nega-

SPICED ALES by the numbers

OG, FG, IBUs, SRM and ABV will vary depending on the underlying base beer. ABV is generally above 6%, and most examples are somewhat dark in color.

RECIPE

Christmas in a Bottle

(5 gallons/19 L, all-grain)

On a cold winter's night, build a fire and pour a glass of this beer to make a memorable beer moment.

OG = 1.090 (21.6 °P)
FG = 1.022 (5.6 °P)
IBU = 43 SRM = 20 ABV = 9.0%

Ingredients

17.5 lb. (8 kg) Crisp Maris Otter or British-style pale ale malt (3 °L)
11 oz. (312 g) Briess crystal malt (80 °L)
3.5 oz. (99 g) Briess black patent malt (525 °L)
10.4 AAU Horizon hops (60 min.) (0.8 oz/23 g of 13% alpha acids)
½ tsp. Cinnamon (ground, dry), (1 min.)
¼ tsp. Ginger (ground, dry), (1 min.)
⅛ tsp. Nutmeg (ground, dry), (1 min.)
⅛ tsp. Allspice (ground, dry), (1 min.)
0.5 lb. (227 g) Lyle's Black Treacle (100 °L) (optional)
White Labs WLP013 (London Ale), Wyeast 1028 (London Ale) or Danstar Nottingham 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 152 °F (67 °C). Hold the mash at 152 °F (67 °C) until conversion is complete, which should be less than 60 minutes. 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 6.5 gallons (25 L) and the gravity is 1.070 (17 °P). Optionally, add treacle to the wort stirring thoroughly to

recipe continued from page 19

avoid scorching.

The total wort boil time is 90 minutes. Add the bittering hops with 60 minutes left in the boil. Add Irish moss or other kettle finings with 15 minutes remaining and the spices with one minute left in the boil. Chill the wort rapidly to 67 °F (19 °C), let the break material settle, rack to the fermenter and aerate thoroughly.

Pitch 15 grams of properly rehydrated dry yeast or use three liquid yeast packages. Alternatively, make a 5-liter starter using one package of liquid yeast, letting the starter ferment out fully and pitching only the resulting yeast into the wort.

Ferment at 68 °F (20 °C), raising the temperature to 70 °F (21 °C) during the last ⅛ of fermentation to help reduce diacetyl and assure complete attenuation. 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 it to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 1.5 to 2 volumes.

Christmas in a Bottle

(5 gallons/19 L, extract with grains)

OG = 1.090 (21.6 °P)
FG = 1.022 (5.6 °P)
IBU = 43 SRM = 21 ABV =9.0%

Ingredients

11.7 lb. (5.3 kg) John Bull Maris Otter, Edme Maris Otter or fresh equivalent English-type liquid malt extract (3.5 °L)
11 oz. (312 g) Briess crystal malt (80 °L)
3.5 oz. (99 g) Briess black patent malt (525 °L)
10.4 AAU Horizon hops (60 min.) (0.8 oz/23 g of 13% alpha acids)
½ tsp. Cinnamon (ground, dry) (1 min.)
¼ tsp. Ginger (ground, dry) (1 min.)
⅛ tsp. Nutmeg (ground, dry) (1 min.)
⅛ tsp Allspice (ground, dry) (1 min.)
0.5 lb (227 g) Lyle's Black Treacle (100 °L) (optional)
White Labs WLP013 (London Ale), Wyeast 1028 (London Ale) or Danstar Nottingham yeast

Step by Step

Mill or coarsely crack the specialty malts. Mix them well and place loosely in a grain bag. Avoid packing the grains too tightly in the bag, using more bags if needed. Steep the grain bag in about 3 quarts (~3 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 and the optional treacle. 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 L) and a gravity of 1.077 (18.7 °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 one hour after adding the bittering hops. Add Irish moss or other kettle finings with 15 minutes remaining and the spices with one minute left in the boil.

Chill the wort to 68 °F (20 °C). Aerate thoroughly and pitch 15 grams of properly rehydrated dry yeast or use three liquid yeast packages. Alternatively, make a 5-liter starter using one package of liquid yeast.

Ferment at 68 °F (20 °C), raising the temperature to 70 °F (21 °C) during the last ⅛ of fermentation to help reduce diacetyl and assure complete attenuation. 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 it to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 1.5 to 2 volumes.

tively impacts its drinkability. If you decide you do want a subtle background hop flavor, using a lower alpha acid English hop such as Kent Golding, Fuggle, or Progress for the bittering hop addition will result in a delicate background hop character. This is because large hop additions, even early in the boil, can be tasted in the finish. I prefer to leave the hop flavor out and instead use a clean, higher alpha acid hop, targeting a bitterness to starting gravity (IBU divided by OG) ratio of 0.4 to 0.5. For bigger beers, use a ratio on the higher side, reaching 0.5 around 1.100 SG. For smaller beers, use a ratio on the lower side reaching 0.4 around 1.065 SG, because all things being equal, a higher starting gravity usually results in a higher finishing gravity. The higher the finishing gravity, the greater amount of bittering required to balance the beer.

There is a lot going on in this beer with the spices, fruity esters, alcohol, and rich base malt, so I keep it simple on the specialty grains. A moderate dose of dark crystal (~80 °L) for about 5% of the grist adds a nice dark caramel/raisin note, good for enhancing that dessert character. A touch (< 3%) of highly kilned malt, like black patent (~525 °L) adds ruby highlights to the color, helps balance the residual sweetness with a tiny touch of roasty dryness, and can add a subtle background chocolate or coffee note.

A friend once told me that you cannot make old ale without treacle. If you expect the beer to age for some time, treacle can be nice. If you plan to drink it soon after fermentation, then it might be best to leave out the bold treacle flavors or cut back substantially. While some people think treacle is just the British word for molasses, there are many products labeled as "treacle" or "molasses" and they're all slightly different. Treacle appropriate for brewing old ale is sometimes referred to as black treacle. It is dark, sweet, and full of highly caramelized notes. Some people say blackstrap molasses is an acceptable substitute, but my preference is Lyle's Black Treacle, which you can find at many English specialty shops if your homebrew shop cannot get it for you. If you can't find treacle, you can add 0.5 lbs. (227 g) of crystal 150 °L malt instead. The beer won't be the same,

but it also won't cost you $5 for a can of treacle either.

You certainly can go with more specialty malts for a richer, bolder beer, but when brewing with spices, you don't want to mask any subtle spice flavors or have to increase those spices so much that they begin to add a different character than the same spice at a lower concentration. The trickiest part of brewing a great holiday spiced beer is being able to brew a great old ale and then enhancing (not ruining) it with spice. Focus on the spice aroma first and the spice flavor will follow. While this style requires obvious spicy notes, the best holiday spiced beers use spice flavors and aromas as an accompaniment to the malt and fermentation derived esters. The spices should blend harmoniously with other aspects of the beer, not overpower them. However, many spices vary in strength based on the source of the spice. If you're not able to source the same spices grown under the exact same conditions each year, you're going to have some variability. Even if you could get exactly the same spices each time, how you add them to the beer makes a big difference.

If possible, buy fresh, whole spices and grind or crush them yourself right before use. There are two times you can add spices to a beer: during the boil or post fermentation. The easiest is to toss them into the boil during the last few minutes, letting the heat and the water extract the spice character. This is a good method, because there is no danger of contamination and extraction happens quickly. The drawback is that you don't know how much spice character you're getting until you taste the beer after fermentation. Another issue is that the character of many spices changes once heated in the boil and they can seem cooked or bitter in a short time.

The alternative is adding spices directly to the beer. Adding spices after the bulk of fermentation is done allows for better precision, as you can taste the beer every few days to see how the flavor and aroma develop. Of course with this method there is some danger of contamination, especially in beers with a moderate level of alcohol. You can also boil your spices for a few minutes in a little water and use that to dose the beer to taste.

A trick you can use when making any spice beer is to make an extract of each spice. Add each spice to a half-pint (237 mL) mason jar about half full with vodka and close the lid tightly. Over several days, the alcohol and water act as a solvent to gently extract color, flavor and aroma from the spices. This works well for a number of spices and beer styles, but the flavors and aromas don't seem quite right if this is the sole source of the spice notes, so it should only be used to tweak the spice character of a beer.

The best technique for old ale is a combination of these methods. Add the spices late in the boil, but use restraint. If it turns out the spicing wasn't enough, you can bump it up by boiling some spice in a little water, making an extract in vodka, or adding dry spices post fermentation.

When using dry spices in the fer-

menter, I wait until the beer is past primary fermentation. I add the spices loose to the fermenter and within a couple days they will usually sink to the bottom. Regular taste tests let me know when the beer has just the right spice level. At that point I keg or bottle the beer, leaving the spices behind. This process gives you more control over the spice level in the beer and adds a fresher spice flavor and aroma than an all-boiled spice addition.

Select an English-type ale strain for this beer. The esters these yeasts typically create can add to the character of the beer. Even though this style is often described as dessert-like, you don't want the beer to finish too sweet. It is better to stick with one of the more attenuating English strains, such as White Labs WLP013 (London Ale), Wyeast 1028 (London Ale), or Danstar Nottingham. If you want the flavor profile of a favorite English yeast and it happens to be less attenuating, you will need to craft a more fermentable wort by replacing a portion of the base malt (grain or extract) with simple sugar (table sugar is fine). If you're an all-grain brewer, you can alternatively choose a lower mash temperature.

I prefer cooler fermentation temperatures for bigger beers made with English-type ale yeasts. With smaller beers you can push the temperatures up into the low 70s °F (low 20s °C) to produce more esters without a lot of hot alcohol notes. For bigger beers, I wouldn't exceed 68 °F (20 °C) for the bulk of fermentation. I like a subtle alcohol character that is gentle and is warming only as an afterthought. I dislike any beer with hot, solvent-like alcohol and I find a cool, steady fermentation with an appropriate pitch of yeast makes all the difference in the world. However, you need to use some care with most English yeasts and big beers. Too cool a fermentation temperature or overnight temperature drops when already fermenting cool can cause the yeast to flocculate early, leaving the beer under-attenuated and sweet. Another thing to keep in mind is that these strains will often produce a fair amount of diacetyl and you'll want to raise the temperature a few degrees for the last ⅓ of fermentation to clean up the beer.

Control fermentation temperature, pitch plenty of clean, healthy yeast and serve your holiday spiced beer at 50–55 °F (10–13 °C). Carbonate around 1.5 to 2.0 volumes if serving at this temperature. English ales fermented hot may have plenty of yeast character when served cold, but they tend to also have a number of harsh alcohols as well. When served cold enough to hide the hot and harsh flavors, the malt character (and in this case the spice character) becomes dull and muted. Contrast that with a cooler fermentation, where yeast-created flavors and aromas are more restrained. When combined with malt and spices that only really present themselves fully at warmer temperatures, it can make for a wonderful drinking experience.

Jamil Zainasheff discusses brewing tips and brewing beer styles as the host of the popular Jamil Show *on* The Brewing Network, *www.thebrewingnetwork.com/jamil.php.*

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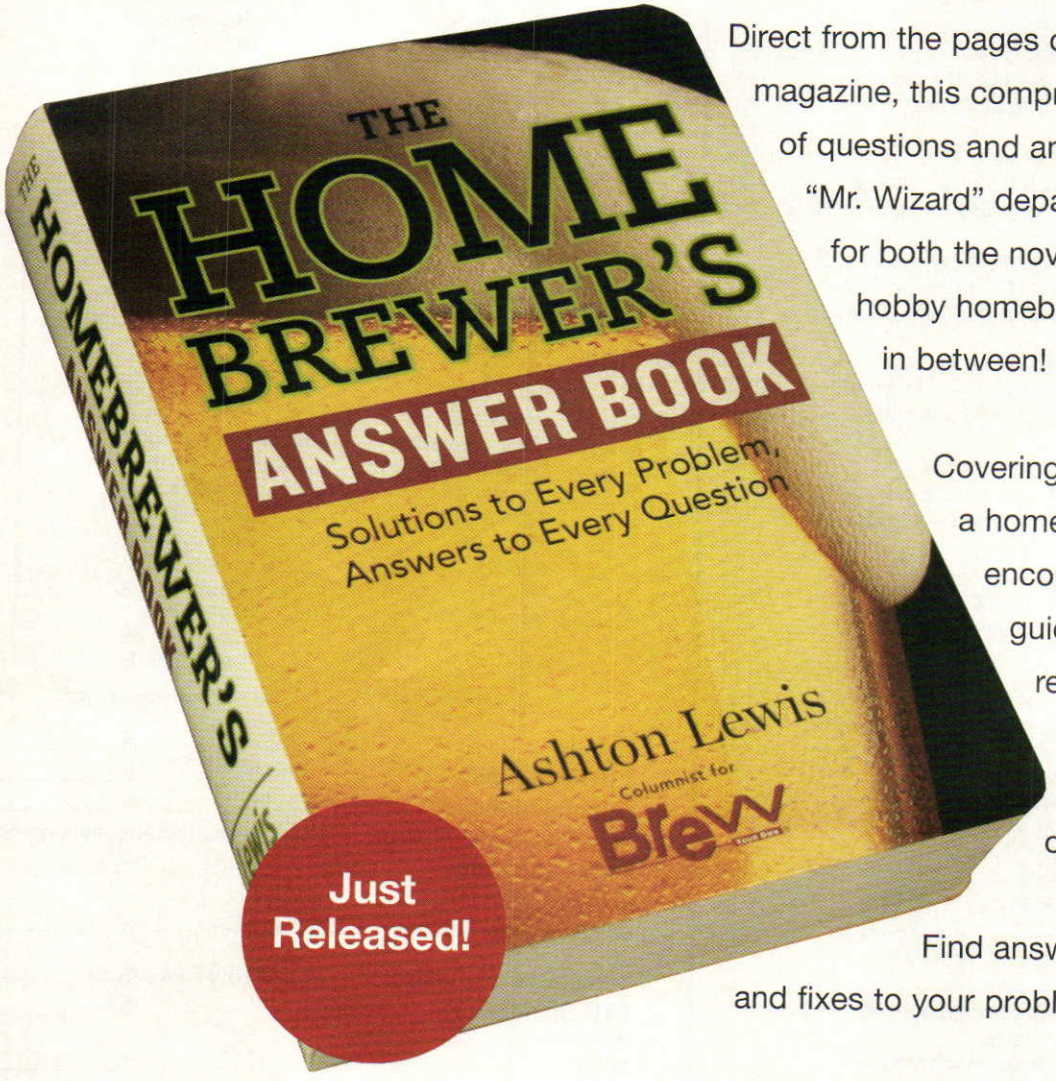

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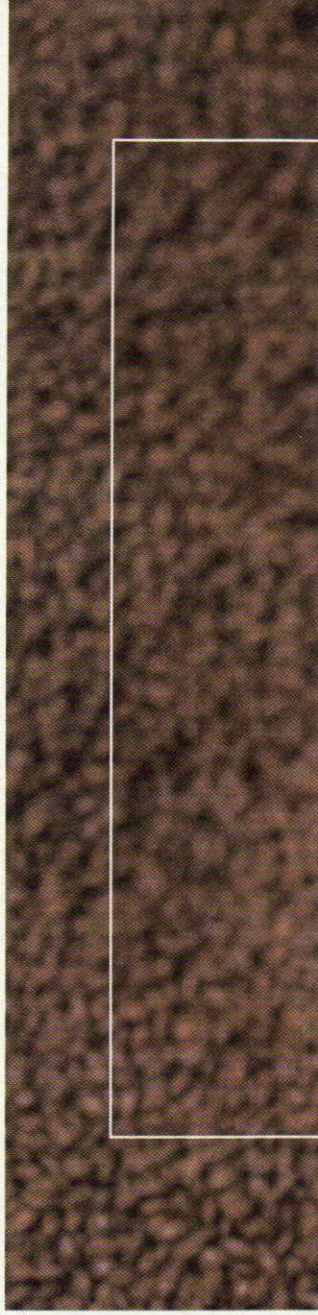
I'm not sure of anything as ubiquitously distributed and enjoyed the world over as "chockies." From the creamy goodness of milk chocolate to the biting dryness of very dark cocoa, it's entirely loved. If only there were something in brewing that we could use to mimic chocolate. If only...

by **Kristen England**



The aptly named and popular chocolate malt gives a chocolate-like flavor to beer while contributing color and can be used in many styles.

Choco Character

In my second installment on the virtues and vices of dark grains, we come to the omnipresent and not-so-very-potent chocolate malt. Nearly all brewers have used it at one time or another and even if they haven't, I'm willing to bet that they have at least tasted it. Considered THE robust porter malt, I would guess it is in over 98% of all commercial porters on the market — and for good reason. Although it has the lightest flavor and aroma profile compared with black malt and roasted barley, there are many more places that it can fit in a style. It is true that it can be "one-dimensional" at times, but nothing can replace chocolate malt in what it brings to a beer — namely chocolate. So what it lacks in dimensionality, it more than makes up for in adaptability. Be it a very mild milk chocolate character, to a punch in the face of 70% dark cocoa, it always brings some sort of chocolate to the party.

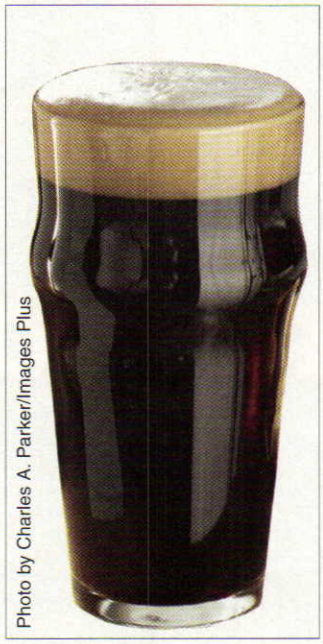


Photo by Charles A. Parker/Images Plus

How It's Made

There are a few different versions of chocolate malt on the market, ranging anywhere from the pale stuff (at around 200 °L) to the dark English (~500 °L). Using a broad brush, the English versions are usually the darkest and the American versions the lightest. Whichever you choose, be sure to account for the differing degree of color (as rated in degrees Lovibond) because 1.0 lb. (0.45 kg) of chocolate malt at 400 °L yields a different color in 5 gallons (19 L) of beer than than 1.0 lb. (0.45 kg) at 500 °L. British chocolate malt is made from 2-row malt while domestic chocolate may be made from either 2-row or 6-row malt. If you have a preference for 2-row, as I do, check the malt specifications.

Chocolate malt is made in a similar manner as black malt. Dried pale malt is roasted at 420–450 °F (220–230 °C), just as black malt is, but for a shorter time — about 2 to 2.5 hours. (For comparison, in actual chocolate production, whole dried "cocoa beans" are roasted at a relatively mild 250–320 °F (120–160 °C) for 30–60 minutes. Coffee beans — used for brewing a different kind of dark beverage — are roasted at 375–425 °F (190–220 °C) for 90 seconds to 15 minutes.)

As the color of the malt increases, so does its intensity, low to high respectively. In addition to regular chocolate malt, Weyermann makes huskless versions of its Carafa® series of malt. Carafa® is a series of dark malts that increase in number as they increase in color, Carafa I® (centered around 337 °L), Carafa II® (~425 °L) and Carafa III® (~470 °L), respectively. I think that the huskless Carafa I® is what comes across as being most chocolate malt-like, but is much smoother and has a less pronounced

CHOCOLATE MALT

Photo by Nigel Blythe/Cephas

Mmmmmmmm.....chocolate

chocolate character than its husked cousins do. Additionally, other malted grains are made into chocolate malt. Chocolate rye (~250 °L) and chocolate wheat (~400 °L) are the two biggest non-barley chocolate malts. Although similar to chocolate malt made from barley, the rye version has more spiciness and milk chocolate quality. The wheat version has more of a pronounced dark chocolate character.

Recipe Considerations

The biggest difference between the use of chocolate malt in homebrewed and commercial examples is that commercial brewers rarely use this malt for "doctoring" the color of their beer. (Instead, black malt, black malt flour or malt color extracts are employed.) Also, commercial brewers usually let the chocolate malt add a specific character, where in homebrewed examples you'll sometimes find a quarter ounce (7 g) buried in with a large grain bill. When putting a recipe together using chocolate malt, try and have it add a specific aspect. Think about how it combines with the other ingredients. What flavor combinations can you get out of using chocolate malt with other specialty grains? Maybe using chocolate malt together with Special B malt to get make-shift chocolate-covered dark fruits. The possibilities are limitless.

Commercial Examples

When breweries use chocolate malt, some like to use a ton of it to ensure you get a big kick of chocolate character and other breweries like to use just enough to add a chocolate note to a beer. A big robust Baltic porter can handle a lot of chocolate malt. With the robust vinous notes, it adds a big chocolate-covered dark fruit character, as mentioned before. Used as a counterpoint to the coffee flavor of roasted barley, chocolate malt really brings out the 70% dark cocoa-like character in an American stout. Used as the focal point in a smoked robust porter it brings out a lot of the darker tones that are usually missed in an everyday porter. Finally, a small amount in an English brown ale really adds depth to the dark caramel notes and a cocoa-like dryness to the finish.

RECIPES

Sinebrychoff Porter clone
(5 gallons/19 L, all-grain)

OG = 1.070 FG = 1.020
IBU = 45 SRM = 51 ABV = 6.1%

From simple ingredients comes massive complexity. Robust toasty notes meet and blend with dark fruits and chocolate. The vinous, port-like character from this brute wraps everything up in a dark happy bow.

Ingredients

10.25 lbs. (4.7 kg) Weyermann Munich malt
3.0 lbs. (1.4 kg) Weyermann Vienna malt
1.5 lbs. (0.68 kg) Weyermann Carafa III® malt (470 °L)
1.0 lbs. (0.45 kg) Dingemans CaraMunich malt (45 °L)
10.5 AAU Hallertau Hersbrücker hops (60 min)
(2.2 oz./63 g at 4.75% alpha acids)
3 AAU Czech Saaz hops (30 min)
(1.0 oz./28 g of 3.0% alpha acids)
Wyeast 2124 (Bohemian Lager) or White Labs WLP830 (German Lager) yeast
(6 qt./6 L yeast starter)

Step by Step

Mash at 153 °F (67 °C) with 20 quarts (19 L) of brewing liquor. Boil wort for 60 minutes. Ferment at 53 °F (12 °C).

Sinebrychoff Porter clone
(5 gallons/19 L, extract with grains)

OG = 1.070 FG = 1.020
IBU = 45 SRM = 51 ABV = 6.1%

Ingredients

1.5 lbs. (0.68 kg) Weyermann Carafa III® malt (470 °L)
1.0 lbs. (0.45 kg) Dingemans CaraMunich malt (45 °L)
2.5 lbs. (1.1 kg) Coopers Light dried malt extract
5.5 lbs. (2.5 kg) Munich liquid malt extract (late addition)
10.5 AAU Hallertau Hersbrücker hops (60 min)
(2.2 oz./63 g at 4.75% alpha acids)
3 AAU Czech Saaz hops (30 min)
(1.0 oz./28 g of 3.0% alpha acids)
Wyeast 2124 (Bohemian Lager) or White Labs WLP830 (German Lager) yeast

Step by Step

Steep grains at 153 °F (67 °C) with 3.75 qts. (3.5 L) of water. Rinse grains with 2 quarts (~2 L) of water at 170 °F (77 °C). Add water to "grain tea" to make 3.0 gallons (11 L) and bring to a boil. Stir in dried malt extract and boil wort for 60 minutes, boiling hops for times indicated. Stir in liquid malt extract with 15 minutes left in boil. Cool wort, transfer to fermenter and add cold water to make 5 gallons (19 L) of wort in fermenter. Aerate and pitch yeast. Ferment at 53 °F (12 °C).

Alaskan Smoked Porter clone

(5 gallons/19 L, all-grain)

OG = 1.067 FG = 1.017
IBU = 45 SRM = 46 ABV = 6.4

Dark, robust and smoky when young. Turns into a porter with sherry, Madeira and raisin notes as it ages. Chewy malt, chocolate with a smoky oily finish. This is how a smoked porter should taste.

Ingredients

8.75 lbs. (4.0 kg) American pale malt (2-row)
4.0 lbs. (1.8 kg) American Munich malt (2-row)
1.25 lbs. (0.57 kg) American chocolate malt
0.5 lbs. (0.23 kg) American black patent malt
11 AAU Chinook hops (60 min) (1.1 oz./31 g of 10% alpha acids)
1.0 oz. (28 g) Willamette hops (10 min)
Wyeast 1272 (American Ale II) or White Labs WLP051 (California V) yeast (2 qt./2 L yeast starter)

Step by Step

Smoke entire grain bill over alder wood. (As an alternative, you can substitute Weyermann rauchmalz for the pale and Munich malt.) Mash at 153 °F (67 °C) in 18 qts. (17 L) of brewing liquor for 60 minutes. Boil wort for 60 minutes. Ferment at 66 °F (19 °C).

Rogue Shakespeare Stout clone

(5 gallons/19 L, all-grain)

OG = 1.061 FG = 1.015
IBU = 70 SRM = 68 ABV = 5.9%

Citrus, coffee and chocolate notes all come together into a sort of chocolate

covered grapefruit.

Ingredients

9.5 lbs. (4.3 kg) American pale malt (2-row)
1.25 lbs. (0.57 kg) English chocolate malt
1.0 lbs. (0.45 kg) English roasted barley
0.75 lbs. (0.34 kg) English crystal malt (150 °L)
0.67 lbs. (0.30 kg) American flaked oats
17.5 AAU Cascade hops (60 min) (3.0 oz./86 g of 5.8% alpha acids)
1.0 oz. (28 g) Cascade hops (10 min)
Wyeast 2220 (Rogue Pacman) yeast (2 qt./~2 L yeast starter)

Step by Step

Mash at 153 °F (67 °C) in 17 qts. (16 L) of brewing liquor. Boil time is 60 minutes. Add hops with times left in boil indicated in ingredient list. Ferment at 68 °F (20 °C).

Rogue Shakespeare Stout clone

(5 gallons/19 L, extract with grains)

OG = 1.061 FG = 1.015
IBU = 70 SRM = 68 ABV = 5.9%

Ingredients

1.25 lbs. (0.57 kg) English chocolate malt
1.0 lbs. (0.45 kg) English roasted barley
0.75 lbs. (0.34 kg) English crystal malt (150 °L)
2.0 lbs. (0.91 kg) Briess Light dried malt extract
4.75 lbs. (2.2 kg) Briess Light liquid malt extract (late addition)
17.5 AAU Cascade hops (60 min) (3.0 oz./86 g of 5.8% alpha acids)
1.0 oz. (28 g) Cascade hops (10 min)
Wyeast 2220 (Rogue Pacman) yeast

Step by Step

Steep crushed grains at 153 °F (67 °C) in 4.5 qts. (4.3 L) of water. Rinse grains with 2 quarts (~2 L) of water at 170 °F (77 °C). Add water to "grain tea" to make 4.0 gallons (15 L) and bring to a boil. Stir in dried malt extract and boil wort for 60 minutes, boiling hops for times indicated. Stir in liquid malt extract with 15 minutes left in boil. Cool wort, transfer to fermenter and add water to make 5 gallons (19 L) of wort in fermenter. Aerate and pitch yeast. Ferment at 68 °F (20 °C).

Hobgoblin Dark Ale clone
(5 gallons/19 L, all-grain)

OG = 1.048 FG = 1.014
IBU = 25 SRM = 24 ABV = 4.3%
Chocolate and toffee malt. Firm bitterness and fruity aroma from the Slovenia Goldings hops and the Ringwood yeast. Rounded moderate bitterness and an overall fruity character.

Ingredients

7.75 lbs. (3.5 kg) English pale ale malt (Maris Otter)
2.0 lbs. (0.91 kg) English crystal malt (75 °L)
0.25 lbs. (0.11 kg) English chocolate malt
3.75 AAU Fuggle hops (FWH) (0.75 oz./21 g at 5.0% alpha acids)
3.9 AAU Styrian Goldings hops(30 min) (0.75 oz./21 g at 5.25% alpha acids)
0.25 oz. (7.1 g) Styrian Goldings hops (10 min)
Wyeast 1187 (Ringwood Ale) yeast

Step by Step

Mash at 151 °F (66 °C) in 13 qts. (12 L) of brewing liquor. Boil time is 60 minutes. Add hops at times indicated. (FWH stands for first wort hops — add hops as you are running the wort off, before the boil.) Ferment at 69 °F (21 °C).

Hobgoblin Dark Ale clone
(5 gallons/19 L, extract with grains)

OG = 1.048 FG = 1.014
IBU = 25 SRM = 24 ABV = 4.3%
Chocolate and toffee malt. Firm bitterness and fruity aroma from the Slovenia Goldings hops and the Ringwood yeast. One of a kind English brown ale. Rounded moderate bitterness and an overall fruity character.

Ingredients

2.0 lbs. (0.91 kg) English crystal malt (75 °L)
0.25 lbs. (0.11 kg) English chocolate malt
1 lb. 14 oz. (0.85 kg) Muntons Light dried malt extract
3.3 lbs. (1.5 kg) Muntons Light liquid malt extract (late addition)
3.75 AAU Fuggle hops (FWH) (0.75 oz./21 g at 5.0% alpha acids)
3.9 AAU Styrian Goldings hops(30 min) (0.75 oz./21 g at 5.25% alpha acids)
0.25 oz. (7.1 g) Styrian Goldings hops (10 min)
Wyeast 1187 (Ringwood Ale) yeast

Step by Step

Steep crushed grains at 151 °F (66 °C) in 3.4 qts. (3.2 L) of water. Rinse grains with 1.5 quarts (~1.5 L) of water at 170 °F (77 °C). Add water to "grain tea" to make 2.5 gallons (9.5 L), add first wort hops (FWH) and bring to a boil.

Stir in dried malt extract and boil wort for 60 minutes. Stir in liquid malt extract with 15 minutes left in boil. Cool wort, transfer to fermenter and top up to 5 gallons (19 L) with water. Aerate and pitch yeast. Ferment at 68 °F (20 °C).

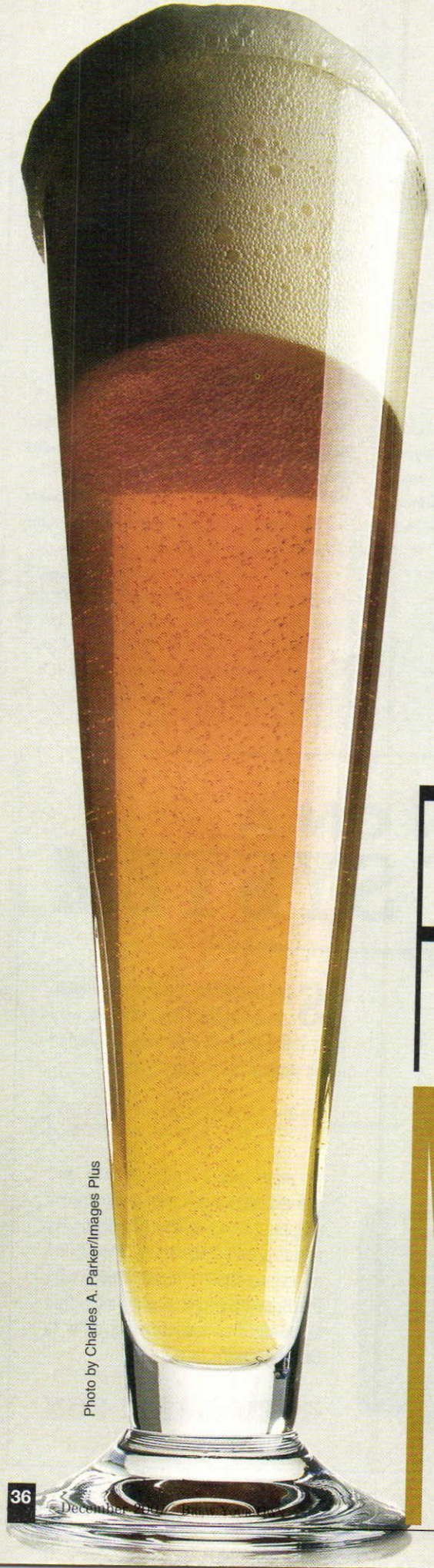


Photo by Charles A. Parker/Images Plus

by **Chris Colby**

REITERATED MASHING

MULTIPLE MASHING FOR MASSIVE BREWS

You can blame Johnny Max for this article. Back in December of 2006, he came to Austin and interviewed me for his podcast (at www.brew-crazy.com). Johnny Max — John McKissack in real life — shared his Cause of Death beer (at an estimated 21% ABV) and I brought my latest attempt at a Samichlaus clone (at around 14% ABV). The bottle I brought was my last bottle of this batch, and I didn't have any plans to brew another very big beer for awhile. However, we got to talking about different ways to make very high-gravity wort using only grains, with no sugars or malt extract added. After the interview, I started thinking. This thinking eventually led to some planning. Planning led to a few back-of-the envelope calculations and this eventually led to four experimental brew sessions. When it was all done, I had come up with a new way to make very-high gravity wort from grains. (For the sake of a definition, lets say anything over 1.090 (22 °Plato) is very high gravity.) Before I spill the beans, let's take a fairly in-depth look at the usual ways to make very high gravity wort.

There are a couple standard ways that all-grain brewers make their wort for very big beers. The easiest way is to add enough grains to your mash tun so that you can fully sparge them and collect a reasonable amount of pre-boil wort for your batch size. Then, you simply add malt extract to raise the specific gravity. For example, you might add 10 lbs. (4.5 kg) of malt to your mash tun, run off the first wort, then sparge the grain bed until your final runnings drop to a specific gravity (SG) of 1.008-1.010. At this point, you will probably have collected around 6 gallons (23 L) of pre-boil wort at around SG 1.040 (10 °Plato). (The exact volume and gravity will depend on a lot of things specific to your brewery and procedures.) You could boil this down to 5 gallons (19 L) at SG 1.048 (12 °Plato) in 60 minutes. With the addition of malt extract in the boil, you can hit any target gravity you like. For example, if you added 5.0 lbs. (2.3 kg) of dried malt extract, you'd have 5.0 gallons (19 L) of an SG 1.093 (23 °Plato) beer.

USE WORT TO MASH A SECOND (OR THIRD) GRAIN BED AND GO BIG

Another way to brew a very big beer is collect "a ton" of wort and boil it "forever." You might, for example, start with 20 lbs. (9.1 kg) of malt. When the grain bed is fully-sparged, this should yield around 12 gallons (45 L) of wort (at ~1.040/10 °Plato). You could then boil this down to 5 gallons (19 L), although this

Reiterated MASH RECIPES

Mjollnir

(Single Reiterated Mash)
(5 gallons/19 L, all-grain)

OG = 1.095 FG = 1.024
IBU = 35 SRM = 7 ABV = 9.2%

In Norse mythology, Mjollnir is the hammer of Thor, the God of Thunder. At one point, the King of the Frost Giants (Prymr), steals Mjollnir, hoping to use it entice Freyja (the Norse Goddess of Fertility) to marry him. To get his hammer back, Thor dresses up as Freyja and goes to the wedding banquet. When a love-struck Prymr presents "Freyja" with the weapon as a token of his affection, Thor rips off his disguise, slays Prymr and mops the floor with frost giants. Now, if Thor can go through all that for his Mjollnir, is it too much to ask for you to add a second mash to your brewday for yours?

Ingredients

First mash
- 3.0 lbs. (1.4 kg) 6-row pale malt
- 3.25 lbs. (1.5 kg) flaked maize
- 3.75 lbs. (1.7 kg) Pilsner malt
- ¾ tsp. calcium chloride

Second mash
- 3.0 lbs. (1.4 kg) 6-row pale malt
- 3.25 lbs. (1.5 kg) flaked maize
- 1.25 lbs. (0.57 kg) Pilsner malt
- 2.5 lbs. (1.1 kg) Vienna malt
- ¾ tsp. calcium chloride

11 AAU Magnum hops
(0.69 oz./19 g of 16% alpha acids)
½ tsp. yeast nutrients
¼ tsp. calcium chloride
White Labs WLP833 (German Bock) yeast
(3 gallon/11 L yeast starter)
White Labs WLP885 (Zurich Lager) yeast
(for kräusen beer)

Step by Step

Use soft water with under 50 ppm carbonates for your initial mash liquor. In your lauter tun, mash grains for the first mash at 150 °F (66 °C) in 15 qts. (14 L) of water. Stir in first dose of calcium chloride as you mash in. Hold at 150 °F (66 °C) for 20 minutes, stirring occasionally, then stir 150 °F (66 °C) water into the mash to make a total volume of 6 gallons (23 L). Let mash sit for about 5 minutes (for grains to settle), then recirculate briefly and run this wort off to your kettle. (You can do this very quickly.)

Dissolve second dose of calcium chloride into wort, then stir grains for second mash into wort and adjust mash temperature to 140 °F (60 °C). Clean out mash tun. Hold mash at 140 °F (60 °C) for 45 minutes, then ramp mash temperature up to 154 °F (68 °C) and hold for another 45 minutes. Stir mash when heat is being applied and adjust burner so that the temperature doesn't increase more than 2 °F (~1 °C) per minute. Heat mash to 168 °F (76 °C), then scoop over to lauter tun. Let mash sit for 5 minutes, then recirculate and run off wort. Sparge with enough 170 °F (77 °C) water to collect 6 gallons (23 L) of wort.

Bring to a boil and add hops and last dose of calcium chloride. Boil for 60 minutes, adding yeast nutrients for final 15 minutes of boil. Cool wort to 50 °F (10 °C) and transfer 4.5 gallons (17 L) to fermenter. Reserve remaining 2 qts. (~2 L) in sanitized container in refrigerator. Aerate main wort with oxygen for two minutes. Pitch sediment from yeast starter. Aerate wort 8-12 hours later with a 1-minute shot of oxygen.

Ferment at 52 °F (11 °C) until fermentation ceases. Put reserved wort in a 6-gallon (23 L) carboy, aerate thoroughly, add a pinch of yeast nutrients and pitch Zurich lager yeast to this wort. Once this wort, now kräusen beer, is fermenting, rack main beer into it. Continue fermenting at 52 °F (11 °C). Once secondary fermentation slows, let temperature rise to 65 °F (18 °C) and gently swirl carboy once. When beer is done, rack to keg and carbonate. Mjollnir will condition faster than you think, so you can start pulling (small) tasting samples after 6 weeks. When Mjollnir is conditioned and ready, invite the giants over.

Ragnarok

(Double Reiterated Mash)
(5 gallons/19 L, all-grain)

OG = 1.142 FG = 1.036
IBU = 34 SRM = 8 ABV = 14%

Ragnarok is the final, cataclysmic battle between the gods and the giants in which almost all life is destroyed. You'll want to have some strong beer on hand.

Ingredients

First mash
- 3.0 lbs. (1.4 kg) US 2-row pale malt
- 3.75 lbs. (1.7 kg) US 6-row pale malt
- 3.25 lbs. (1.5 kg) flaked maize
- ½ tsp. calcium chloride

Second mash
- 3.0 lbs. (1.4 kg) German Pilsner malt
- 3.75 lbs. (1.7 kg) US 6-row pale malt
- 3.25 lbs. (1.5 kg) flaked maize
- ½ tsp. calcium chloride

Third mash
- 2.0 lbs. (0.91 kg) German Pilsner malt
- 1.0 lb. (0.45 kg) German Vienna malt
- 3.75 lbs. (1.7 kg) 6-row pale malt
- 3.25 lbs. (1.5 kg) flaked maize
- ½ tsp. calcium chloride

12 AAU Magnum hops (60 mins)
(0.75 oz./21 g of 16% alpha acids)
½ tsp. yeast nutrients
¼ tsp. calcium chloride
White Labs WLP833 (German Bock) yeast
(5 gallon/19 L yeast starter)
White Labs WLP885 (Zurich Lager) yeast
(for kräusen beer)

Step by Step

Use soft water with under 50 ppm carbonates for your initial brewing liquor. Mash in to 150 °F (66 °C) and hold for 20 minutes. Recirculate briefly, then run wort off to kettle, sparging with enough water to yield 6 gallons (23 L). Stir grains for second mash into kettle and return temperature to 150 °F (66 °C). Hold for 60–90 minutes, stirring occasionally. Scoop mash to lauter tun and run off wort, again sparging with enough water to yield 6 gallons (23 L). Stir final grains into wort and adjust temperature to 140 °F (60 °C). Hold for 60 minutes, stirring occasionally. Ramp temperature to 154 °F (68 °C) and hold for another hour. Heat to 168 °F (76 °C), scoop to lauter tun, recirculate and collect 6 gallons (23 L) of wort. See the Mjollnir recipe for post-mash instructions. The first time you try this mashing technique, your brewday may not go as smoothly as you might hope. Taking thorough notes will ensure that your second attempt goes much better. So don't worry if the first run-through is a bit chaotic . . . it's not like its the end of the world.

would take about 7 hours at a 15% evaporation rate. This would yield a beer with an original gravity (OG) around SG 1.096 (24 °Plato).

To save yourself some boiling time, there is another option. You could add even more malt, collect only the high-gravity first wort, and leave the grain bed unsparged. For example, you could add about 30 lbs. (14 kg) of malt to your mash tun (assuming you had 15 gallons (57 L) of space in your mash tun), mash the grains and drain only the first wort. At a normal mash thickness — in the 1.25 qt./lb. (2.5 kg/L) range — you might collect around 6 gallons (23 L) of wort at 1.085–1.090 (21–22.5 °Plato). Boiled down to 5 gallons (19 L), this would yield a beer with an OG around 1.105 (26 °Plato).

Advantages and Disadvantages

Each of these methods has its ups and down. In the first method, in which you supplement your wort with malt extract, you get good extract efficiency from your grains as the grain bed is fully-sparged. Plus, you don't have to boil for an excessive amount of time. However, malt extract (or refined sugars) cost more than malted grain and — if you really want to make an all-grain beer — adding malt extract is "cheating." (You didn't hear it from me, but lots of commercial big beer producers "cheat" in this manner.)

In the second, very-long-boil method, you also fully sparge the grain bed, but you end up spending a lot of time (and propane) concentrating the wort. During the long boil, your wort will turn many shades darker from the heat. (In this method, the wort is concentrated boiling at atmospheric pressure. In the first method, the malt extract was also concentrated by a long boil, although under a vacuum and at lower temperatures.)

In the third, "big mash," method, you leave a lot of sugars behind in your grain bed. But, the inefficiency of your mash is offset by the fact that you can do a normal-length boil. In this case, the wort is "concentrated" in large part by not diluting it with sparge water.

In my method, you fully sparge the grain beds, you don't add malt extract (or sugars) and you only perform a normal-length boil. How can this work? Well, you might have noticed that I wrote "grain beds," not "grain bed," a couple sentences ago.

In my method, you concentrate your wort in the mash tun by mashing with wort. As such, no part of your wort gets boiled for an extended amount of time — either in your kettle at atmospheric pressure or at the extract plant under a vacuum — so you can brew beers that are ludicrously light-colored, given their enormous gravity. (Looked at another way, you can control the color of your beer through your ingredients choice, not kettle "caramelization.") Another benefit of my method is that you can brew very big all-grain beers without a larger mash tun or a larger kettle. Using your present system, you can brew beers nearly triple the strength you normally could using normal methods. Finally, it's a cheap way of brewing a very big beer, as you don't shuck out for lots of

So You Want to Ferment a VERY BIG BEER?

Normal-strength beer fermentations almost always proceed in a repeatable manner when your pitching and aeration rate are in the right ballpark. For bigger beers, it becomes more important to pitch adequately and aerate well. For very big beers — let's say over SG 1.090, although obviously there's no sharp division between big and very big — extraordinary methods are sometimes required to handle a fermentation and every fermentation may exhibit unique characteristics.

When fermenting a very big beer, you need to pitch a lot of yeast. The pitching calculator at www.mrmalty.com will help you estimate your needs. To raise the required amount of yeast, you may need to make a very large starter — up to the point of brewing a low-gravity batch of beer simply to raise the required yeast for your very big beer. For the dedicated monster beer brewer, investing in a stir plate and large Erlenmeyer flask will help immensely. Intermittently — or constantly — aerating a stirred starter allows you to raise more yeast in a smaller volume of starter wort.

With very big beers, you need to aerate thoroughly. Forget about pouring your wort between buckets or using a whisk — get an aeration stone, an in-line HEPA filter and a small oxygen tank. Give your cooled wort a good shot of oxygen immediately before pitching your yeast. Depending on the gravity of your beer, you may also need to aerate one or more times between pitching and high kräusen. At a minimum, one extra shot of oxygen 6–8 hours after pitching will help the yeast reach a density that will allow them to ferment the wort.

Nutrition is very important in very big beers. Most of the time, adding yeast nutrients will help the yeast cope with the thick wort. Look at the manufacturer's recommendations and add the maximum amount they recommend.

When I make very big beers, I always save 10% of the volume of wort in my refrigerator for kräusen beer. I also reserve some yeast. Once fermentation stops or slows, I aerate the kräusen wort thoroughly, add a pinch of yeast nutrient and pitch the retained yeast to the kräusen beer. When the kräusen beer is fermenting strongly, I add this to my main batch, often in conjunction with racking. This almost always helps with attenuation and makes for a cleaner beer.

Towards the end of fermentation, raising the temperature and perhaps gently stirring the wort will most often shave at least a few points off your final gravity. Happy fermenting!

malt extract or propane. The down side — and hey, there's always a downside, isn't there? — is that your brew day is fairly long. However, it's no longer than with the long-boil method for a comparably-sized beer. So now, finally, allow me to introduce my method — and by "my method," I mean a lot of ideas I mostly stole from a variety of other sources and rolled into one method, which I call . . .

Reiterated Mashing

The basic idea behind my method, which I call reiterated mashing, is that you mash your grains, run off the wort and then use that wort as mash liquor for your next grain bed. In short, you use wort for your mash liquor instead of water. I have done two types of reiterated mashes — a single reiterated mash (with two separate mashes) and a double reiterated mash (with three separate mashes). A single reiterated mash makes a beer that's roughly twice the strength of a singly-mashed beer. A double reiterated mash makes a beer that's about three times that strong. On my system, with my procedures, this yields unboiled wort around 1.075 (19 °Plato) for a single reiteration or 1.108 (27 °Plato) for a double reiteration. Boil these for an hour, from 6 gallons (23 L) down to 5 gallons (19 L), and the OGs are around 1.091 (23 °Plato) or 1.130 (32 °Plato), respectively. Assuming 75% attenuation from the yeast — a reasonably big assumption at these gravities — this yields beers around 9% or 13%, respectively. (With longer boil times, of course, you could hit any target gravity you want.)

The details of your system and brewing procedures — including how finely you crush your grains, your mash thickness, your water chemistry, your lauter tun efficiency and other factors — will affect what OG you reach. Take very good notes if you try this — and don't be too disappointed if your first reiterated mash yields merely a big brute, not a gigantic, slavering monster of a beer.

Here's how a reiterated mash works:

Recipe Formulation

To formulate your recipe, begin with the amount of pre-boil wort you plan to collect. From this, figure out how much grain it will take to make this volume of wort, assuming that you fully sparge the grain bed. (If you don't know this value on your system, start by assuming that 10 lbs. (4.5 kg) will yield about 6 gallons (23 L) of wort once the grain bed is fully rinsed. This can vary quite a bit, though, depending on the raft of things mentioned earlier.) Your grain bill becomes that amount of grain, multiplied by either two or three. What grains go into your grain bill is, of course, your choice. For the purposes of this article, we'll discuss a 5-gallon (19-L) batch of beer in which each mash will use 10 lbs. (4.5 kg) of grain.

First Mash

OK, now you're ready for the first mash of the day. You've got a long day ahead, so keep two things in mind. First, you want to get done with this step as quickly as possible. And secondly, since you won't be doing a mash-out — and hence all the enzymes will be run into the next mash — you don't need to wait for this mash to fully convert before it is run off.

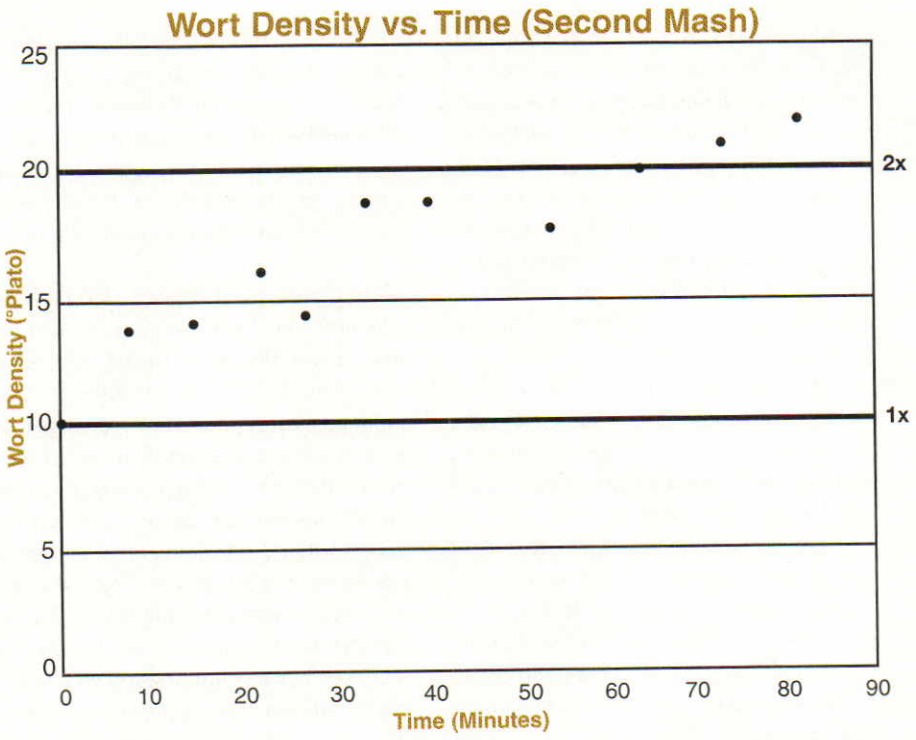
Mash your grains, in your mash tun, at a normal mash thickness at around 150 °F (66 °C). Let the mash sit for around 20 minutes. Stir it every 5 minutes or so to make sure all the starches, enzymes and other stuff gets into solution. Then, add 150 °F (66 °C) water so that your total mash volume is (at least roughly) equal to your intended pre-boil volume. Next, recircu-

late very briefly, for maybe 5 minutes, then quickly run all this wort off into your kettle. At this point, the starches in your mash may not be all converted, nor will your wort be as clear as it usually is. Neither of these issues is a problem.

The grains will absorb some of the water, so you will not have the full pre-boil volume of wort in your kettle. So, sparge the grain bed with hot water until you collect your full pre-boil volume. (In our example, it will probably take about an extra gallon of water for sparging.) Keep the sparge water heated only to the point that your wort runs off at 150 °F (66 °C). Once you have all the wort in your kettle, record the specific gravity, volume of wort and how much sparge water it took to reach your target volume. Congratulations, your first mash is done.

Second and Final Mash

I'll first explain what to do if your first mash is also your final mash — i.e. if you're doing a single reiterated mash. To start with, you'll have your pre-boil volume



In the second mash, it takes time for the starches from the grain to dissolve into the wort. The above results show the increase in gravity during the second of two mashes of equal amount of Vienna malt. Stirring the mash helps speed the process.

worth of single-strength wort in your kettle. It should be at 150 °F (66 °C). Next, stir the crushed grains for your second mash into this wort (which is still in your kettle). In our example, we'd have 6 gallons (23 L) of wort around SG 1.040 and we'd stir 10 lbs. (4.5 kg) of grain into it. This will drop your temperature to around 140 °F (60 °C). If you end up lower than 140 °F (60 °C), add heat and raise the temperature to 140 °F (60 °C).

At this point, your mash is very thin in terms of the liquor-to-grist ratio. However, since the liquor is wort, there is no need to worry about the usual problems associated with a very thin mash.

Let the second mash rest at 140 °F (60 °C) for "awhile." A rest in the 140–145 °F (60–63 °C) range yields a very fermentable wort. Given that we are shooting for a very high OG, this is a good thing. Your rest here should last at least 30 minutes and could be extended to a couple hours. Check your temperature every 15 minutes or so and add heat to keep it right around 140 °F (60 °C). (Always stir the mash vigorously when adding heat.) While this is resting, clean the spent grains out of your mash tun.

After the "fermentability rest," ramp your mash temperature up to around 154 °F (68 °C). Heat the mash so that the temperature rises by about 2 °F (~1 °C) every minute. Stir constantly to avoid scorching the grains. Rest at 154 °F (68 °C) so that your total mash time is at least 90 minutes. If you already rested for longer than that at 140 °F (60 °C), rest at 154 °F (68 °C) for maybe 10–15 minutes.

Once you're done at the 154 ° (68 °C) rest, heat your mash to 168 °F (76 °C) and transfer it to your mash tun. Let it sit in the mash tun for about 5 minutes. Use this time to rinse your kettle. Next, do a normal recirculation and run off the first wort back into your kettle. As with the first mash, the grains will have absorbed some liquid, so you won't yield quite your full pre-boil wort volume. So, as before, sparge with enough water to reach the volume you desire. This time, however, the sparge water can be much hotter than before — just don't let the grain bed temperature rise above 170 °F (77 °C). Once all the wort is in the kettle, record the volume, specific gravity and how much sparge water you used.

Now you've got your full pre-boil volume of "double-strength" wort in your kettle. Boil as you normally would and finish off your beer in the usual manner. After the boil, record the volume of wort and its specific gravity. (See the pg. 40 sidebar for tips on fermenting a big or very big beer.)

Second of Three Mashes

I learned the hard way that, in a three-mash brew, the second mash cannot be rushed. In my first experimental double-iteration mash, I added my single-strength wort to the crushed grains of the second mash, let it sit for about 5 minutes, then ran all the wort off. When I checked the gravity with my refractometer, it was about the same gravity as my single-strength wort. Why? Because it takes time for the starches from crushed barley to dissolve into your brewing liquor when your liquor is wort; the amount of time is much longer than when your liquor is water. So, given that constraint, here's how to do the second of three mashes.

Stir your crushed grains into the single-strength wort in your kettle. The temperature should drop to around 140 °F (60 °C). Begin heating the mash immediately and ramp the temperature up to 150 °F (66 °F). Then, hold the mash temperature there for 60–75 minutes. Stir the mash every 15 minutes. Once an hour or so has passed, most of the starches from the second grains will have dissolved into your single-strength wort and it will be roughly double strength. (Interestingly, on my second experimental three-mash brew, my second wort was more than twice the strength of my single-strength wort — i.e. my mash efficiency went up for the second mash. See the graph on pg. 41 and the section on water chemistry for a possible explanation.) If you have a refractometer, it is easy to take small samples every 10 minutes or so and monitor the progress of second and third mashes.

Once the hour is up, or you have hit your target gravity for the second mash, scoop it to your mash tun and then run the wort off back into your kettle (which you will need to rinse out). Do not perform a mash-out at this stage; you want to retain as many enzymes as possible from the first and second mashes for the final mash. As with the first mash, add just enough sparge water to yield a kettle volume roughly equal to your target pre-boil volume. Record your specific gravity, wort volume and how much sparge water you used and proceed to your final mash.

The Third and Final Mash

The third mash of a doubly-iterated mash is a lot like the second mash in a singly-iterated mash. Basically, you rest at 140 °F (60 °C) for "awhile," then ramp the temperature up into the saccharification range. Give the mash at least a couple hours total, and stir every 15 minutes or so. When you think you're about 20 minutes from being done, take a small sample of wort and take the specific gravity. Then, 20 minutes later — when you think you should be done — take another gravity reading. If the gravity is still climbing and you are not in the range you want to be, stir the mash and wait another 10 minutes or so. Repeat this procedure until you hit the gravity you want (or you give up and say, "I'm done"). Next, recirculate normally, run off the first wort and sparge with just enough water to collect your pre-boil wort volume. For one last time, record your specific gravity, wort volume and how much sparge water you used. The information you collect each time you brew will help you tweak your procedures in subsequent brews.

Water Chemistry

One topic I have yet to experiment adequately with is water chemistry. In a normal, single mash, there are chemical reactions between calcium in your water and phosphates in the grain that lower mash pH. There are also acids in malt, especially in darker malts, that directly lower the mash pH. On the other hand, a mash is heavily buffered by amino acids. If distilled water is used to mash pale malt, the pH of this solution will be in the 5.8 range, and this largely due to the influence of amino acids on wort pH. (Look for more on buffers and their implications in brewing in an upcoming issue of BYO.) Any carbonate ions in the water will also moderate the degree to which the pH drops.

In a reiterated mash, it is possible that the calcium or carbonates get used up by the second or third mash. At the same time, with every mash, your wort gets thicker (and hence more buffered). Depending on how well-suited your water

chemistry is to your grist, your extract efficiency may go up or down in subsequent mashes. For example, if you brew a light-colored "Pilsner" — at SG 1.130 — with soft water, the calcium in the water may be depleted after the first mash and your efficiencies for your later mashes may suffer. On the other hand, I did a three-mash brew using only Vienna malt. My water is fairly carbonate-rich and my efficiency improved with each mash. My interpretation was that the (slightly) darker Vienna malt was gradually depleting the water of carbonates and my pH was sliding down into the optimal range in later mashes. (Admittedly, there are other possibilities, having to do with wort thickness, increased stirring or other factors.)

If you have a pH meter and try this procedure, it may be worth your while to monitor the pH of each mash and stir in calcium (from gypsum or calcium chloride) or carbonate (from chalk or baking soda) as needed. At the least, stirring a little calcium into each mash for light beers or a little carbonate in each mash for dark beers may help you keep the mash pH in a reasonable range.

Conclusion

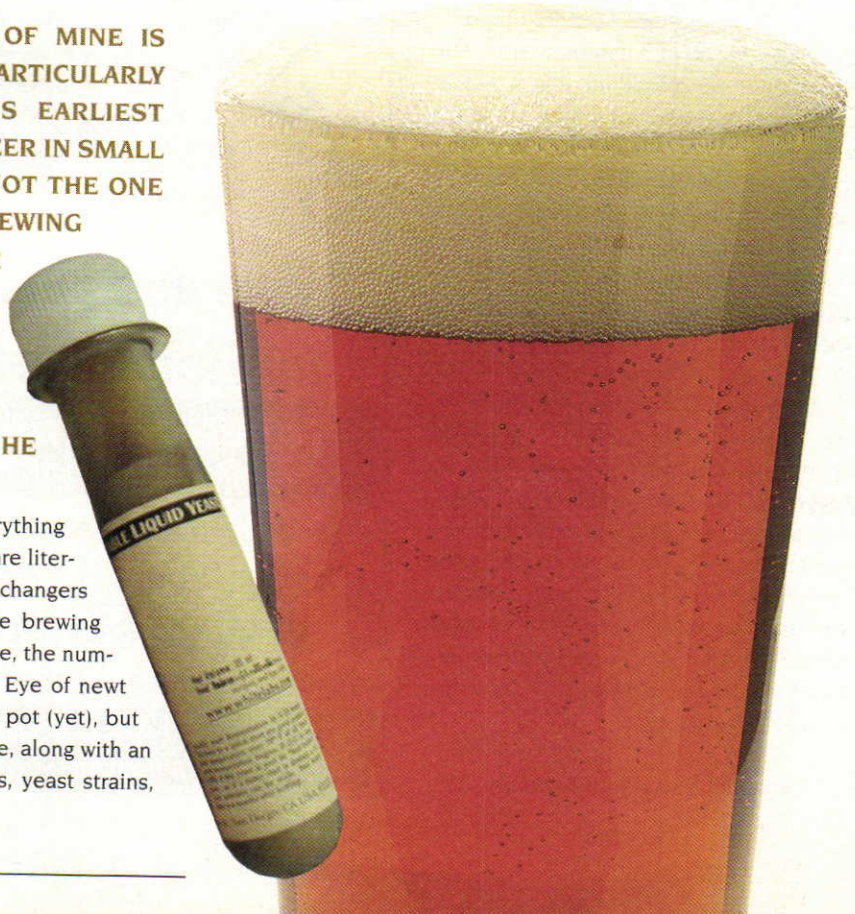
When I first experimented with reiterated mashing, I thought it would be interesting, but mostly a curiosity. The more I tried it, however, the more I began to see the strengths of the procedure. Also, as each experiment rolled by, my extract efficiency either went up or I figured out something that would improve it. I'm now (mostly) convinced that — with a little time, stirring and monitoring of wort pH and specific gravity — most brewers will be able to achieve an extract efficiency almost as high as their normal, single-mash efficiency. The big drawback, of course, is that multiple mashes add time to your brew day. However, when you add everything up, the time expenditure is comparable to collecting a lot of wort and boiling it down. And from an equipment perspective, you don't need a larger mash tun, kettle or hot liquor tank to make a brew three times the size that your system is capable of using normal brewing procedures. If you frequently brew very big beers, you're going to want to try this.

Chris Colby is the editor of Brew Your Own.

NEW ingredients for 2008

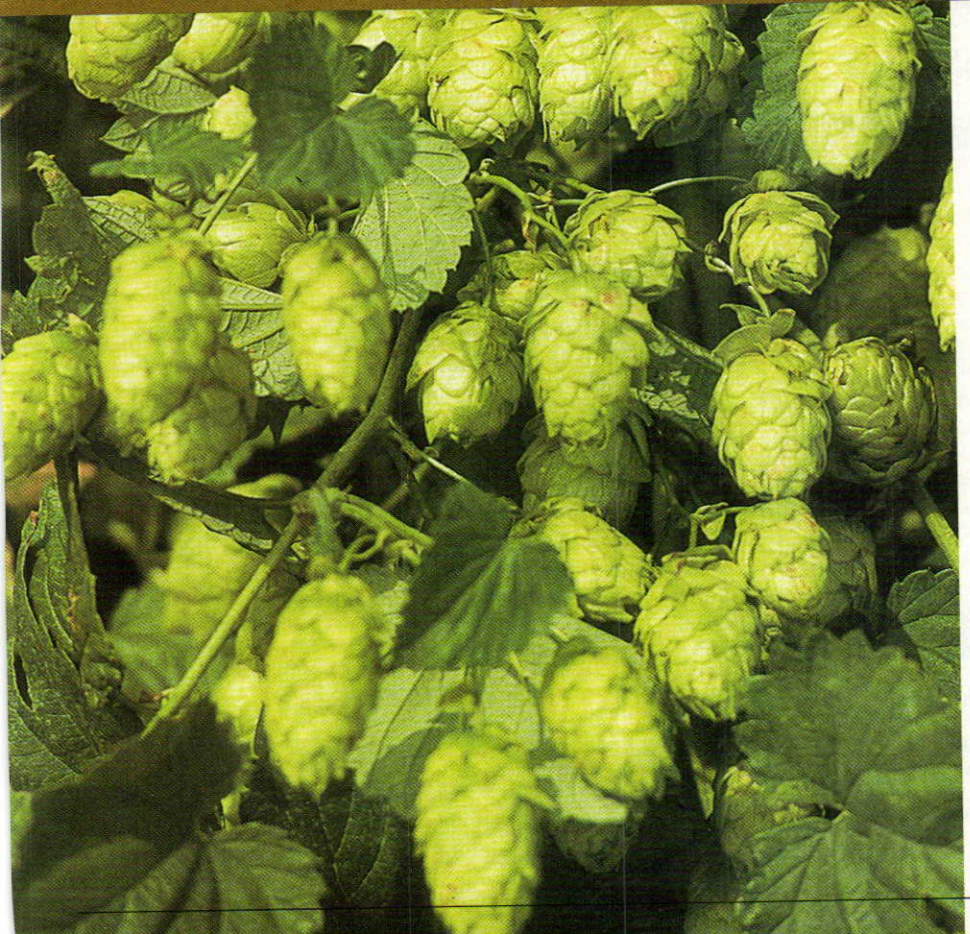
by **Glenn BurnSilver**

A HOMEBREWING FRIEND OF MINE IS FULL OF STORIES. HE PARTICULARLY LIKES TO RECOUNT HIS EARLIEST DAYS TRYING TO MAKE BEER IN SMALL TOWN COLORADO. HIS FAVORITE IS NOT THE ONE ABOUT HIS "PROHIBITION-STYLE" BREWING EXPERIMENTS USING TABLE SUGAR AND BAKERS YEAST (SINCE THAT'S ALL HE HAD), BUT RATHER HIS EXPLOITS OF HEADING DOWN TO A LOCAL BAKERY AND CONVINCING THEM TO SELL HIM GRAINS THAT HE COULD USE IN HIS BEERS.



Today, supplying homebrewers with everything imaginable has become big business, and there are literally thousands of products — from plate heat exchangers to conical fermenters to refractometers to entire brewing "sculptures" — that address every need. Of course, the number of brewing ingredients has proliferated too. Eye of newt has not made it from the witches pot to the brew pot (yet), but all kinds of berry syrups and unusual extracts have, along with an endless amount of malts, specialty grains, sugars, yeast strains,

WHAT'S NEW FOR YOUR BREWS?



hops and spices can be found at most homebrew shops.

Every year new products are unveiled, mostly gadgets and thingamabobs that make the brewing process easier and more efficient. But rolling into 2008, there are also a few new ingredients that homebrewers may want to be aware of. This includes specialty yeast strains, "new" hops and a syrup that can be used to make gluten-free homebrew for beer lovers with Celiac's disease.

YEAST

Yeast strains have seen the most, uh, growth, if you pardon the pun. White Labs and Wyeast now offer bi-monthly specialty strains as part of their Platinum and Very Special Strains programs, respectively.

Currently available White Labs Platinum series strains are Premium Bitter Ale Yeast (WLP026) and Belgian Bastogne (WLP510). The bitter strain is perfect for traditional English style ales. The

Fermentis has expanded their lineup of dried yeast to 6 strains with the addition of a wheat beer yeast. Their entire homebrew lineup is now available in 11.5 g sachets.

Bastogne is a Trappist-style strain with a clean character, for use in high-gravity beers — especially Belgian ales, dubbels and tripels.

Platinum strains for January include Australian Ale Yeast (WLP009) and Essex Ale Yeast (WLP022). The Aussie strain provides a warm bread aroma and character, and is excellent for making robust down-under style stouts and hearty ales. Essex is a classic British-style yeast with dry finish, bready and fruity characters that's excellent for brewing all English style ales.

White Labs has also recently introduced two yeast strain blends, and one new strain licensed from homebrew guru Charlie Papazian — WLP862 or "Cry Havoc." Papazian developed the strain in 1983 and it has the ability to ferment at both ale and lager temperatures, and is excellent for a wide-variety of beer styles. Fermented at ale temperatures the estery essence of berries and apples shines through, yet when used as a lager those esters dissipate for a clean finish. Malt-accented lagers will have a "pleasant

baked bread-like yeast aroma," lab founder Chris White explains.

"It is technically a lager strain," White says, "but everything in his books is made with this strain. It's great for pale ales, IPAs, porters, and any kind of lager. The yeast is really smooth. Anyone who wants to open Charlie's books and tackle those recipes,

"The problem this year is that there is a world shortage of hops," [Olson] says. "There is not enough acreage growing hops to keep up with the demand."

this is the yeast."

The new blends include WLP080 (Cream Ale Yeast Blend). This blend of ale and lager strains makes for crisp and clean American "lager-style ales," imparting a mellow estery aroma. The second blend, WLP568 (Belgian Style Saison Ale Yeast Blend), is excellent in any Belgian beer applications. A mix of ale and saison strains, this yeast creates fruity aromas and flavors with a complexity that can include an earthy, clove-like overtone.

Wyeast's Very Special Strain (VSS) series — which has, in the past, seen the release of Rogue's Pacman yeast and Flying Dog's yeast strain — currently includes Fat Tire Ale Yeast, a proprietary strain from New Belgium Brewery, Canadian/Belgian Ale (3864) and French Saison (3711).

The Fat Tire Ale strain (VSS brewery strains are not numbered) lends crispness and toasty malt flavors to any pale and amber ale. The Canadian/Belgian ale is excellent for any Belgian-style ale and imparts a dry tartness. This strain also

works well at higher fermentation temperatures. The saison yeast creates "bieres" that are highly aromatic with clean, citrusy notes and spicy, peppery highlights.

"I am very excited about this strain," Wyeast Quality Control Manager Greg Doss says. "It's a really great strain and you can make some exceptionally crisp saisons with this."

Wyeast has also released some of their yeast strains in gluten-free form — most recently their 2206 (Bavarian Lager and 1272 (American Ale II) strains. The gluten-free strains are labeled "GF," to distinguish them from the regular Wyeast strains, which are grown on and packaged in media containing gluten.

The ranks of available dried yeast strains has also expanded. Fermentis released a new dried yeast strain called Safbrew WB-06 in June. This is a wheat beer or weizen beer strain, available in 11.5 g sachets. (In addition, Safbrew S-33 and T-58, formerly available in 10 g sachets, are now sold in 11.5 g packages.)

HOPS

To hear Hop Union owner Ralph Olson tell it, newer (and less popular) hop varieties may not be hard to find in 2008, but we had better stock up on our old favorites.

"The problem this year is that there is a world shortage of hops," he says. "There is not enough acreage growing hops to keep up with the demand."

That doesn't mean there aren't hop varieties available, though classics like Cascade may be tougher to come by. Less popular varieties like Columbus, Santiam and Amarillo are becoming the new favorites, Olson says.

"Amarillo is on fire," Olson laughs about the hop variety often used as a Cascade substitute in American pale ales. "Columbus is real popular now. Liberty and Crystal have gone nuts. These are less traditionally-used hops."

Hop Union's online data book at www.hopunion.com/hopunion-variety-databook.pdf contains information on many hops varieties, as well as suggested substitutions — which may come in handy this year.

Some European hop varieties that may not be new, but are new to North American homebrewers, can now be found in some well-stocked homebrew shops.

These include the Czech, Saaz-derived varieties Premiant and Sladek, the Polish hops Marynka and Lubelski and the relatively new German Saphir.

NEW SYRUPS

Celiac disease is the intolerance to gluten, a common protein found in most grains including barley, wheat, rye, spelt, oats, kamut and triticale. This list, of course, encompasses the grains most commonly used in beer production. For homebrewers suffering from Celiac's disease, Briess Malts & Ingredients Company is now making sorghum syrup, which is gluten-free.

"We have two options with different degrees of fermentability," Briess Technical Services Manager Bob Hansen explains. "One is our 45 DE High Maltose, which has similar fermentability to a brewer's wort, right around 75 % apparent attenuation. The other is a syrup called 60 DE. It's closer to 80–85% fermentable."

Hansen says that the 45 DE syrup works better in the brewing process since one of the challenges of brewing gluten-free beer is retaining a certain amount of unfermentable sugar to give the beer some body.

Finally, for brewers of Belgian beers, dark Belgian candi syrup is now available called Dark Candi. This syrup — imported from Belgium — yields a subtly different flavor than the rock sugars that are frequently labeled "candi sugar" in homebrew shops. It is reputedly the same syrup that is used in several Belgian breweries.

Not too many years ago, Munich malt was exotic and Vienna malt was unheard of in North American homebrew shops. These days, homebrewers have an array of ingredients to choose from. For homebrewers looking to try something new (or those unable to find old favorite hop varieties this year), new ingredients may yield new beer-drinking experiences.

Glenn BurnSilver has written many articles for Brew Your Own *inlcuding a piece about gluten-free beers in the March-April 2007 issue. He lives, writes, brews and collects vinyl records in Fort Collins, Colorado.*

Where to find more information:

www.briess.com

www.darkcandi.com

www.fermentis.com

www.hopunion.com

www.whitelabs.com

www.wyeast.com

PRACTICAL

Porter has a long history, with its own creation story and tales of its subsequent evolution intertwined with the changing technology, emerging consumer protection laws, tax structure and pub culture of England . . . but that isn't the point of this article. This article is about the practical considerations homebrewers face when brewing an "ordinary-strength" porter, with ingredients you can find in your homebrew shop. Porter is one of the most flavorful styles of beer. As such, we'll look at porter from the perspective of its component flavors.

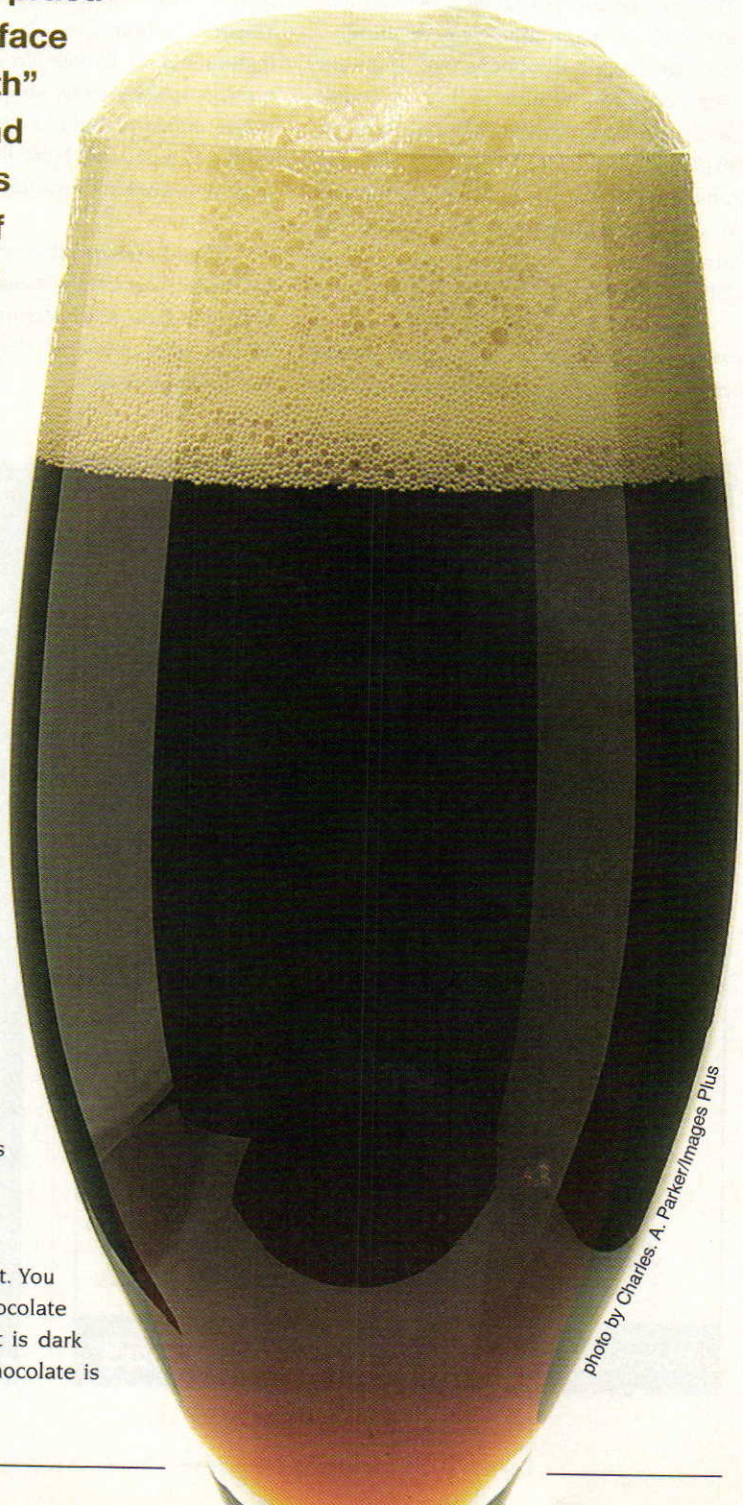


photo by Charles A. Parker/Images Plus

Porter Styles

Brown porter is a mildly-roasty, chocolate-flavored brew, usually with a nice dollop of caramel sweetness — pretty much a darker version of brown ale. Robust porter is, well, more robust. Darker grains, usually including black patent malt, lend a sharper edge to its roast character. Higher gravity and higher hopping rates make it a more aggressive beer than brown porter. If you're like me and worry about flavor first and styles second, porter can be brewed on a continuum from smooth and mild to sharp and aggressive, and everything in between.

Diversity of Dark Grain Flavors

Darkly roasted malts are the cornerstone of any porter. Both the aroma and flavor of a good porter will show a nice, roasted malt character. This can also be accentuated with the aroma and flavor of roasted (unmalted) barley. Most porters have a chocolate edge to their roastiness, especially those brewed in the brown porter tradition. Many also have coffee notes. Robust porters may additionally have a highly-roasted character to them that has a bit of a bite to it. Given the wide variety of darkly-roasted malts and grains available, porters show a wide variety of roast profiles.

Chocolate Malt

Most porters are formulated with at least some chocolate malt. You can, in fact, make a nice, mellow porter with a good-quality chocolate malt being the only dark grain in your grist. Chocolate malt is dark brown and usually falls in the 350–400 °L range. The name chocolate is

PORTER

by Chris Colby

very apt as the malt gives a very chocolate-like flavor and aroma to porters. For more on this malt, see page 30.

Black Patent Malt

Black malt, or black patent malt, gives a very sharp, roasty edge to a beer, often with some bitter and acidic notes. The "aggressive" roast character in most robust porters is due to this malt. Black malt is usually used in conjunction with other, more mildly-roasted malts. As the name implies, black malt is very dark, with a Lovibond rating of 500 °L or more. Unlike most other dark grains, black malt has little aroma by itself.

Roasted Barley

Unlike chocolate malt and black malt, roasted barley is made from unmalted barley. It comes in two different versions, one that usually falls around 300 °L and a more darkly roasted version falling around 500 °L. The darker version is the type of roasted barley found in most Irish stouts. In porters, this can be added to give some stout-like notes reminiscent of coffee.

Brown Malt

Historically, porters were brewed from a dark base malt called brown malt. This malt is commercially available, but many times it is hard for homebrewers to find. (If you're curious about a brown malt porter recipe, see Terry Foster's article on porter in the January-February 2003 issue of BYO.)

Other Dark Malts

These days, most homebrewers have access to a wide variety of dark malts. These include pale chocolate malts, coffee malts, debittered black malts, chocolate wheat malts and on and on. Any of these are candidates to be used in a porter. Give the grains a whiff the next time you are at your local homebrew shop and you should be able to tell if you want to experiment with them.

How Much?

Porters are darker than brown ales or dark milds and have enough dark grains in the grist to give a roast character beyond that found in either of these two beers. On the top end of the scale, porters can be darker and more roasty than a stout, although the character of the roast is usually different — i.e. not based so much on roasted barley (500 °L). As a rough guideline, brown ales usually contain up to 0.5 lbs. (0.23 kg) of dark-roasted grains per 5.0 gallons (19 L), with the darkest grains being absent or used in very small quantities. Brown porters usually contain between 0.5 lbs. (0.23 kg) and 0.75 lbs. (0.34 kg) of dark grains, with chocolate malt being the most prevalent. Robust porters most often contain from 0.75 lbs. (0.34 kg) to 1.25 lbs. (0.56 kg) of dark grains per 5.0 gallons (19 L), with a substantial portion of the dark grain fraction being black patent. As we will see, many factors will influence how the dark grain portion of the grist is perceived.

Crystal Malt and Other Specialty Grains

What tastes great with chocolate? How about caramel? Crystal, or caramel, malts show up in the vast majority of porter recipes. "Medium" crystal malts (40–60 °L) give a nice, caramel-like flavor and aroma to a beer. Darker crystal malts (60–90 °L) additionally give some plum or raisin notes while the darkest (90–150 °L) additionally have some roast character to them. Crystal malts also add sweetness and body to a porter. You can use one or more crystal malts in your grain bill and also pair them with specialty malts.

The amount of crystal malt in porter recipes varies, but from 0.5 lb. (0.23 kg) to 1.25 lbs (0.56 kg) is typical. In lower amounts, the dark grains are at the forefront of the beer, with the crystal malt only playing a supporting role. In higher amounts, both the roast and the sweet/caramel flavors mingle.

Other malts — including biscuit, Victory, aromatic, melanoidin, honey, rye, etc. — can be added to give the beer more complexity. However, as always, there's a tradeoff; adding little elements for complexity takes focus away from the main elements of the beer. I generally prefer simpler recipes that stress

PORTER RECIPES

Paranthropus Porter
(5 gallons/19 L, all-grain)

OG = 1.054 FG = 1.014
IBU = 46 SRM = 58 ABV = 5.2%

A robust porter with a nice balance between the sharp bite of black patent malt and hop bitterness. Chocolate notes mingle with English hops in the nose. This won first place in the dark beer category of the Austin ZEALOTS 2004 Homebrew Inquisition. Do not skip making the yeast starter as the beer will not attenuate properly without it.

Ingredients

7.75 lbs. (3.5 kg) English 2-row pale ale malt
2.0 lbs. (0.91 kg) Munich malt (10 °L)
8.0 oz. (0.23 kg) crystal malt (40 °L)
5.0 oz. (0.14 kg) crystal malt (60 °L)
7.0 oz. (0.20 kg) chocolate malt
5.0 oz. (0.14 kg) black patent malt
3.0 oz. (85 g) roast barley (500 °L)
11.3 AAU Northern Brewer hops (60 mins)
(1.3 oz./35 g of 9.0% alpha acids)
0.5 oz. (14 g) First Gold hops (15 mins)
0.5 oz. (14 g) First Gold hops (0 mins)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast
(1.5 quart starter/~1.5 L starter)
⅞ cup corn sugar (for priming)

Step by Step

Mash at 154 °F (68 °C) for 50 minutes in 15 quarts (14 L) of brewing water (liquor). Mash out to 168 °F (76 °C). Boil wort for 90 minutes, adding hops at times indicated in the ingredient list. Ferment at 68 °F (20 °C).

Extract option:

Omit pale ale malt, reduce amount of Munich malt to 2.5 oz. (71 g) and add 2 lb. 11 oz. (1.2 kg) Muntons Light dried malt extract and 3.3 lbs. (1.5 kg) Muntons Light liquid malt extract to the ingredient list. Steep crushed grains at 154 °F (68 °C) in 2.5 quarts (2.3 L) of water for 45 minutes. Rinse grains with 1 quart (~1 L) of water at 170 °F (77 °C). Add water to make 3.5 gallons (13 L), stir in dried malt extract and bring to a boil. Boil for 60 minutes, adding hops at times indicated in the ingredient list. (Do not let boil volume drop below 3.0 gallons/11 L; add boiling water to top up if this occurs.) Add liquid malt extract with 15 minutes left in boil. Cool wort, then transfer to fermenter. Top up with cool water to 5.0 gallons (19 L), aerate and pitch yeast. Ferment at 68 °F (20 °C). One beer falls clear, rack directly to keg or bottling bucket. (In other words, skip your secondary fermenter.)

Molasses and licorice option:

Add one 12-oz. (355-mL) bottle of Granny's unsulphured molasses and 2.0 in. (5.1 cm) of brewers licorice for last 15 minutes of boil.

Fourth Quarter Porter
(5 gallons/19 L, all-grain)

OG = 1.044 FG = 1.009
IBU = 30 SRM = 40 ABV = 4.6%

A more highly-attenuated, less caramel-sweet version of a brown porter. A firm, but not overpowering, roast character takes center stage on this balanced, drinkable ale. A brown porter with the session beer sensibilities of a dark mild or dry stout. Invite a few buddies over — even the ones who "don't like dark beers" — and this keg of porter will kick by the fourth quarter.

Ingredients

4.0 lbs. (1.8 kg) US 2-row pale malt
3.0 lbs. (1.4 kg) Munich malt (10 °L)
8.0 oz. (0.23 kg) crystal malt (40 °L)
6.0 oz. (0.17 kg) chocolate malt
2.0 oz. (57 g) black patent malt
1.0 oz. (28 g) roast barley (500 °L)
0.75 lb. (0.23 kg) cane sugar
8.0 AAU Willamette hops (60 mins)
(1.6 oz./45 g of 5.0% alpha acids)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Safale S-05 yeast
(1.5 quart/~1.5 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

Mash at 149 °F (65 °C) for 60 minutes in 10 qts. (9.5 L) of brewing liquor. Collect around 5 gallons (19 L) of wort — stop collecting wort if specific gravity of runnings drops below 1.010 — and add water to make 6.0 gallons (23 L). Boil for 60 minutes, adding hops at times indicated in the ingredient list. Add cane sugar for final 15 minutes of boil. Ferment at 68 °F (20 °C).

Countertop partial mash option:

(Brewing follows basic countertop partial mash procedures. See the October 2006 issue of ***BYO***, or corresponding article at byo.com, for more on this technique.) Omit pale malt. Add 3.0 lbs. (1.4 kg) of Coopers Light liquid malt extract to the ingredient list. Use a 2.0-gallon (7.6-L) beverage cooler as a mash tun for your partial mash. Mash at 149 °F (65 °C) for 60 minutes in 5.5 quarts (5.2 L) of brewing liquor. Collect first wort and add 180 °F (82 °C) water to cooler to restore previous liquid level. Collect second wort, add water to wort in kettle to make make 3.0 gallons (11 L). Bring wort to a boil. (No DME is added before the boil.) Boil wort for 60 minutes, adding hops at times indicated in the ingredient list. Add liquid malt extract and sugar with 15 minutes left in boil. Cool wort (perhaps by placing brew pot in cold water in sink), then transfer to fermenter. Top up with cool water to 5.0 gallons (19 L), aerate and pitch yeast. Ferment at 68 °F (20 °C).

"The Bellhop" (Raspberry Porter)
(5 gallons/19 L, all-grain)

OG = 1.048 FG = 1.012
IBU = 34 SRM = 50 ABV = 4.6%

A middle-of-the-road porter, with raspberries. The flavor and aroma of porter dominate this brew, but both are rounded out with raspberry notes. A fruit beer that even a guy can enjoy, but one that also says, "Hello Ladies!"

Ingredients

6.25 lbs. (2.8 kg) US 2-row pale malt
2.0 lbs. (0.91 kg) Munich malt (10 °L)
1.0 lb. (0.45 kg) crystal malt (30 °L)
9.0 oz. (0.26 kg) chocolate malt
5.0 oz. (0.14 g) black patent malt
4.5 lbs. (2.0 kg) raspberries
9 AAU Magnum hops (60 mins)
(0.56 oz./16 g of 16% alpha acids)
Wyeast 1272 (American II Ale) or White Labs WLP051 (California V Ale) yeast
(1.5 quart/~1.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Mash at 152 °F (67 °C) for 60 minutes in 13 quarts (12 L) of brewing liquor. Boil for 75 minutes, adding hops at times indicated in the ingredient list. Ferment at 68 °F (20 °C). After primary fermentation has finished, add raspberries to a sanitized bucket and rack beer on top of them. (You do not need to do anything to attempt to sanitize the fruit.) Let beer condition, in contact with the fruit, for about a week. (You will see a bit of a renewed fermentation from the sugars in the raspberries. This should only last a day or two.)

Extract option:

Omit pale malt and reduce amount of Munich malt to 2.0 oz. (57 g). Add 2.0 lbs. (0.91 kg) Briess Light dried malt extract and 3.3 lbs. (1.5 kg) of Briess Light liquid malt extract. Steep grains at 152 °F (67 °C) for 50 minutes in 3.0 quarts (2.8 kg) of water. Rinse grains with 1.5 quarts (1.5 L) of hot water (170 °F/77 °C). Add water to make 3.0 gallons (11 L), add dried malt extract and bring to a boil. Boil for 60 minutes, adding hops at times indicated in the ingredient list. Add liquid malt extract with 15 minutes left in boil. Cool wort, then transfer to fermenter. Top up with cool water to 5.0 gallons (19 L), aerate and pitch yeast. Ferment at 68 °F (20 °C). After primary fermentation has finished, add raspberries to a sanitizd bucket and rack beer on top of them. Let beer condition, in contact with the fruit, for about a week. (You will see a bit of a renewed fermentation from the sugars in the raspberries. This should only last a day or two.)

Web extra:

Bonus porter recipes on the Web at:

http://byo.com/feature/1670.html

the main aspects of a beer, believing that good brewing technique does far more to make a beer stand out than a hint of this or a smidgen or that. However, my porter recipes tend to be relatively complex and I do think it pays to think of all the great flavors in porters and how they can be complemented or contrasted with other beer and "non-beer" flavors.

Base Malt

You might think that in a flavorful beer like porter, the base malt wouldn't matter much, but it does. The roast and caramel flavors in porter don't cover up the flavors of the base malt, they just appear alongside it.

Porter is often brewed as an English-style ale. As such, a good English pale ale malt is a great base. Pale ale malts, usually kilned to around 3 °L, have an "English" nutty/toasty aspect to them that works great in big, full-bodied porters with lots of caramel character. In porters in which the roast characters are front and center, and the amount of crystal malt is limited, the more "blank" quality of domestic pale malt — often coming in just under 2 °L — may be more appropriate.

The maltiness of porter can be accentuated by adding some Vienna or Munich malt to the grist. It wouldn't be traditional, but you could also use either of these for 100% of your base malt.

Extract brewers should choose a light malt extract for most of their fermentables, and steep or partial mash the roasted grains and specialty malts for color and flavors. Dark malt extracts are available; however, if you want to be able to tweak the roast character in your porter, using light malt extract supplemented by a steep or partial mash is the way to go.

Astringency

Beers containing more dark grains are more likely to have some astringency in them. This is because darkly-roasted malts give up their tannins a bit easier in the mash. In a dark beer like a porter, adding less dark malt really isn't an option. So, it pays to keep two things in mind. First, if you don't oversparge, you probably won't get an excessive amount of astringency, even in the darkest porter. Monitor your final runnings and don't let them drop below SG 1.010 (or rise above a pH of 5.8, if you have a pH meter). Also, you can cool down and taste little samples of your runnings as you direct them to your kettle. Once the runnings start to have a puckering, drying sensation to them, stop collecting wort.

Finally, keep in mind that a hint of astringency in a porter, especially an aggressive robust porter, is not a bad thing. In most beers — especially lightly colored and flavored beers — brewers strive to minimize astringency. However, a small amount in a dark beer can actually be a good thing — a pleasant, drying sensation in the aftertaste. As with many things, it's all a matter of degree.

Mashing and Steeping

For all-grain brewers, a single infusion mash is all that is required for a porter. For a "rounder," full-bodied brew, mash

between 152 °F (67 °C) and 156 °F (69 °C). Mash out to 168 °F (76 °C) when the mash is done to (mostly) stop enzymatic activity. In addition, there's absolutely no reason to extend your mash beyond the point in which an iodine test shows that all the starches are converted.

For a beer that's a bit more dry, mash around 148–150 °F (64–66 °C), for about 60 minutes. In a drier beer, the roast character will be accentuated and your porter will have a dry-stout-like element to it. A mash thickness of 1.25–1.5 qts./lb. (2.6–3.1 L/kg) will work well no matter what your mash temperature is. In any case, as mentioned above, don't oversparge. Quit collecting wort at the appropriate time and — if needed, in a lower-gravity beer — add enough water to reach your full, pre-boil volume.

Extract brewers can either steep their grains or do a partial mash that includes some base malt. When steeping the malts, hold the temperature between 150–156 °F (66–69 °C) and keep the liquor-to-grain ratio below 3.0 qts./lb. (6.3 L/kg).

Hop Choices

Cocoa and coffee are both bitter. Hops are bitter. Can these elements exist side-by-side in a porter — they sure can!

Since porter originally comes from England, many homebrewers choose English hops for their brews. And, all the classic English hops will work well in a porter. One of my favorite hops for a porter is Northern Brewer. Northern Brewer is often described as a minty and, gee, do chocolate and mint taste good together? (Hint: yes.) As with the type of base malt, don't think that the variety of hops you choose isn't going to matter.

The amount of hops you add is dependent on your own tastes. Generally, in porters with more of a focus on chocolate, caramel, sweetness or other "soft" flavors, less emphasis is placed on hop bitterness. (The BJCP lists 18–35 IBUs as the range for brown porters.) In porters with a sharper roast character, more hops provide a nice balance. (The BJCP lists 25–50+ IBUs as the range for robust porters.) In a robust porter, the hops should also have enough character to compete with the other bitter flavors. This, in my opinion, is a place for high-cohumulone hops to shine.

"Non-Beer" Ingredients

Porter is one the best styles to add "other" flavors to. You can, for example, accentuate the chocolate-like and coffee-like flavors and aromas with actual chocolate or actual coffee. You can pair the chocolatey notes in a porter with other flavors frequently found paired with chocolate in cooking; these include raspberry, vanilla, almost anything sweet — and even a little heat from mild chili peppers. Smoked porters can also be excellent. Porter is a style of beer in which it pays to think like a cook when you formulate the recipe.

Carbonate-Rich Water

Good brewing water is (nearly) flavorless; however, you need to pay attention to your water when brewing a porter to get the best character from the dark grains. In any mash, calcium ions in your brewing

liquor react with phosphates from the malt to produce acid. When brewing a dark beer, the dark grains add additional acidity. When brewing a dark beer using water containing a low level of carbonates, the pH of the wort and beer can drop fairly low and the resulting beer can taste thin and acidic. At higher levels of carbonates, the pH will end up in the proper range and the dark grain character will have a full, rich chocolate/coffee/roast character to it.

To counteract the acids in a mash, you can add either calcium carbonate (chalk) or sodium bicarbonate (baking soda). Adding chalk adds calcium along with the carbonate, and these two partially offset each other in terms of their effect on pH. If your brewing water is deficient in calcium or you only need to make a small adjustment in mash pH, chalk is a good choice. If you already have enough calcium in your water, or you need to make a relatively large change in pH, baking soda may be a better choice. (Note: do not use baking soda that has been used previously to absorb odors from your refrigerator.)

If you have a copy of your water report and brewing software, you can calculate a water profile that will work well for your porter. Most brewing software packages will calculate the residual alkalinity — the amount of alkalinity "left over" after you take the effect of calcium into consideration — for your brewing water based on the levels of various mineral and ions in your water. Water with higher residual alkalinity levels, anywhere in the 3.5 to 5.5 range, are best for a porter.

Another option for the all-grain brewer is to mash in his porter with his "regular" brewing liquor, then stir in sodium bicarbonate, if needed, until the pH of the mash climbs to 5.2 to 5.4.

Your water chemistry does not need to be extremely fine-tuned to brew a great porter. As such, you can take an approach based more on "guesstimation," and still get great results — especially if you brew the porter more than once.

For the all-grain brewer who has not previously adjusted his water chemistry, here's a quick-and-dirty approach to sodium carbonate additions for a porter. If the best beers you have ever brewed with your untreated water were light-colored beers, add 1.5–2.5 tsp. of baking soda per 5 gallons (19 L) of mash liquor. If your best

beers have been light amber, add 1.0–1.5 tsp. per 5 gallons (19 L). If dark amber beers have been your forte, add 0.5–1.0 tsp. per 5 gallons (19 L). Finally, if brown to black-colored beer have consistently outshined your lighter-colored efforts, add 0.0–0.5 tsp. of baking soda per 5 gallons (19 L) of brewing liquor.

Extract and partial mash brewers have a strange dilemma when brewing a porter. All of the dark grains for your porter are steeped or mashed with comparatively little base malt. Unless you use exceedingly carbonate-rich water, the pH of your steep or mash will be very low — below a pH of 5, and maybe even below 4. Since all the dark grains are "concentrated" in a steep or partial mash, you need a lot of carbonates in the mix to counteract the acidity. As such, extract or partial mash brewers should only add half the planned amount of chalk or baking soda to their brewing liquor. The remaining half should be stirred directly into their steep or mash.

Once you've mixed up your brewing liquor, give it a taste. You should never let your water treatment plan make your water taste bad.

No matter if you've calculated your residual alkalinity down to 3 decimal points or just winged your carbonate additions based on the above recommendations, taste you porter critically and make any further adjustments only if the flavor of your beer requires it. If your porter tastes acidic, add more carbonate the next time you brew it. On the other hand, if it tastes flabby or the hop character seems overly coarse, add less carbonates to subsequent batches.

Yeast and Attenuation

Porters can be brewed with ale or lager yeast, but the overwhelming majority of homebrew recipes call for ale yeast. Any decent English or American-style ale yeast will work well in a porter.

For a full-bodied beer, pick a yeast strain that isn't too attenuative. My favorite porter strain is Wyeast 1968 (London ESB)/White Labs WLP002 (English Ale) strain. This is reputedly Fuller's yeast, and they make a great porter. For a drier beer, any attenuative strain — I like Wyeast 1056 (American Ale), White Labs WLP001 (California Ale), Safale US-05 or Nottingham — will ferment to a lower final gravity. The lowered sweetness and body of the beer will accentuate roast and hop profile.

Conclusion

In a porter, you have lots of elements to balance. Your ingredients, water, brewing procedures and how you handle the fermentation will all effect how your beers turn out. Fortunately, with porters, there is a fat "sweet spot." Any decent recipe, brewed with acceptable water, is going to turn out fine in the hands of a competent homebrewer. After brewing your first porter, you can hopefully use the practical advice in this article to tweak the appropriate variables and create your own perfect pint of porter.

Chris Colby brews porter from the carbonate-rich, "extra chunky" water of Bastrop, Texas.

Cereal Mashing

Methods for using starchy adjuncts

by Jon Stika

Mention the word "cereal," and most folks think of ready-to-eat breakfast food. To a brewer, cereal is the grain produced by any number of grass crops from *Avena sativa* (oat) to *Zea mays* (corn) that has not been sprouted to make malt. Cereal grains make up the greatest quantity and provide the most energy to the human diet, more than any other type of crop in the world. As brewers are well aware, barley in its malted form serves as the staple cereal grain of brewers worldwide because of its high enzymatic power when malted, and a husk that serves as a convenient filter following the mash.

But in a broader sense, what we are really engaged in when it comes to mashing is converting starch to sugar so it can be fermented by yeast. While the starch contained in cereal grain is in a fairly handy package, almost any starchy plant material from seeds to roots or tubers can be included in a mash — as long as it is handled appropriately.

So why should you as a homebrewer bother concocting a cereal (or other type of starchy adjunct) mash to include in your brew? Historically, starchy adjuncts have been used in beer to add flavor, save money or because of the sheer necessity of making beer with whatever starch source was available. Homebrewers today use cereals or other starchy adjuncts (hereafter referred to simply as adjuncts) for the same reasons, and also to exercise the creativity allowed by performing your own mash.

To explore the world of adjunct mashing you should first consider several questions: What style of beer do you plan to brew and how would various adjuncts complement that style? Are you going to perform a step mash or double (split) mash? What adjuncts do you plan to use and how should they be handled?

Cream ale or American lager are two beer styles that typically employ a mash with corn and/or rice. However, there are many interesting possibilities to explore by using either traditional or unusual adjuncts to modify existing beer styles or create something truly unique. Traditional adjuncts include corn, rice, wheat, barley and oats. Some unusual adjuncts include sweet potato, pumpkin, sorghum, millet, and rye among many others.

The question of whether to perform a double mash with the main malt bill mashed as a single infusion (and the adjunct mash then added to it, hence the name double mash), or a step mash is largely a matter of equipment. A step mash works best if you have a mash vessel to which you can apply heat (i.e. kettle), and a double mash works best if you have a mash vessel to which you cannot apply heat but is well insulated (i.e. converted cooler). In either case the adjunct mash itself will be prepared in a separate pot that can be heated on a burner.

With either approach, an adjunct mash is prepared and then added to the main mash. With the step mash procedure, the main mash is held at a low enough temperature so that the temperature can be increased to starch conversion range even after the hot adjunct mash is added. With the double mash procedure you will not have the luxury of applying heat to the main single infusion mash other than by means of adding hot water. Because there are obvious limits on the size of the mash vessel and the desired consistency of the mash, a brewer cannot simply add excessive quantities of water to accomplish the task of adjusting the mash temperature. Therefore, some special attention needs to be paid to monitoring and adjusting the temperature with a limited amount of water after the adjunct mash has been added when using the double mash procedure.

There are various approaches that can be used in the double mash method to control the temperature of the single infusion mash to which the adjunct mash is added. One approach is to prepare a slightly thick single infusion mash near the low end of the starch conversion range (149 °F or 65 °C) and allow the boiling hot adjunct mash to raise the temperature of

Flaked Rice

Flaked Wheat

Torrified Wheat

Flaked Corn

Photos by Ian McKenzie

the whole combined mash nearer to the higher end of starch conversion (158 °F or 70 °C) temperature. When using this approach, keep some cold water or ice cubes on hand to cool things down if you overshoot the temperature somewhat.

Another approach is to allow the adjunct mash to cool down very near to the main single infusion mash temperature before combining the two. This should have minimal impact on either the temperature or consistency of the combined mash. If you are going to use a double mash system, take careful notes of quantities and temperatures when the adjunct mash is added and any temperature adjustments that were made to help predict or modify your process as needed in the future.

Now let's run through an example adjunct mash procedure using corn grits and a step mash system.

First, prepare your main barley malt mash as usual in a kettle on a burner except to start at 133 °F (56 °C) and reserve enough malt to include in the corn grit mash. Then hold the mash at that temperature while you prepare the corn grit mash in a separate pot.

"There are many interesting possibilities to explore by using either traditional or unusual adjuncts to modify existing beer styles or create something truly unique."

Corn grits are commercially produced by soaking dried corn kernels in an alkaline solution, rinsing, and then drying and grinding them into meal. Polenta is coarsely ground corn. Cornmeal is degermed corn ground somewhat finer than polenta. Any of these products can be used, but the polenta or cornmeal may require a longer cooking time than corn grits. Usually, grits are a bit easier to work with. Combine the grits with between 15% and 30% crushed barley malt (by weight) and enough water to get the mash to the consistency of soupy oatmeal in a pot on the stove and begin heating.

Stir the mixture frequently and add water if necessary to keep the consistency thin and prevent scorching. Bring the temperature of the mixture to the upper limit of starch conversion (158 °F or 70 °C) and hold it there for at least five minutes. This gives the modest amount of barley malt enzymes a chance to reduce the size of the starch granules and reduce their sticking together or causing the mash to stick to the pot.

The starch granules will then become coated with water, loosening hydrogen bonds and dissolving some of the amylose off of their surfaces. This will allow the starch to absorb water and become gelati-

nous or "gelate." This gelation is essential in order for the amylase enzymes of the malt to penetrate the starch in the grits and convert it to sugar after it is added to the main mash.

After the five minute rest, continue to heat the corn grit mash to boiling, stirring constantly to prevent sticking or scorching. Boil the mash for 30 minutes to assure that the starch has absorbed enough water to gelatinize. Starch gelation occurs when starch is cooked in water between 140 °F (60 °C) and 200 °F (93 °C), depending on the type of starch.

Then, stir the corn grit mash into the main mash and heat the entire mash up to the desired conversion temperature, which is between 149 °F (65 °C) and 158 °F (70 °C). Hold the mash at the desired conversion temperature for at least 45 minutes before adding the sparge water and lautering as usual.

If you are going to use a starchy adjunct other than a cereal, be sure it is either coarsely ground or in small pieces that will gelate without an excessive amount of cooking (more than 30 minutes) to avoid a sticky or scorched mash.

> "If you are going to use a double mash system, take careful notes of quantities and temperatures when the adjunct mash is added and any temperature adjustments . . ."

Several starchy adjuncts often used in brewing are also available in flaked or torrified form. Flaked grain is steamed then rolled, and torrified grain is moistened and heated until it pops. Barley, rice, oat, wheat, rye, and corn (maize) are commonly available in flaked form, and wheat is readily available in torrified form. Both flaked and torrified grains have already undergone gelation and so can be added directly to a standard mash containing barley malt for conversion without prior mashing or cooking.

There is some debate in brewing circles regarding the differences in finished beer flavor between the use of cooked adjuncts or flaked/torrified adjuncts. While the flaked and torrified products may be more convenient and sometimes yield more extractable sugar than cooked adjuncts, many argue that the cooked adjunct mash produces better flavor.

So join the debate and add to your brewing skills by learning to do an adjunct mash. That way, you can decide for yourself if it results in better beer for you!

Jon Stika is an avid homebrewer from North Dakota. He writes "Techniques" for every issue of Brew Your Own.

Projects

D.I.Y. Wort Chiller

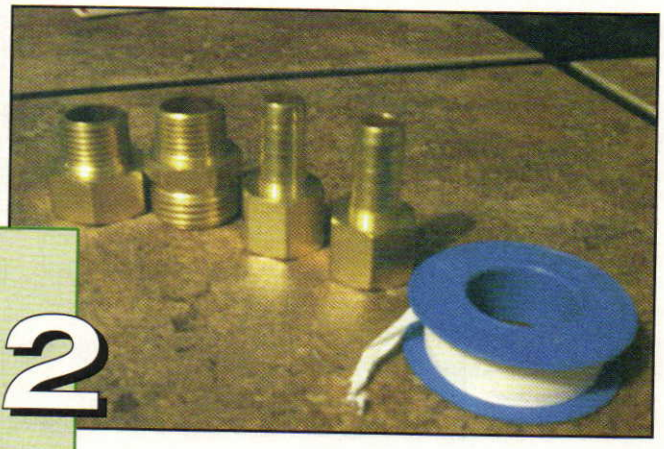
Turn an immersion version into a recirculator

Story and photos by Forrest Whitesides

Given that there are so many places in the world where fresh, potable water is a scarcity, I think the least we can do as enthusiasts of a water-intensive hobby is minimize water usage while brewing. One obvious place to start looking for water usage inefficiencies is the wort chilling process. This project, which turns a typical immersion chiller (the biggest offender in terms of waste water) into a water-recirculating chiller, can be a big help in warmer climates with warm ground water and also useful for reducing water usage.

I've been using a plate chiller for the past year and a half, which is efficient in terms of water consumption. However, I had growing concerns about properly sanitizing homebrew-sized plate chillers, and I was looking for an alternative. I admired a very clever pump-driven "whirlpool" chiller design by BYO contributor Jamil Zainasheff, but I didn't like the idea of pumping the wort around for 15 minutes while it's still hot. So, I considered recirculating the chilling water instead of the wort, a design change that would save a lot of water while using a cheap pump.

This project is a similar concept to the use of ice banks, which have been used in larger breweries for years. In these systems, cold water or glycol is frozen in large reservoir tanks. This allows the breweries to even out the cooling load and have much smaller compressors, saving money.



2 To complete this project, you will need an assortment of brass plumbing fittings.

Project overview

This project is built on three main components: a submersible or in-line pump, a standard coiled-copper immersion chiller, and a cold water reservoir (a plastic bucket or cooler). The reservoir is filled with water and ice. The pump is submersed in the reservoir and the other end is attached to the input side of the immersion chiller (which sits in the kettle, as normal). The output side of the immersion chiller is connected via tubing back to the reservoir, completing the circuit.

Parts selection

Other than a decent pump, all you need for this project is an immersion chiller, (Figure 1) either a bucket or cooler (5-gallon/19-L capacity works fine), some vinyl tubing, and a few brass plumbing fittings to help connect everything (Figure 2 and 3). The most common type of immersion chiller is made from ⅜-inch copper tubing, but ½-inch copper will work as well.

1 In this project, you will learn to convert a regular immersion chiller like this one into one that can recirculate.

Pump selection

Choosing the right pump is the most critical part of this project. If you already have a March model 809 impeller pump (as many homebrewers do), you can skip to the next section. You need a pump that has an operating head pressure rating that exceeds that of the total head pressure exerted by the recirculating system itself (read on for a method to estimate system head pressure). This rating is given in inches or feet of head pressure, which in the broadest sense is any resistance exerted on the pump, be it gravity or other flow impediments like small-diameter system tubing, also known as friction loss. Head pressure is not just how high the fluid must be pumped and includes several other factors (read on). Head pressure is just as important as flow rate when selecting a pump.

To arrive at the approximate operating head pressure of your system, use this formula: System Head Pressure = A + (B / 10) + (C / 2) + (D / 4), where "A" is the vertical height in feet between the water level in the reservoir and the input connection of the

3 This is what your immersion chiller should look like once you've attached the brass plumbing fittings.

chiller, "B" is the total distance in feet of the system (vinyl tubing plus chiller coils), "C" is the number of 90-degree bends in the system, and "D" is the number of miscellaneous adapters and plumbing fittings. All of those things are a factor in how much resistance the pump must overcome to move the water. (This handy equation was appropriated from www.azponds.com.) Note: The above equation assumes the use of tubing that is in the general range diameter as would be found in typical homebrewing setups (see below for more on how diameter effects flow rate). It will be fairly accurate for tubing from about ⅜ inches to ¾ inches in diameter. Another assumption is that the tubing is smooth on the inside and not convoluted or corrugated.

Example: To pump your cooling water up 2.5 feet through vinyl tubing into a 25-foot immersion chiller with four 90-degree bends, along with four plumbing fittings, you'll end up with a system head pressure of approximately 8.25 feet (or 99 inches). Your pump should have a head pressure rating between 10% and 20% higher than your system pressure to get adequate throughput. So for our example, you'd want a pump with a rating between 9.1 feet and 10 feet or more.

Some pump manufacturers will provide a table or graph, known as a pump curve, showing estimated flow rates at various head pressures. These are very useful in determining if a given pump will do the job you need.

Another factor is the difference, if any, between the pump's output fitting diameter and the diameter of the tubing. A quick-and-dirty way to estimate the drop in flow rate is to calculate the percentage difference in diameter between the pump and the tubing and apply that to the flow rate. For example, a pump with a ½-inch output fitting pushing water into a ⅜-inch chiller coil will result in an approximately 25% drop in overall flow rate due to the added restriction of the smaller-diameter coil.

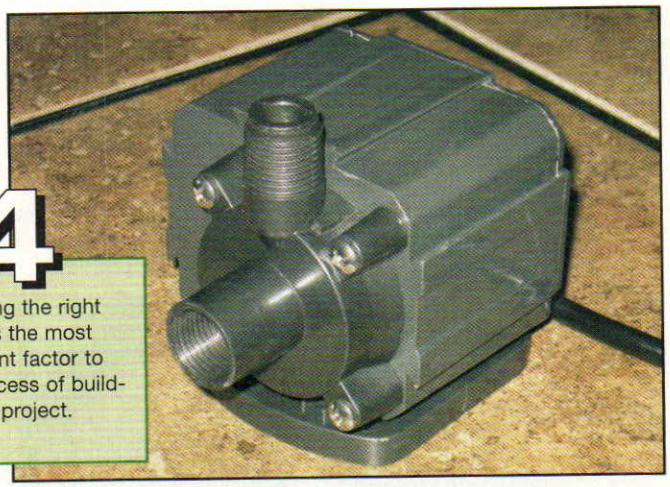
The pump I used when building this project is rated at 370 GPH, or about 6.2 gallons per minute (GPM), and has a maximum operating head pressure of 10 feet (Figure 4). Again, these ratings are maximums under ideal conditions. My setup is almost identical to the example given above and I get a flow rate of about 1.25 GPM through the recirculating chiller at a calculated head pressure of 8.5 feet. As the head pressure of the system increases, the flow rate of the pump decreases. Outdoor pond pumps are a good and cheap way to go, and submersible sump pumps will also work quite well. Both are available at home centers, and pond pumps are available at most pet stores or online.

Chiller operation

1. Prepare the reservoir.

A bucket will work fine, but a cooler will help it stay cold a bit longer as well as allow you to chill the water ahead of time and keep it cool until you're ready to use it.

For ice, you could just use a couple of bags of ice from a local store, but that's not the DIY spirit (and it costs more). As an alternative, you can fill about a dozen aluminum soda or beer cans and freeze them. I picked up this great trick from the Covert Hops Society brew club based in Atlanta, Georgia. You can also add salt to the ice water in the reservoir to drop the temperature a few more degrees. Why this works is outside the scope of this article, but Googling the term "freezing point depression" will give a good explanation.



4 Choosing the right pump is the most important factor to the success of building this project.

2. Ready the pump.

Attach some tubing to the pump's outlet, which may require a fitting. I used a ½-inch female NPT to ½-inch hose barb fitting to make attaching the tubing easier (Figure 5). It is unnecessary to attach anything to the pump's inlet connection, and doing so will add to the system head pressure. Lower the pump into the reservoir, but don't connect it to the immersion chiller (Figure 6).

3. Drop in the immersion chiller.

With 15 minutes or so remaining in the boil, put the immersion chiller in your kettle. This sanitizes the chiller and kills any bad things that might have piggybacked on the outside of the coils.

Now you can either start the chilling as normal with ground water and then switch to the chilling reservoir (see 4a below), or you can simply start off with a very large volume of ice in the reservoir and chill exclusively with the recirculated water.

5 Get the pump ready by attaching some tubing to the outlet, which may require a fitting.

4a. Chilling partially with groundwater.

Once the boil is complete, attach your groundwater source to the input side of the immersion chiller and move the outlet side away from reservoir. Chill the wort with groundwater as you normally would until the temp approaches about 100 °F (38 °C) or so. This will probably take about 10 or 15 minutes, depending on the temperature of your groundwater. You can collect some of this water to reuse later to clean your kettle and other equipment.

You've probably noticed in the past that dropping the wort temperature from boiling to about 100 °F (38 °C) goes pretty quickly — it's those last 20 or 30 degrees that take so long. And it's at this point that the recirculation system kicks in and does the heavy lifting to get your wort to a cool pitching temperature.

Now connect the pump to the input side of the chiller and make sure the outlet tubing is feeding back into the reservoir. Fire up the pump and let the cold water in the reservoir drop the temperature of your wort. If you can keep your reservoir water close to 50 °F (10 °C), your wort should be in the mid- to low-70 °F (21 °C) range (and possibly much cooler) in about 20 minutes, but many factors will effect how long it takes, including flow rate, chiller diameter, etc.

4b. Chilling Only with Ice Water

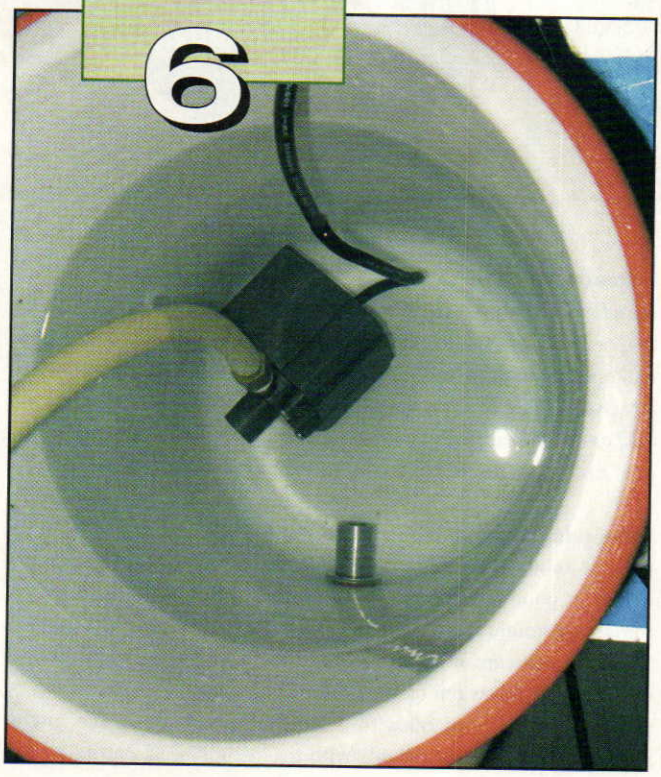
Rather than use groundwater to do the initial phase of the chilling, you can opt to increase the amount of ice in the reservoir significantly and chill the whole batch (down to about 70 °F/21 °C) with just recirculated water. This method can save a tremendous amount of water (more than the previous method), but requires more preparation and equipment to perform most efficiently.

For chilling five gallons (19 L) of boiling wort with this method, you'll need approximately 44 pounds (20 kg) of ice. This is about five gallons (19 L) of frozen water, so if you freeze five 1-gallon Ziplock bags or about six 3-liter plastic soda bottles filled with water, you've got 44 pounds of ice. (If you're interested in how these numbers work, try Googling "latent heat of fusion.")

For maximum chilling efficiency, the water returning to the reservoir from the chilling coil needs to be evenly distributed over the mass of ice. Do this by attaching the outlet tubing to a sparging arm commonly used in continuous (fly) sparging setups (to build a sparge arm, see the November 2006 issue).

Forrest Whitesides writes the "Projects" column in each issue of BYO *and tries to keep his brewing operations green.*

Once you've made all the attachments, lower the pump into the reservoir without connecting it to the chiller.



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Once you've lowered it in, connect the pump to the inlet side of the chiller.

7

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AMERICAN AMBER/RED

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ENGLISH & SCOTTISH STRONG ALE

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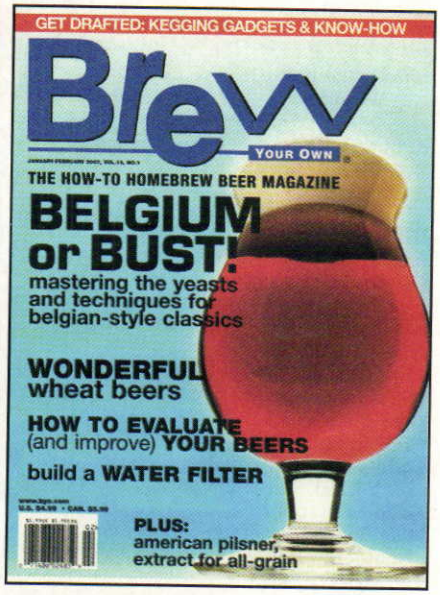

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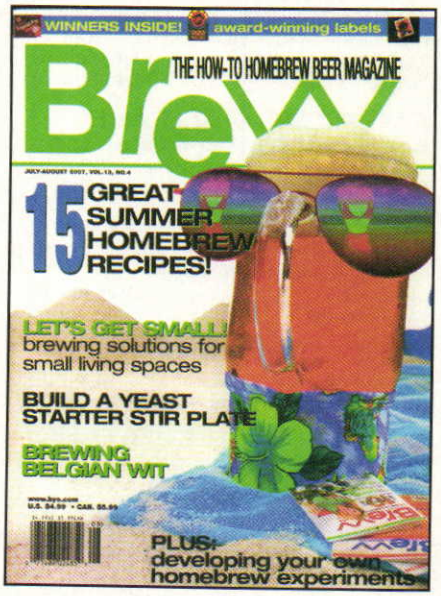

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HOMEBREW DIRECTORY

Best Intentions

The explosive story of root beer gone bad

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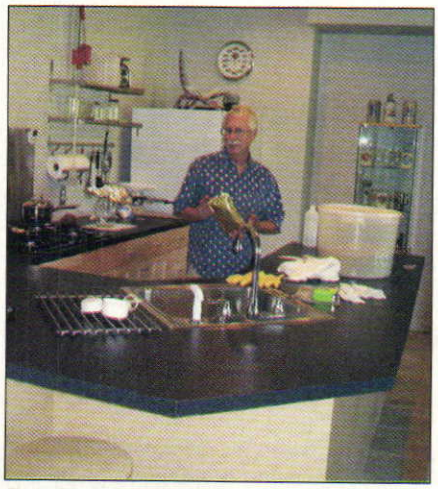


Bob Stovall learned the hard way that it's best to follow a recipe — or at least be careful when selecting yeast!

It was the early 1990's and I was on a roll. Even though I was just a beginner at homebrewing, I was making pretty good beer. I started with kits that went into bottles. It was drinkable and so far I had not hurt anyone. I liked it and so did my friends and neighbors.

It was around that time that I discovered I could make root beer at home, too. I had two kids who liked root beer. We had a lot of kids in the neighborhood who would like root beer. I liked root beer. It just seemed like a natural thing to do at the time.

To make said root beer, I bought a small plastic bottle of root beer extract I found at the grocery store, thinking, "wow, two whole cases or more from that little bottle." I picked up some Red Star Pasteur Champagne yeast to go with it and I had a great project.

The process was pretty straightforward. Boil five gallons (19 L) of water, add four pounds (1.8 kg) of sugar, add the extract, add the yeast, let it ferment for a day, then bottle two cases and wait for carbonation. What could go wrong? All went well. Tasted fine at the bottling, so then I just had to be patient.

Several nights later, asleep in bed, I awoke to a strange noise. I asked my wife, "What was that?" I heard it again. And again. I got out of bed and walked through the house. There it was again. Pop! Pop! As I approached the back of the house, near the brewing room, I began to smell . . . what is it? Root beer! Oh no!

When I got to it, I found the brew room completely soaked with root beer. The floor was wet, the ceiling above the cardboard cases was wet, and there was glass everywhere too. I knew what was happening immediately . . . bottle bombs! This was serious. I quickly got dressed and tried to figure out what to do.

This was clearly a dangerous thing, the glass, the exploding bombs — but it was funny too. Hilarious in fact, but something had to be done.

I decided I clearly could not just reach into the cases and grab the unexploded bottles. That would be a recipe for serious cuts, and the mixing of blood and root beer did not seem appealing in the least.

Then I had an idea — a cover, of course! I ran to the garage, got a handful of shop towels and came back to the brewing room. I covered both cases with two or more towels and waited. All quiet.

I gently moved the first case to the garage, then the second. So far, no more explosions. Success was mine.

The next morning, after a lot of careful cleanup in the brew room, I had to deal with those remaining cases of bottle bombs waiting for me in the garage.

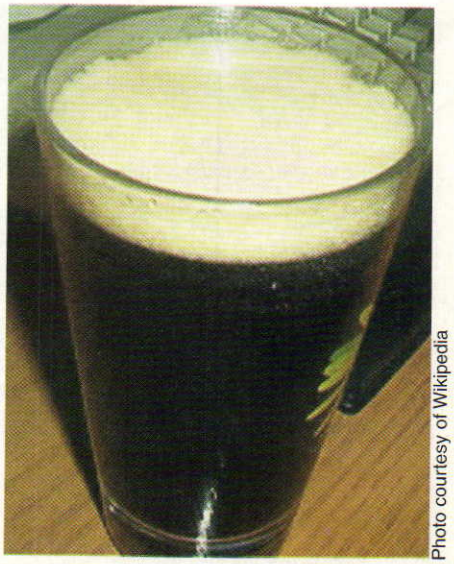
You know, some things are just best done in private. At times, a project like this may require adult language, or at least some solitude. However, the neighborhood kids, of course, had to gather around. They had to get really close to see what was going on. Had to ask a lot of questions. Had to be shooed back to a safe distance. "Why is there root beer running down the driveway Mr. Stovall?" "Why is there glass everywhere?" "What is that noise?"

Trying to get a bottle opener on a bottle bomb is not a lot different than those old WWII movies where the sweating guy has to cut the red wire on the torpedo — or was it the blue wire? I finally figured out how to put the crown cap lifter on the top of the bottle and then cover the thing with a towel while it is still in the cardboard case then open it up.

"Trying to get a bottle opener on a bottle bomb is not a lot different than those old WWII movies where the sweating guy has to cut the red wire on the torpedo — or was it the blue wire?"

Do you know how much foam a 12-ounce bottle of root beer can make? I can tell you it makes enough to smell up the whole garage. A dozen or more will make enough "sticky" to make your tennis shoes squeak until you throw them away.

In the end, I survived. The kids thought it was high comedy, no injuries were recorded (except to my ego) and the experiment was a learning process. The moral of the story? Be careful when playing with yeast and sugar!



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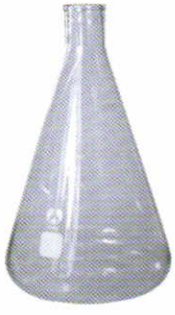

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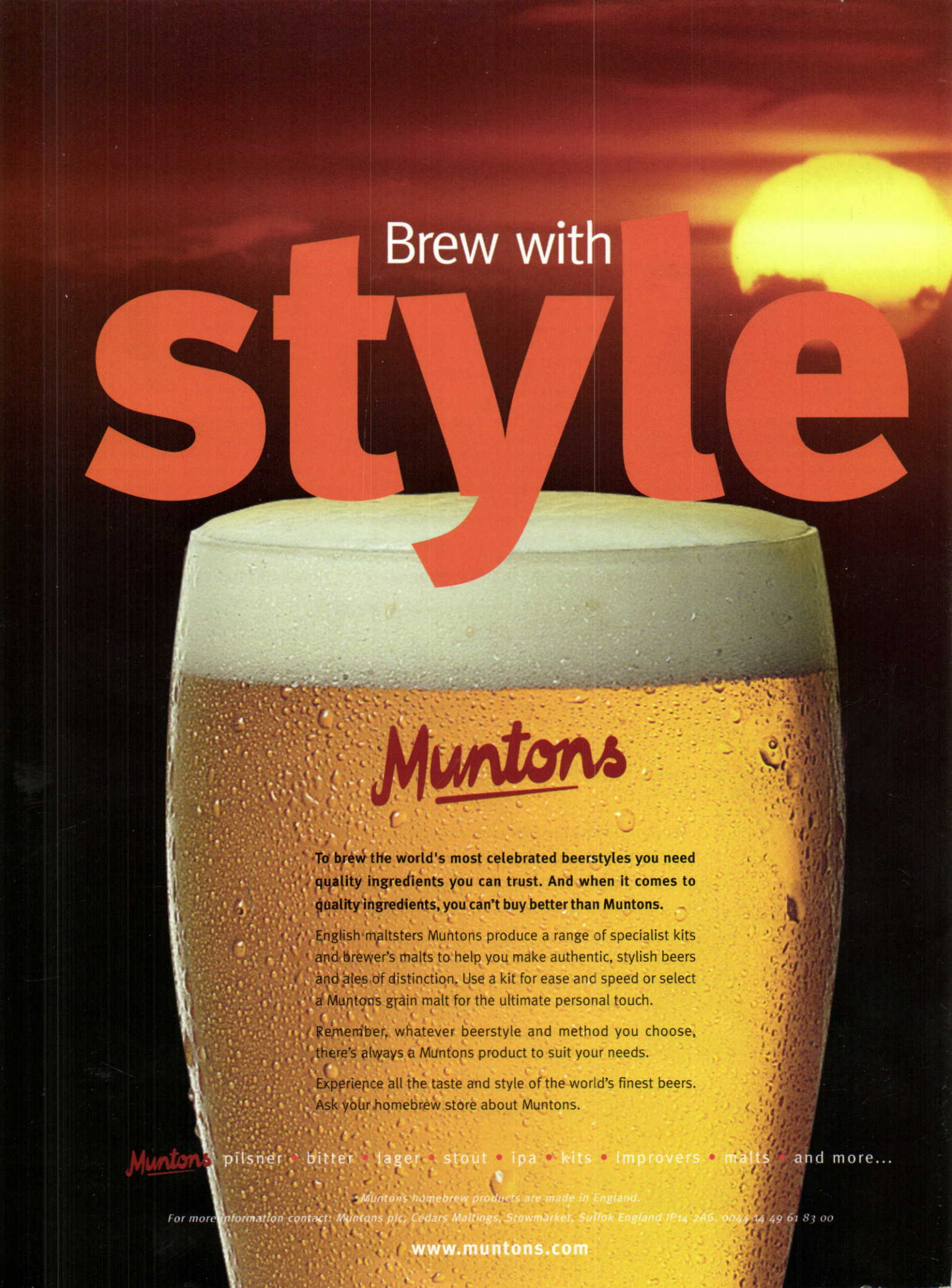
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