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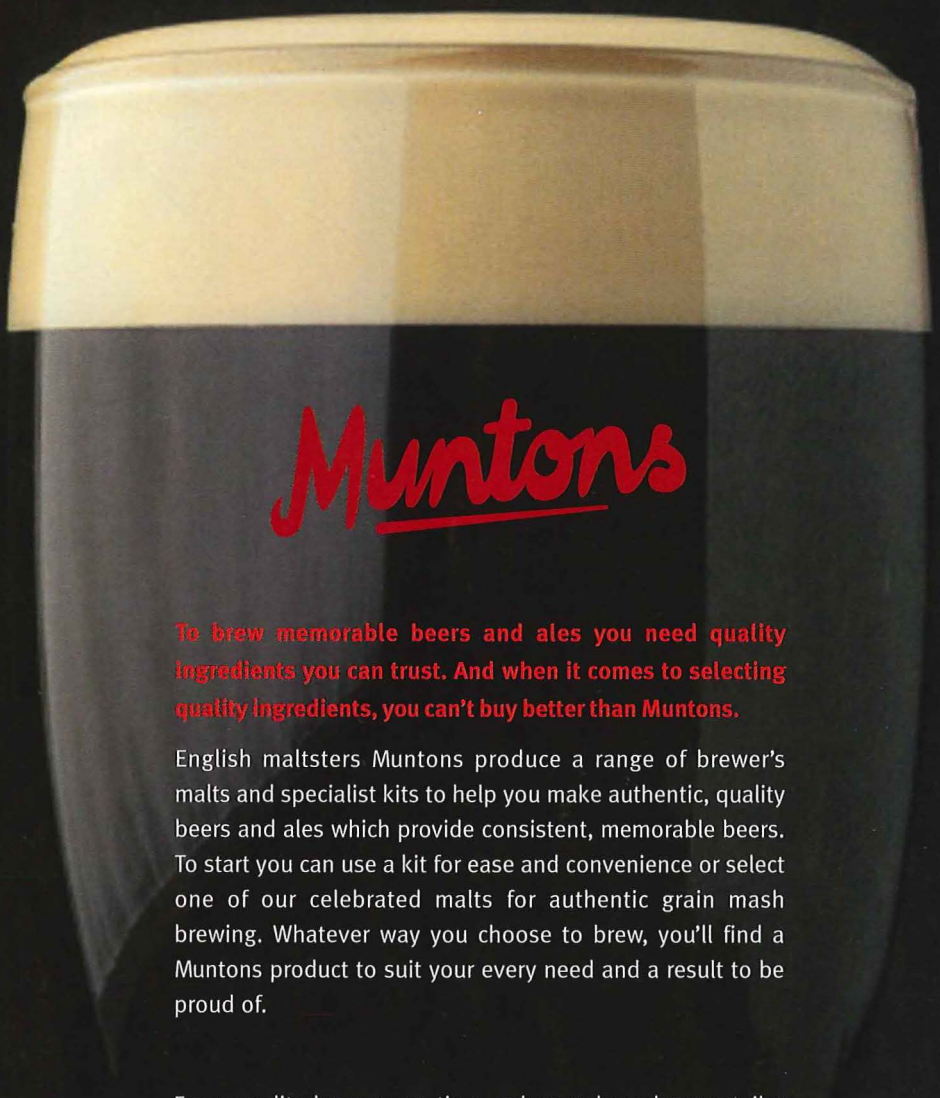
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OCTOBER 2006
Volume 12 Number 6

Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

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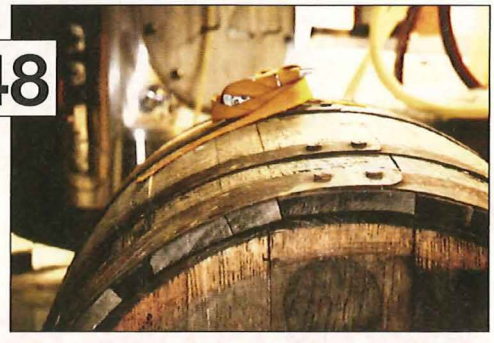
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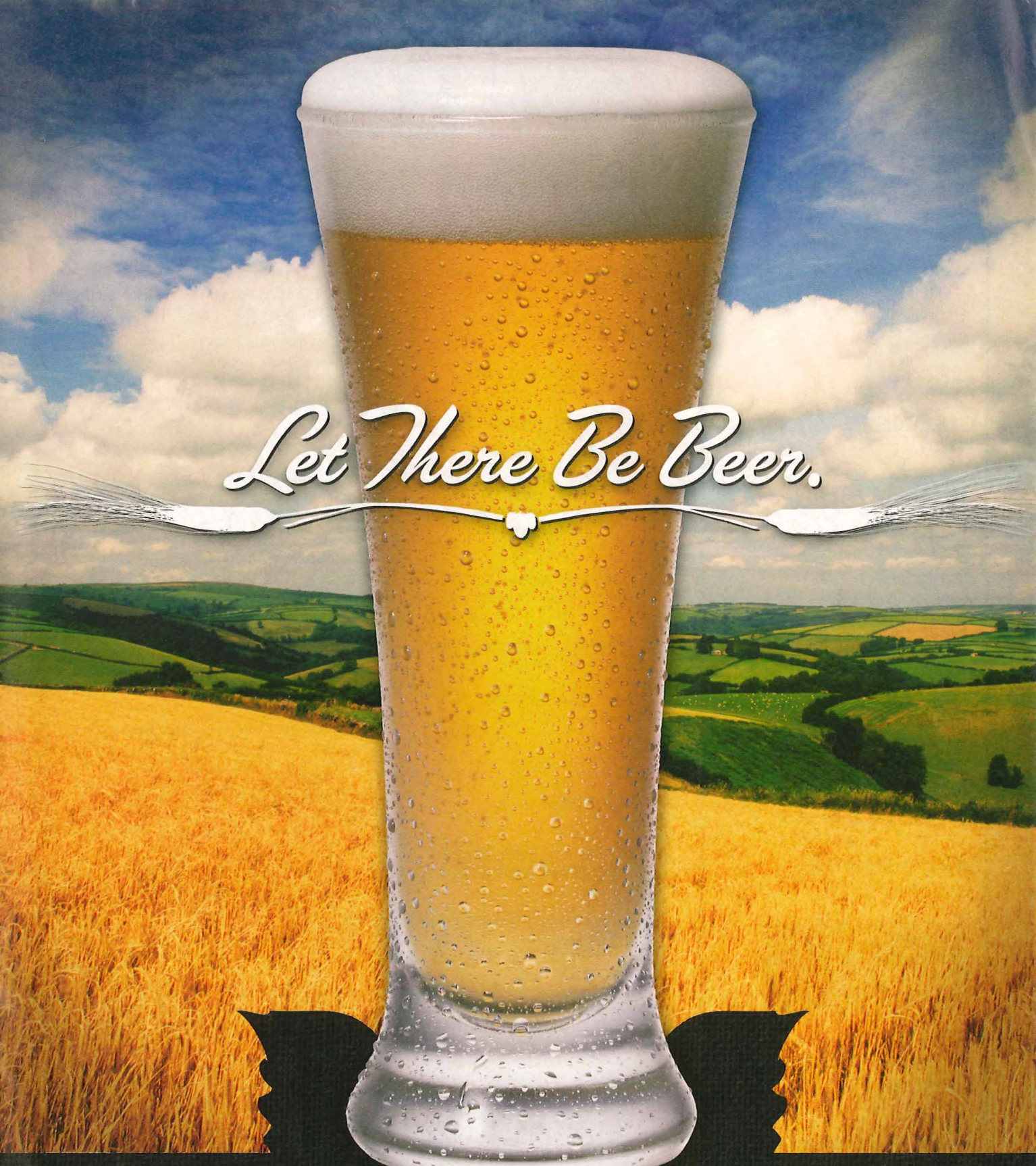




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COVER PHOTO: CHARLES A. PARKER



IN EARLY 1933, BEFORE PROHIBITION COULD BE OFFICIALLY REPEALED, PRESIDENT ROOSEVELT SIGNED EMERGENCY LEGISLATION ESSENTIALLY DECLARING LET THERE BE BEER. IT WASN'T UNTIL DECEMBER THAT WINE AND HARD LIQUOR LEGALLY RETURNED. AFTER BEING DEPRIVED OF LEGAL ALCOHOL FOR 13 MISERABLE YEARS, THIRSTY AMERICANS NEEDED A BEVERAGE OF MODERATION.

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EDITOR
Chris Colby

ART DIRECTOR
Coleen Jewett Heingartner

ASSOCIATE EDITOR
Garrett Heaney

TECHNICAL EDITOR
Ashton Lewis

EDITORIAL INTERN
Dave Green

CONTRIBUTING WRITERS
Steve Bader, Thom Cannell, Horst Dornbusch, Bill Pierce, Marc Martin, Terry Foster, Glenn BurnSilver, Kristin Grant, Paul Zocco

CONTRIBUTING ARTISTS
Don Martin, Ian Mackenzie, Shawn Turner, Jim Woodward

CONTRIBUTING PHOTOGRAPHER
Charles A. Parker

CANINE ASSISTANT
Heidi

PUBLISHER
Brad Ring

ASSOCIATE PUBLISHER & ADVERTISING DIRECTOR
Kiev Rattee

ADVERTISING SALES COORDINATOR
John Ragozzine

BOOKKEEPER
Jim Moulton

NEWSSTAND DIRECTOR
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How to reach us

Editorial and Advertising Office
Brew Your Own
5053 Main Street, Suite A
Manchester Center, VT 05255

Tel: (802) 362-3981
Fax: (802) 362-2377
E-Mail: BYO@byo.com

Advertising Contact
Kiev Rattee
kiev@byo.com

Editorial Contact
Chris Colby
chris@byo.com

Subscriptions Only
Brew Your Own
P.O. Box 469121
Escondido, CA 92046

Tel: (800) 900-7594
M-F 8:30-5:00 PST
E-mail: byo@pcspublink.com
Fax: (760) 738-4805

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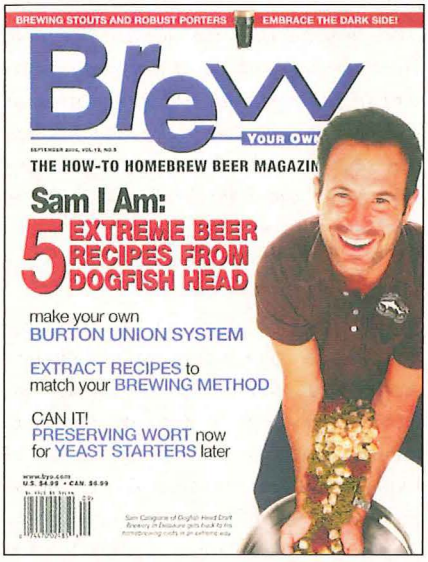
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Extract Late Added Too Early?

In the "Method to Your Madness" story (September 2006), the directions for the extract late recipes are the same as those for the concentrated boil recipes. They have you add all the dried malt extract and boil for 60 minutes.

Kevin Clark
via email



In an extract late recipe, you add some of the malt extract late, not necessarily all of it. In most of the extract late recipes in BYO, *the hops are boiled in the "grain tea" or wort from the steep or partial mash, along with a bit of dried malt extract (DME). Then, at or near the end of the boil, some liquid malt extract is added. This is how the recipes in the "Method" story were formulated.*

Full Wort Boil 1

This letter is in response to your article in the September issue on extract brewing methods. Although you started down this path with the "Texas Two-Step" method that you described, you missed the simplest, most effective way to take extract brewing to new heights: full boil method. The day that I moved out of the garage with a 9-gallon kettle on top of a King Cooker-type of burner, my beer went from good/great to great/outstanding.

You can then combine some other techniques if you wish, such as late addition of the extract, although I have not personally had an experience with carmelization when boiling 6+ gallons of wort. Although this requires a few bucks to go this route, you'll never regret it and your beer will improve significantly.

Kevin Bosch
St. Charles, Missouri

Full Wort Boil 2

I read Chris Colby's article [on extract brewing methods] and I believe it's an excellent write-up. But he did not touch on a 5th extract boil method — a full boil. I do extract with steeped grains these days and I always do a full 5-gallon boil in a 6-gallon stainless steel pot. I need to be careful when adding the bittering hops but after the initial hops, the rolling boil always stays below the lip of the pot providing I keep the heat adjusted just high enough for a good boil. Also, I add small amounts of water during the entire boil to keep the volume up to around 5 gallons.

Tom Hargrave
via email

Story author and BYO *Editor Chris Colby responds: "The full-wort boil is indeed a great way to make extract wort. In fact, it was one of the four methods I tested head-to-head in my October 2004 article, 'Extract Experiments.' The 'Method' story was only meant to compare different stovetop methods of wort production, but the final version of the story failed to stress that distinction."*

A Closer Union

I enjoyed reading this month's *BYO* (September 2006), including the Burton Union project article. I just thought I'd mention that one doesn't really have to travel to the Marston Brewery to see a working Burton System as the article mentioned. Just visit Firestone Walker Brewing in Paso Robles, California. (www.firestonewalker.com/sections/firestoneunion/oak_brewing_system.html)

Also, I'm sure you're aware that some of the Dogfish Head "pre-boil teas" suggest steeping certain grains in large volumes of water that would benefit from being mashed (i.e. 6-row, torrefied wheat, Munich, flaked rye). I just thought you may want to include some sort of disclaimer to your readers regarding that practice.

Guy Cameron
Los Gatos, California

The Union-inspired brewing system at Firestone Walker looks pretty cool.

We did indeed notice that the recipes excerpted from the upcoming book, "Extreme Brewing," called for steeping some base grains in 4.5 gallons (17 L) of water. Most advanced extract brewers, of course, would perform a small partial mash instead, "steeping" the grains in 1–2.5 quarts of water per pound of grain (2–5 L/kg). This would ensure that starch was not present in the finished wort and that astringency was limited.

However, the recipes in the book were designed for beginning brewers and the procedures were kept simple on purpose. (Our own Replicator does the same thing in his column, for the same reason.) We know from experience that brewing this way produces good beer. We also know that complex brewing instructions will dissuade many potential brewers from giving homebrewing a try.

At BYO, *we try to provide content for homebrewers at all levels of involvement in the hobby. (We also know that more advanced brewers will 'upgrade' simple instructions when they appear.) So, keep in mind that every brewer has to start somewhere.*

By the way, Sam Calagione wanted us to tell everyone that ingredient kits for the recipes found in "Extreme Brewing" can be purchased at xtremebrewing.com.

Wondering about Water

Your September Beginners Block on water analysis made me wonder about my recent use of distilled water in my homebrews. I am a late extract brewer with a few grains thrown in. I can boil about 3 gallons in my 4-gallon brew pot. I use the city tap water for the boil, but after racking to my fermenter, I add about 2 gallons or more of distilled water. This is a recent development, but now I'm

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BYO RECIPE STANDARDIZATION

Extract efficiency: 65%
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one gallon of water, would yield a wort of 1.024.)

Extract values for malt extract:
liquid malt extract (LME) = 1.033–1.037
dried malt extract (DME) = 1.045

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

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

second guessing myself. I reviewed my city's water analysis and the water appears to be very soft. Correct me if I'm wrong, but I think distilled water probably approaches zero for all measurements. Thus, I could be diluting some already low or desired measurements to something lower.

You may be asking why distilled water? I got it into my head to use some kind of bottled water (I used to use off-the-shelf spring water) to top off the fermenter, thinking it would less likely contaminate my brew before using tap water that wasn't boiled. But I haven't had any problems over the years when using the tap water to rinse equipment and bottles, so I'm leaning toward using tap water for the entire brew. Your thoughts would be appreciated.

Frank Hoffman
Wichita, Kansas

Distilled water does indeed have mineral levels close to zero. However, keep in mind that your malt extract should have enough minerals dissolved in it to make wort with a reasonable amount of calcium and other ions. As such, using distilled water for extract beers is pefectly acceptable. In fact, we prefer using distilled water for most of our extract beers. (If you're brewing something fairly hoppy, adding a little gypsum can be a good thing.)

For extract brewers, fiddling with the amounts of dissolved minerals in your brewing water is usually not needed. Most tap water is perfectly acceptable for extract brewing, provided it is filtered — or otherwise treated — to remove chlorine or chloramines.

Hop Back to Dry Hops

I took the clone recipe for Tröegs Hopback Amber (May 2005) and am going to put the types and amounts of hops for the hopback in the secondary fermenter as dry hopping instead. I don't have the capability to pump through a hopback.

Anything I need to know about dry-hopping ahead of time beyond just putting the hops in the secondary fermenter? Should I increase the dry hopping amounts over what's called for in the hopback recipe?

Kevin Axt
via email

To dry hop a beer, just put the hops in a nylon bag and submerge the bag in the beer. Boil the bag before you use it and weigh the bag down with something non-reactive in your secondary fermenter. (A stainless steel nut or barbed fitting works great. Some brewers use sanitized marbles.)

Dry hopping yields a somewhat different character to beer than hops in a hopback. Using the same amount of hops would likely be the best starting point when brewing this clone for the first time. Taste the beer side-by-side with the original (if possible) and adjust the amount accordingly next time. Also, note that you can sample the beer and remove the dry hops when the right level of hop flavor and aroma is reached.

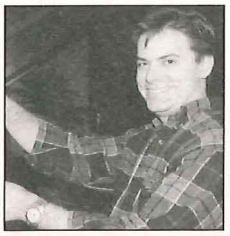
Hop Straining Tip

As a bucket brewer, I had considerable trouble using a conventional kitchen strainer/colander to separate spent hops from the wort as it went into the fermenter. I always needed another set of hands to hold the colander over the bucket, and the steam from the pouring wort was a potential danger to unprotected hands. A typical colander also seemed to clog quickly, making for a very long process.

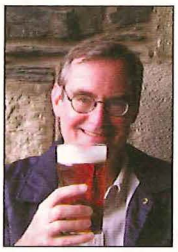
After coercing a professional painter friend to help with the cumbersome straining process, he offered a solution — a disposable mesh paint strainer that stretches over the top of his 5-gallon paint buckets with elastic edging. He uses them once and throws them away, but I found that they rinse and wash up just fine with the regular laundry. Eventual replacements are cheap and readily available at any paint supply store. This great addition allows me to brew alone if I have to (but it's always more fun with pals around).

Jeff Morlan
Sioux Falls, South Dakota

This sounds like a neat solution for straining the hops from your wort. However, we feel compelled to point out that you'll be much, much better off if you cool your wort first, then transfer it to your fermenter.



Ashton Lewis is the Master Brewer at Springfield Brewing Company in Springfield, Missouri and *BYO's* technical editor. He is a graduate of the brewing program at University of California Davis. In addition, as revealed in our September 2005 issue, he is also our Mr. Wizard columnist. The column is a favorite among *BYO* readers and, since 1995, Ashton has answered over 300 letters from homebrewers, looking for a bit of "Wizdom." Ashton says that reading and answering reader letters, "is a great mental exercise that I really enjoy." From this wealth of material over the past 11 years, he is currently working on a manuscript for an upcoming Mr. Wizard book. On page 15 of this issue, he answers questions about ways to calculate a grain bill, the best time to transfer a beer to secondary fermentation and how to get the best performance from your wort chiller.



Paul Dienhart got an extract kit for Christmas in 1998, kept it in a hot closet for six months, made numerous blunders when he finally brewed it and still came out with a beer that was better than the MeisterBrau he had been guzzling. Thus, he was enlightened. Now a member of both the St. Paul Homebrewers and the Minnesota Homebrewers Association and a National BJCP judge, he organized his first bourbon-barrel brewing project four years ago. On page 48 of this issue, his article, "A Barrel of Fun," discusses everything you need to know — from appropriate styles to brew to extended conditioning tips — about brewing and aging a beer in a used bourbon or wine barrel. Making sour beers is also discussed. The barrel brewing article is his first for *Brew Your Own*. In real life he writes and edits a global magazine for Cargill, which manufactures malt.



David Green, *BYO's* new intern, was first introduced to homebrewing at Colby College with buddies experimenting in the chemistry lab. After college, he landed a job as Assistant Brewmaster at Brickhouse Brewery, a brewpub located in Patchogue, New York. Under the guidance of Norman "the brewdude," he learned important lessons in sanitation, hopping, grain mills and most importantly, enjoying the finished product.

David has since moved to southern Vermont to pursue snow and a teaching career. He teaches chemistry and environmental science at Stratton Mountain School in Stratton, Vermont for grades 10-12. He started brewing again two years ago with extracts, but quickly switched over to all-grain. He has a propensity towards Belgian brews, or anything with a nice balance of malts and hops.

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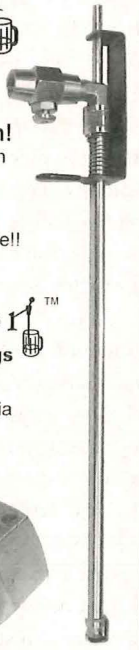
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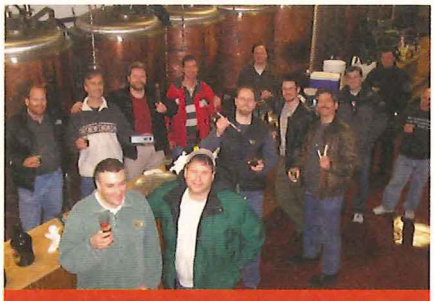
brewer CLUB FIELD TRIP

by David Woods

Ramapo Ruffians

Northern New Jersey and Rockland County, New York

Knowing the specific gravity is important in figuring out when your beer has finished fermenting, the bittering rates of your hops and also in figuring out the alcohol content of your brew. It's important to know just how accurate the methods we use as homebrewers to check specific gravity are. Are all hydrometers, or refractometers, made equal? This question was posed by a member of the Ramapo Ruffians from Northern New Jersey and Rockland County, New York, and we decided to check out the accuracy of our equipment.



The Ramapo Ruffians take a field trip to a local brew pub to test equipment.

So we took a field trip for our club meeting to Neill Acer's soon-to-be-opening Defiant Brewing Company in Pearl River, New York. Even with the hassles of opening a new business, he was nice enough to open his doors and let us run amok inside. We all gawked at the copper and stainless steel equipment along the one wall just waiting to be hooked up and used. The tasting bar had been roughed in and although the top wasn't finished yet, it still held all of our hydrometers (and hombrew).

One of our members brought out some of his lab equipment and started to make an acceptable specific gravity standard for us to start our testing. We used regular water first to calibrate to 1.000 taking care to see that it was 60 °F (16 °C), which is the temperature that most hydrometers are corrected to. Then we used the same water to test all the refractometers. We also noted whose equipment tested at what reading.

Then after heating up the sugar water we finally were able to check everything to a known gravity. We took down the readings while taking turns dunking in the hydrometers one at a time. Care was taken so as to not dilute the sample — drops of water that remain on the side of your hydrometer (or refractometer) can askew the reading, so we all thoroughly shook off the excess water from the first test. The mantra of "keep your instrument clean" was strictly enforced! Both of mine came out a little high, reading 1.042 when it should have been 1.041. I found it slightly odd that two different hydrometers were off in the same way. The same sugar solution was used on the refractometers at first, but then a little twist came. We threw the sugar solution back on the burner to heat it up to an unknown temperature and then had the refractometer guys check their equipment again. This idea came from Neill and he said that even if the refractometer wasn't of the temperature correcting type, it was good to know how far off it could be when adding uncooled wort. Another great reason to have a club meeting in a brewery with a professional brewer present!

Some of the problems that we solved with this excursion were: one member admitted to having a refractometer and not knowing what scale it belonged to: Plato, Balling or Brix. Since he had received it second hand there were no instructions, but the known testing media helped us decide that it was in Plato. Another member in the club had a refractometer that was off by 0.5%! Luckily it was of the adjustable kind and with the instructions it was set back to zero and retested.

But all in all, the hydrometers and refractometers were pretty close. Most with a +/- of .002, which is definitely good enough for the average homebrewer. There were some that were further off though, so it was good for them to discover this — I wonder if their brews will improve! Lesson learned: It's not only good sense to keep your instrument clean, it is equally important to know its accuracy.

homebrew CALENDAR

October 6

The 23rd Annual Dixie Cup Homebrew Competition
Houston, Texas

Deadline for the 23rd Annual Dixie Cup is October 6. The competition will be held October 20-21. Over the course of the two days of formal activities, there will be opportunities to learn about beer and brewing from homebrewers, professional brewers, brewing authors and industry experts. For full information visit www.crunchyfrog.net/dixiecup/index.phtml.

October 7

Hoppy Halloween Challenge
Fargo, North Dakota

Entries are due September 25th through October 7th and the awards banquet will be held on October 28th. Information about the competition and entry forms can be found online at http://prairiehomebrewers.org.

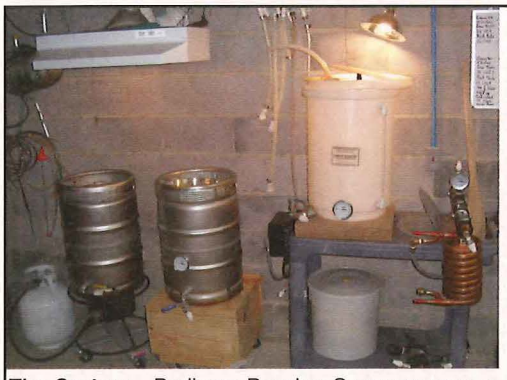
October 27

Knickerbocker Battle of the Brews
Albany, New York

The 11th annual Knickerbocker Battle of the Brews will be held at C. H. Evans Brewing Co. in Albany, New York on November 11. Drop off or mail entries between October 27 and November 3 at any of the locations listed at www.moonbrew.com/kbotb/index.php. Entrants will receive expert commentary by judges recognized by the BJCP. Best of Show takes $250 and gets their beer brewed at C.H. Evans!

homebrew systems that make you DROOL

Brian Dueweke • Richmond, Virginia



The System - Badbrew Brewing Company uses a uniquely designed mobile brewing platform to which the RIMS chamber, wort chiller, pump and control panel are attached. The mash tun sits atop the platform during mashing and the brew kettle sits atop the platform during wort chilling. The platform itself is a base Rubbermaid industrial wheeled cart.



PID- The mixture is circulated through the RIMS system with the mash temperature monitored and controlled by a PID controller.



Sparging - Hot water is sprayed onto the grain bed as the grains are "rinsed" of fermentable sugars and other elements resulting from the mashing process. The run-off is collected in the brew kettle and makes up the wort.



The Lift - After boiling is complete, the hot wort is lifted into position on the brewing cart for chilling. I utilize gravity wherever possible to aid in constant flow control of the liquids.



Chilling - From boiling to yeast pitching temperature (approximately 70 °F/21 °C), hot wort travels through the copper wort chiller and into the glass primary fermenters.

big-winning RECIPE

Michael Ball • Cambridge, Wisconsin

BEST OF SHOW
Big & Huge Homebrew Competition
Madison, Wisconsin

The Big & Huge Homebrew competition is held by the Madison Homebrewers and Tasters Guild. This was the 19th annual competition and received over 90 high gravity brews.

Schwarzbier

yield: 5 gallons/19 L

3 lbs. (1.35 kg) Weyermann Vienna malt
2.5 lbs. (1.13 kg) German pils malt
2 lbs. (0.9 kg) German Munich malt
0.75 lb. (0.34 kg) Belgian Aromatic Munich malt
0.5 lb. (0.23 kg) Weyermann Carafa
0.25 (0.11 kg) Briess CaraPils
0.25 (0.11 kg) CaraMunich
0.46 oz. (13 grams) Magnum hops (16.8% AA) (60 minutes)
0.46 oz. (13 grams) Styrian Goldings hops (4.4% AA) (60 minutes)
0.46 oz. (13 grams) Spalt Select hops (3.5% AA) (30 minutes)
Wyeast 2124 Bohemian (a re-cultured dose from the previous year's schwarzbier was used)
0.75 cup corn sugar (for priming)

Step by Step

Mash at 104 °F (40 °C) for 20 minutes. Increase temperature to 144 °F (62 °C) for 30 minutes. Increase temperature to 148–150 °F (65 °C) for 30 minutes. Increase the temperature to 159 °F (71 °C) until saccharification is determined. Boil for 80 minutes, adding Magnum hops with 60 minutes left in the boil and Spalt Select hops with 30 minutes left in the boil. Start fermentation in the low 50 °F-range (10–12 °C) then drop to mid-40s °F (6-8 °C) after 2 weeks. Secondary fermentation should be held in the low 50 °F-range (10–12 °C) for about two weeks at which time it is ready to bottle. Bottle with 0.75 cup corn sugar and let condition at low 50 °F-range (10–12 °C) until carbonated. When full carbonation has been determined, refrigerate as cold as possible without freezing.

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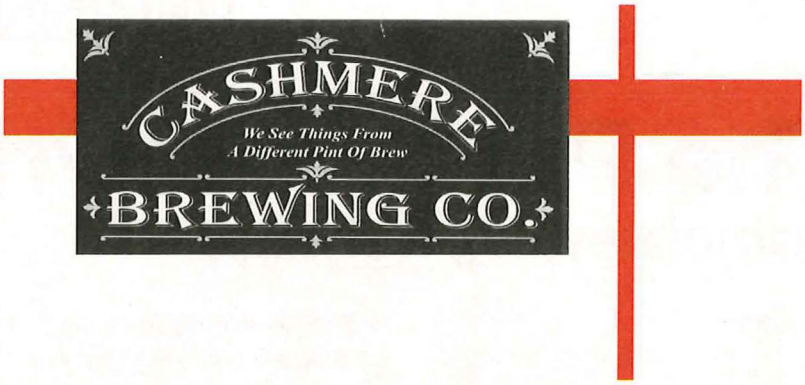
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replicator

by **Marc Martin**





Dear Replicator,

A brewing buddy and I decided to beat the New Mexico heat and head north to sample beers in British Columbia, Canada. While driving through central Washington we stopped for gas in the small town of Cashmere. The station attendant told us about Cashmere Brewing Co. so we checked it out. It is a very rustic, "peanut shells on the floor" place and we even met Joe, the eccentric owner/brewer. There is no food served but all four of his beers were excellent. We thought the best was the Bulldog Amber. We decided that this would be great beer to brew this fall if you could get the details from him.

Brian Davidson
Santa Fe, New Mexico

I hadn't heard of this brewery but it sounded so interesting that I decided to take a short vacation road trip of my own. What I found was a truly unique brewery nestled in the central Cascade Mountains. It is housed in an old warehouse with décor that is a cross between logging camp and a ski chalet. The shells from the complimentary peanuts are sometimes an inch deep on the floor. I had called ahead and was warmly greeted by Joe Nestor the owner/brewer. In fact, it is almost a one man operation. He and a part time assistant, Nate Dogg, brew less than 500 barrels a year on a well used 3-barrel system. His original 1 ½-barrel system is also on display. This is truly grass roots brewing. Joe was an eight-year homebrewer and has attended the American Brewers Guild program. He is a big supporter of the local homebrewers club. Most of his beer is sold right there at the brewpub, but he does have a few local tap accounts.

All 3 of the beers on tap for my visit were very clean and true to style. I also found the amber to be my favorite. It almost has an Oktoberfest profile. Joe describes his Bulldog Amber as a classic American Amber but with a somewhat lower hop level. He shoots for a well balanced beer with a great malt backbone and a higher than normal finishing gravity. The use of a less attenuative English ale yeast allows him to achieve a sweeter and slightly nutty finish. Joe reports that this is his best selling beer and I can see why. He doesn't have a brewery Website yet but for more details you can call Joe at (509) 264-0800.

Cashmere Brewing Company Bulldog Amber – American Amber Ale clone

(5 Gallons/19 L extract with grain)

OG = 1.060 FG = 1.014 IBUs = 28
SRM = 11–12 ABV = 6 %

Ingredients

6.6 lbs. (3.0 kg) Coopers unhopped light malt extract
0.5 lb. (.22kg) amber dry malt extract
1.5 lb. (.68kg) Munich malt grain
0.5 lb. (.22kg) crystal 20° grain
0.25 lb. (.11kg) flaked barley
2 oz. (57g) chocolate grain
½ tsp. yeast nutrient (15 min.)
3.9 AAU Crystal hop pellets (60 min.) (0.3 oz./8.5 g of 13.0% alpha acid)
1.9 AAU Cascade hop pellets (60 min.) (0.3 oz /8.5 g of 5.7% alpha acid)
2.8 AAU Cascade hop pellets (30 min.) (0.5 oz./14g of 5.7% alpha acid)
1.2 AAU Willamette hop pellets (5 min.) (0.25 oz./7g of 4.8% alpha acid)
White Labs WLP 002 (English Ale) or Wyeast 1098 (British Ale) yeast
0.75 cup (150g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 3 gallons (11.4 L) of water at 155 °F (68 °C) for 30 minutes. Remove grains from the wort, add the liquid extract and bring to a boil. Add the first additions of Crystal and Cascade hops and boil for 60 minutes. During the boil, use this time to thoroughly sanitize a fermenter. Add the second addition of Cascade hops and boil for 30 minutes. Add the yeast nutrient for the last 15 minutes. Add the last addition of Willamette hops for the final 5 minutes of the boil. Now add the wort to 2 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Condition for 1 week and then bottle or keg. Allow to carbonate for 2 weeks!

All-grain option:

This is a single step infusion mash. Replace the malt syrup and dry malt extract with 9 lbs. (4.1 kg) 2 row pale malt, 2.25 lbs.(1kg) Munich, 1.25 lbs. (0.56 kg) crystal 20 °L, 0.25 lbs.(0.11 kg) flaked barley, and 3 oz. (85 g) chocolate malt. Mix the crushed grain with 4 gallons (15.2 L) of 170 °F (77 °C) water to stabilize at 155 °F (68 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the first addition (60-minute) of Crystal and Cascade hops to 3.25 AAU (0.25 oz./7 g) and 1.4 AAU (0.25 oz./7 g) respectively due to the higher utilization factor for a full wort boil. The remainder of this recipe is the same as the extract recipe.

The Primer on Priming

Homebrewing bubbles

by Garrett Heaney

The primer

So, you've conducted a healthy fermentation, achieved the final gravity you were targeting and are ready to keg or bottle. If you take a sip of your beer, you'll realize that it's not quite right. Something is missing — it's flat! While not all beer drinkers prefer the pop and fizz of a cold one, most will agree that proper carbonation is crucial to the success of a brew.

There are a couple of ways homebrewers accomplish carbonation in the keg or bottle, but the most common and effective is priming. Priming is the addition of sugar in order to wake up a portion of the dormant yeast that is left behind in a fermented brew. When the sugar comes into contact with the yeast, the yeast becomes active and begins consuming the sugar, similar to the earlier fermentation (only on a much smaller scale). When priming a fermented beer, just a touch of sugar added to a beer with trace amounts of yeast present will result in carbon dioxide production.

In priming, you will seal the container (keg) or containers (bottles) in order to trap the CO_2 and allow the beer to absorb it. The result — carbonation!

Sugar additions

So, now that we know what we're talking about as far as the practice of priming with the object of gaining carbonation, we can discuss our different options as far as sugar additions (i.e. types or mediums of sugar). Two common ingredients for priming your beer are corn sugar (dextrose) and dry malt extract. Both have their advantages and appropriate uses.

Corn sugar is the standard priming sugar. It is a dependable, consistent means to achieving the end.

Dry malt extract is also a popular choice and contains about 60–80% of the fermentable sugar of dextrose. Therefore, you'll need a little more to get the job done and it typically takes a little more time. One advantage of priming with dry malt extract is that you have options as to what types of extract (i.e. pale ale malt or darker malts) and you can pair this with the particular style you are brewing.

How much?

The amounts of sugar that you add for priming depends on whether you are bottling or kegging. In general, the rule of thumb for bottling is ¾ of a cup of dextrose for every 5-gallon (19-L) batch of beer, or 1¼ cups of dry malt extract for the same size batch. For kegging, you will only need about ⅓ of a cup of dextrose or ⅔ of a cup of dry malt extract for the keg.

How do I add it?

The practice of priming your beer is actually quite simple, it's just important to ensure all the equipment you will be using is sanitized. You have gotten your beer so far, it would be a shame to contaminate it after the fermentation is complete. So, follow these steps, making sure that everything is clean and sanitary:

Step by Step

1. Stir either your corn sugar or your dry malt extract into a pint of water and boil for five minutes.

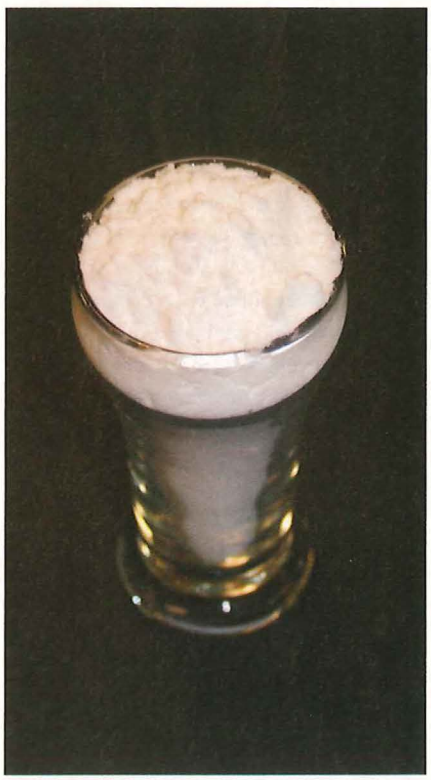
2. Cool rapidly with an ice bath, it needs to be about room temperature, but you don't want to let it sit, as this invites contamination.

3. Add your priming solution into a bottling bucket or a keg.

4. Place the priming vessel below the carboy of fermented beer and siphon the beer into it leaving about a half-inch of sediment behind.

5. If you are kegging, then you are basically done, just clamp the keg shut, purge the airspace with your CO_2 source and store between 60-70 °F (16–21 °C) for about two weeks. If bottling, you should stir the beer and sugar mixture to ensure the sugar is evenly distributed. The stirring should be "quiet," however, and not raise any foam. Transfer the beer from the priming vessel into your sanitized bottles, leaving an inch of airspace in each, cap and store between 60–70 °F (16–21 °C) for two weeks.

Priming is a tried and true method of carbonating your beer at home. It takes some experimenting to hone in on the proper levels. Taste your beers and determine whether you think they could benefit from more or less carbonation, and adjust your priming dosages accordingly. Cheers and enjoy all those bubbles!



Corn sugar (also known as dextrose) is the standard priming sugar. Most recipes call for ¾ cup for priming in bottles.

Malt and Hop Combos

Putting the flavor profiles together in balance

by Garrett Heaney

Two of the biggest ingredients at a brewer's disposal are malt and hops. Each ingredient has its very own flavor profile, and matching the right malt with the right hops — in the right balance — is the key to formulating perfect recipes that are true to style. This issue, we talk to three professional brewers who give advice on scripting grain and hop bills that will commingle successfully to style.



Alan Pugsley is Master Brewer at Shipyard Brewing Company in Portland, Maine. Since moving to the U.S. from England over 15 years ago, Pugsley has assisted with the establishment of more than 65 microbreweries and brew pubs.

At Shipyard we have an English single infusion brewhouse so we use premium quality English malts which have been well modified and are suited both to our system and flavor profiling. We will also employ some German malts for different character traits in some of our brews.

The key to all great beers is to ensure there is a perfect balance between the malt and hops according to style. I always say that malt and hops should go down the aisle and get married to create the perfect balance. To this end, I do not formulate recipes based on straight IBUs, ABV and color but more on achieving a good balance between all these facets to create a pleasant drinking beer that will ultimately taste like "another one!"

Our Brewers Choice Brown (vintages 2005 and 2006) is a beer that accentuates the malt character very well along with a good hop character. A combination of pale ale, crystal and chocolate malts are used along with wheat and roasted barley to produce a very smooth malt balance which highlights in a very defined but subtle way the chocolate character in particular. This is then balanced off with English Goldings and Challenger hops for a good English hop character. The beer has 31 IBUs, a color of 34 SRM and 5.2 % ABV.

We use about 20 different varieties of hops in the beers we make at Shipyard, some from the USA, some from the UK and some from Germany. They are all used for specific formulation reasons. However I can say that as a general rule we primarily use hops that one might consider "aroma" hops even for bittering. We do not tend to use many hops over an alpha acid content of 7 since the traditional high alpha hops tend to lend a "tar-like" taste to beers (in my opinion). Using lower alpha hops tends to be expensive but it's worth the price to make a "world class beer."

One beer we make that truly accentuates our hops is our Shipyard "Fuggles IPA," which has 50 IBUs and only uses the English Fuggles hop in its recipe. The average alpha acid of this hop is 4.0 and hence to achieve 50 IBUs we use a lot. (Don't let the bean counters get a hold of this!) This beer — for a hoppy IPA — is extremely gentle and very flavorful, without making the inside of your mouth pucker up.

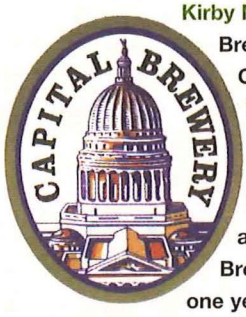
HARPOON BREWERY

Todd Charbonneau is the Head Brewer at Harpoon Brewery of Boston, Massachusetts and Windsor, Vermont. He has worked at Harpoon for over eight years. In 2001, Todd attended the Master Brewers Association's "Brewing and Malting Science" course in Madison, Wisconsin. Homebrewing inspired Todd to pursue his career in the industry.

After deciding what to brew and how it's going to be brewed, I normally choose the base malt to be used first (i.e. Maris Otter for a British style, Pilsner Malt for a German Lager, etc.). For specialty malt usage, I recommend doing your homework on the malts you want to use. Contact the maltster about recommended usage and expected flavor profile. Brew the same beer more than once, and make incremental changes to learn about the impact the malts you've chosen have on your beers.

Our IPA has a slightly sweet, toasty malt character. The residual sweetness is complemented by the toasty notes provided by a malt from Briess Malting called Victory Malt. This added complexity goes well with the four late Cascade hop additions that we employ. It is this malt character combined with the citrusy, piney essence of the Cascade hops that is the signature of our IPA.

I recently used a Chinook hop for a barleywine. It has strong notes of grapefruit, mango and pine. I used it in three additions at 70, 80 and 90 minutes during a 90-minute boil. After fermentation, the beer had such an amazing aroma that I considered not dry hopping it. I'm sure I will reconsider when the time comes!



Kirby Nelson is Brewmaster at Capital Brewery in Madison, Wisconsin. He started at the brewery in 1986 as Assistant Brewmaster. After one year, he filled the role as Brewmaster and has been at the brewery, perfecting lagers ever since. He is also a member of *BYO*'s Editorial Review Board.

In terms of malt selection for a beer, my rule of thumb is to first know what I want the beer to accomplish in terms of flavor. Then, I decide what types of malt are needed to achieve the desired flavor profile. Most importantly though, is to determine the amounts of the chosen malts percentage wise in order to create a properly balanced (key word!) beer that has the desired taste and is very drinkable (key word #2!).

Our Pilsner is a Bavarian-style Pilsner in which I have switched to using malted barley from Germany. I did this because after years of messing around formula wise with domestic malt, I have come to the conclusion that to gain the proper flavor profile of this particular style, U.S. barley doesn't make the nut.

The European barleys grown for brewing have a flavor depth and richness that I find lacking in domestically grown barley varieties. In order to get the hop bitterness that this beer needs to exhibit, the flavor that German barley (Scarlett in this instance) provides is much more appropriate.

This is an 11.8 °Plato beer and the IBUs are in the mid-30s range. I am using Northern Brewer and Saaz for the hop bill and throw a good amount of Saaz in post boil when we are pumping to the swirl tank. This helps to give this beer that unique Saaz flavor. This beer has a very pleasant depth of malt flavor yet exhibits that dryness from the bittering in the finish that a Pilsner must have. After 20 years I'm damn near happy with it!

We also make a beer called Winter Skål. This is our winter seasonal that is a 15 °P beer with 2-row and 6-row brewer's malt, caramel 60, Munich and honey malts. A fairly rich beer with IBUs in the low 20s. As far as hops, I use Liberty (my favorite U.S. hop) for bittering and like our Pilsner, add a decent amount to the wort in the kettle in the last few minutes of puming to the swirl tank.

This gives the beer a very nice hop flavor, yet the bittering does not get in the way of the maltiness that I want this beer to exhibit. Always understand how you want your beer balanced and remember, ultimately it should be drinkable! Extremism does not necessarily make a good beer — even though this seems to be a concept that a lot of folks do not agree with. Personally, I believe over-hopping is a vice.

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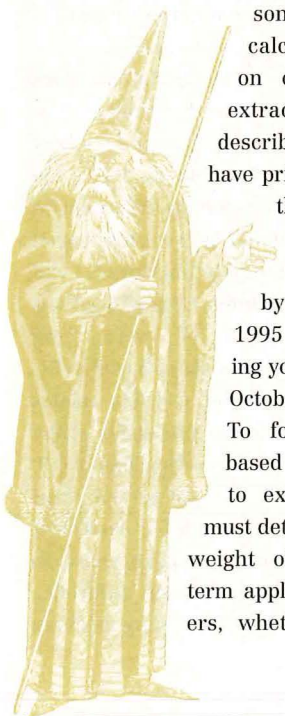
Recipe Calculation

Timing your secondary and a chilling inquiry

Get a grasp on my grist

I have been creating a worksheet for preparing my own recipes. As far as I can tell, all the recipes I've seen are formulated based on choosing the percent (by weight) for each component of a grist that will make up a wort's original gravity. However, I was under the impression that the flavor of the beer is based more on simple sugars that ferment into other compounds, and the more complex sugars that are left behind. As such, I would like to be able to formulate my recipes based on how much I want each component to contribute to the overall specific gravity of the wort. As an example, if I desired a wort with 50% of its specific gravity "points" from pale malt and 50% from wheat malt, I would like to be able to back calculate the required weight of each component. I am working off the assumption that this will give me more control over the flavor profile of the final beer. Can you tell me if this is the case, and if so, how to back calculate my grist makeup using this approach?

Paul Way
Minneapolis, Minnesota



I have seen both methods of formulating recipes used and I personally favor the calculations based on contribution to extract like you describe. I know we have printed articles on this topic in the past, one of them written by me back in 1995 (see "Calculating your Brew" in the October 1995 issue). To formulate beers based on contribution to extract you first must determine the total weight of extract (this term applies to all brewers, whether extract or all-grain) you require.

There are a couple of different calculation methods that give roughly the same solutions and the one I use is metric. When it comes to brewing calculations, as well as most other types, metric really makes things easier. Let's say you want to brew 20 liters of wort with a specific gravity of 1.048 (12 °Plato). By multiplying these together (20*1.048*0.12) you can see that 2.5 kg of extract is required to produce your target wort gravity. So 50% of this is 1.25 kg and that is how much extract should come from pale malt and from wheat malt. That's the easy part.

The tricky part is figuring how much pale malt you must use to yield 1.25 kg of extract. To determine the answer two numbers are required. The first is the laboratory yield of the malt. While commercial brewers have easy access to this information, the same is not true for homebrewers, meaning that some guess work is involved in this part of the equation. Pale barley malt usually hovers around 0.78 kg extract per kg malt (78%) when it comes to the "as-is, hot water extract (fine grind)" results of lab testing. Wheat malt is slightly higher, somewhere around 82% as-is hot water extract (fine grind), because wheat has no husk. Special malts are usually lower in yield than pale malts and this ranges from about 60–75%.

You can find much of this information on the internet by visiting malting company websites and looking at their typical malt specification numbers. These malt specifications show what the maltsters are aiming for in their process and usually are very, very close to what is actually produced. The variability arises from the fact that malt quality is dependent upon barley and, like all agricultural crops, it varies by nature. In any case, you can get a pretty good handle on the laboratory yield of malt based upon typical specifications.

The second piece of information required is the so-called brewhouse yield or efficiency of your brewing equipment. This performance metric relates how much of the goods you squeeze from the grains compared to the folks in the laboratory. I promise you that this is not a contest where a prize comes with high brewhouse yield. There are only two real reasons that serious brewers give a hoot about brewhouse yield. The first relates to being able to consistently bring in different grains into the brewery and confidently use these raw materials to meet the brewing objective (that's what you are after). The second reason is purely economic.

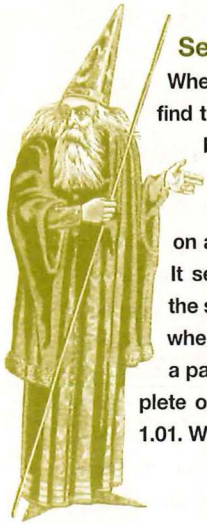
Big brewers can easily justify investing lots of money in brewing equipment to improve brewhouse yield by fractions of a percent. They simply use so much malt that marginal improvements in yield add up to big bucks. For a commercial brewer, this is a very real prize and much time and energy is put toward continually competing in this competition. The small brewer, be it a commercial craft brewer or a homebrewer, has a more difficult time justifying the pursuit of improving brewhouse yield for financial gain. In fact, it is well-accepted that beer flavor is often negatively affected when brewhouse yield becomes too high. So, for all those brewers who have a low brewhouse yield, there is no reason to feel ashamed. Likewise, the pursuit of high yield at home should be examined because, besides financial savings (maybe a couple bucks per brew at most), there is no other benefit.

A real dog of a system may deliver only 75% of the laboratory yield and a really efficient brewhouse will consistently deliver over 95% of the laboratory yield. Remember, this has nothing to do with flavor. Some breweries who have the ability to be very efficient deliberately choose to limit their brewhouse yield to avoid leaching out undesirable components during the end of wort collection. Whatever the brewhouse yield happens to be, it must be empirically determined by collecting data and comparing how much extract you landed in the brew kettle and how much was left in the mash tun. This is best done on normal gravity

beers since high gravity brews, like barleywines, reduce the efficiency of even the most efficient of systems.

Armed with these two numbers, you are now ready to determine how much pale malt and wheat malt is required to obtain 1.25 kg of extract of each ingredient. Let's say you have an average system and are able to coax about 85% of the extract from the malt and that your pale malt has a lab yield of 78% and the wheat malt yields 82% of its weight as extract in the lab. By multiplying your efficiency by the laboratory yield (0.85 * 0.78, for example) you determine that 1 kg of pale malt yields 0.66 kg of extract and 1 kg of wheat malt yields 0.70 kg of extract. I call this number my working yield. To determine how much malt is required to obtain the extract goal, simply divide the target (1.25 kg in this example) by the working yield. Punching this into the old adding machine tells me that 1.9 kg of pale malt and 1.8 kg of wheat malt are required for the brew. It's at this point that I usually convert from kilograms to pounds (2.2 pounds per kilogram) and prepare to weigh out 4.1 pounds of pale malt and 3.9 pounds of wheat malt.

This is the way many brewers calculate recipes because it is simply the easiest way to formulate a beer. If you do enough of these calculations you will quickly discover that 50% pale malt and 50% wheat malt, whether expressed by weight or extract are pretty darn close, and when casually discussing the contents of a grist bill the subtle differences become insignificant. However, when it comes to crunching numbers and brewing accuracy, speaking extractly is the key!



Secondary motions

When racking to a secondary, I find that a lot of active yeast can be left behind, especially if it is done too soon. I don't see much risk leaving beer on a small amount of sediment. It seems to me that racking to the secondary should take place when fermentation has reached a particular level, say 80% complete or when a hydrometer reads 1.01. What is your opinion on this?

Jared Spice
Toronto, Ontario

"Personally, I like to minimize the number of times wort and beer are transferred because with each transfer there is a risk of damaging the beer either by contamination or oxidation."

Oooh — you want my opinion! Personally, I like to minimize the number of times wort and beer are transferred because with each transfer there is a risk of damaging the beer either by contamination or oxidation. I, like most brewers these days, use cylindroconical fermenters and the only time the beer is typically moved is after fermentation — either en route to the filter or directly to the serving tank for unfiltered beers. We do rack some of our beers to a secondary fermenter when we dry hop using whole hops or when we are making some beers that are aged in oak.

When racking into a secondary is deemed appropriate, I like to do the racking before fermentation is complete to help minimize oxidation since active yeast will quickly reduce the level of any oxygen introduced during transfer. If you wait until fermentation is complete and then rack, the likelihood of oxidation increases since yeast activity wanes after fermentation is complete. This can be especially problematic when dry hopping since whole hops have entrained air.

I agree with your rule of thumb of racking when the fermentation is about 80% complete and also agree that a small amount of yeast carry-over is not detrimental. In fact, when beer is transferred with very little yeast, I get concerned about oxidation and will use methods to remove oxygen from the vessel I am going into. At home when kegs are used, the easiest way to do this is to fill the keg with water and displace the water with carbon dioxide prior to filling.

I recently learned that many winemakers use pelletized dry ice to do the same thing. They place pellets of dry ice in a tank and allow the dry ice to sublime. This forms a nice blanket of carbon dioxide in the bottom of the tank and the wine is filled under the carbon dioxide blanket. This method is easy to use if you have access to small chunks of dry ice. This method requires attention to detail since dry ice in a closed container is a great way to make a little gas bomb. If you choose to try this method, do not place the dry ice in a closed vessel, rather leave the vessel vented to the atmosphere to ensure that pressure is not built up in the carboy, keg or whatever you are using.

Chilling for geeks

I love reading all the questions from fellow techno-geeks like myself. My homemade immersion chiller once worked wonders on extract brews. Since I've been mashing, its performance has dwindled. It usually 30–40 minutes to reach pitching temperatures. I've thought of building a counterflow chiller, but are they really that fast? Another thought I had, since I like the ease of immersion chillers, was to build another one using ½" copper tubing as opposed to ⅜", so as to increase the surface contact area to the hot wort. Any thoughts?

Mark Moriarty
Rochester, New Hampshire

So you want a techno-geek essay on heat exchangers? I'll do my best here admitting up-front that mass and heat transfer are not subjects that I claim much expertise. But wort cooling isn't rocket science and taking my advice, even if totally crazy, will not do anyone serious harm . . . so, yes, you can try this at home!

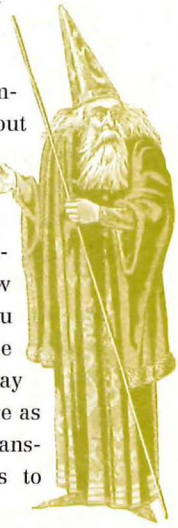
There are a couple handy equations that help communicate this subject. The first is $Q=MC_p\Delta t$, where Q expresses how much cooling we have to do, M is the mass of wort, Cp is the specific heat of wort (about 0.95) and Δt is the number of degrees the wort temperature will change. In English units, cooling 5 gallons (about 44 pounds) of wort from 210 °F to 75 °F requires about 5,600 BTUs. Another handy equation, $Q=UA\Delta t$, relates this thermal load to the properties of the heat exchanger. Q is the cooling load (5,600 BTUs, for example), A is the surface area, U is the overall heat transfer coefficient (called "U-value" in heat exchange circles) and Δt is the temperature difference between the wort and the cooling medium.

What's important is that the capacity of a heat exchanger to cool can be changed by affecting the U-value, A or Δt. The most influential variable is the U-value and is composed of several important components, including material thermal conductivity, material thickness, exchange rate on the medium side, exchange rate on the wort side and a fouling factor (dirty units don't work as well as clean units). Thermal conductivity is a property of the material of construction and the best material used for heat exchangers with respect to this value is copper. Stainless steel, by comparison has a much lower thermal conductivity. Material thickness also affects U and as the thickness of the material (your copper tube wall thickness) increases, the U value decreases. This is why cooling fins on radiators are so very thin.

The U-value also depends on liquid flow across the surface of the exchanger. High turbulence on either side of the exchanger increases U. Turbulence can be affected by decreasing fluid viscosity or by adding shapes that induce turbulence. If you have ever looked at a heat exchanger at the local brewpub you probably have noticed that the plates look like lasagna noodles. The shape of the surface is important because of its effect on the U-value. In some shell and tube heat exchangers (garden hose around a copper tube, for example) the inner tube or tubes carrying the product have a spiral or ridged pattern that increases the U-value.

Finally, there is the difference between the wort and the cooling medium (usually water or glycol) and the area. Heat transfer increases as the difference between the product and coolant temperatures increase. Since the temperature difference between product and coolant changes as heat transfer happens, a sort of average temperature difference called the log mean temperature difference or LMTD is used in calculations. Adding surface area increases how much of the product and coolant is in contact with the heat transfer surface.

So how does this geek Greek help your cooling challenge? For starters, it empirically helps answer the question about the tube diameter. While it may seem at first glance that a fatter cooling tube will benefit cooling because of the larger diameter, the increase in area comes with a potential reduction in the U-value unless the cooling flow rate is also increased to maintain good turbulence. So increasing the tube diameter and coolant flow (more BTUs per minute of coolant) is certainly one way to increase cooling.



When you measure the temperature of the water coming out of your heat exchanger and compare it to the wort temperature, you will ideally discover that the two temperatures are not more than a few degrees apart, provided you have good flow. Note that if the flow is very low the coolant may be nearly the same temperature as the wort, but very little heat transfer is occurring. The idea is to



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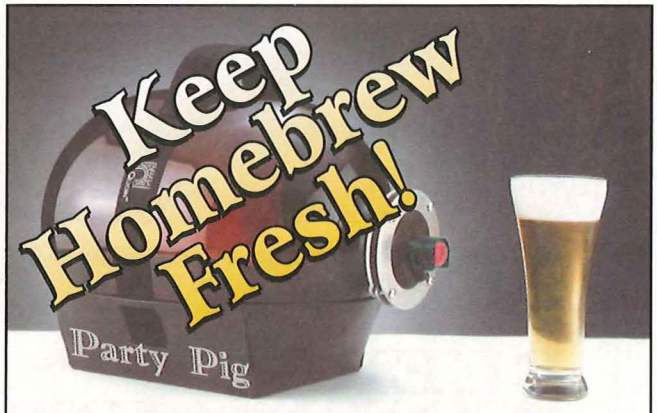
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If you have a good coolant flow rate and have a big difference between the coolant outlet temperature and wort you know that the flow of heat into the coolant is poor. This can either be caused by low U-value or insufficient area. Generating turbulence on either side of the cooling coil will improve the U-value. If you use an immersion chiller, stirring the wort is one way to improve U. If you focus on the coolant side you can increase turbulence and contact between the coolant and cooling surface by decreasing tube diameter, but this limits the amount of flow you can push through the exchanger.

A chiller with supply and return headers connected by multiple, small diameter cooling coils increases the U-value and area while maintaining the flow rate of coolant required to rapidly chill the wort. This would be a pretty slick little unit and could be easily built with standard parts from a hardware store. In principle, this is how plate heat exchangers used in most sectors of the food and beverage world operate. It's also how cooling jackets on big beer fermenters are designed.

No matter what type of immersion chiller you use, it becomes clear that the coolant flowing through the unit is more effectively heated than the wort that is sitting on the opposite side is cooled. This is because the U-value is so much better on the coolant side. For this very reason, it is the norm to put the product being either heated or cooled on the tube side of a shell and tube heat exchanger and to put the heating or cooling medium on the shell side.

This is why a counterflow heat exchanger, be it a shell and tube or plate design, is so much more efficient than batch cooling in a kettle, even without having really cold water. The key to using these units is control. Ideally you should be able to throttle the wort flow and the coolant flow. If you have a ball valve on your kettle you can use that to control wort flow and the spigot on the hose can be used to control coolant flow. Of course measuring the wort temperature is required and with a few simple tweaks you are guaranteed to have the wort cool enough for pitching provided that the cooling water is at least 5 °F (3° C) cooler than the target wort temperature. If you find that it takes too long to chill the batch and increasing coolant flow does not help, then increasing the chiller capacity by adding more tube length is required. Stay cool!



BYO Technical Editor Ashton Lewis has been answering homebrew questions as his alter ego Mr. Wizard for the last 11 years. Do you have a question for him? 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!

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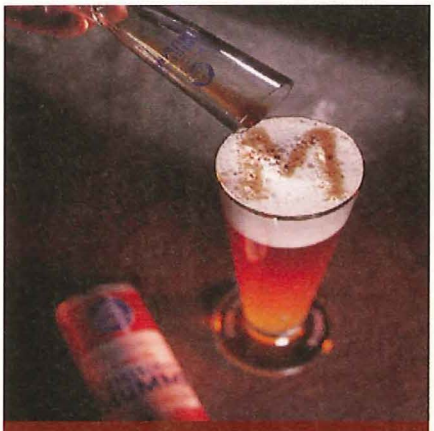
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Mumme's the Word

A trading ale from the days of sail

by Horst Dornbusch

In the late Middle Ages, when the Bavarians in the south of Germany, near the Alps, struggled to improve the quality of their beer, brewers in port cities such as Bremen, Hamburg and Lübeck along the Baltic coast were busy producing a very thick, malty, brownish ale that was suitable for trading in merchant ketches and for sustaining sailors during long ocean voyages. The beer they made was called Mumme, so-named after a brewer from the city of Braunschweig (Brunswick) who allegedly made it there for the first time in 1492, the same year Columbus set sail in search of the East Indies and ended up in the New World. The pronunciation of the brew is "moom-muh" (not "mummy). Give the two syllables equal weight and pronounce the "u" as in "foot" instead of "mom."



Mumme dates back to 1492 and was likely the world's first beer style that was not brewed with herbs.

Mumme beer from Brunswick quickly became an international trading commodity, sailing from the North Sea ports of Hamburg and Bremen to Great Britain, India and the Netherlands. Mumme is an almost syrupy brew, very nourishing, with an extremely high final gravity — how high, though, is anybody's guess. Apparently, it remained palatable almost forever. Today, we would probably liken the taste of a medieval Mumme to that of a modern Swiss herb candy, but with a hoppy overtone. Unbeknownst to most beer aficionados, the obscure Mumme is of enormous historical significance, because it was probably the world's first actual beer "style" that was not brewed with herbs. Mumme was always flavored with hops making it the first post-gruit beer.

Interestingly, this once-dominant brew of the northern German lowlands has faded almost entirely from the beer scene and few people seem to be interested in reviving it. By the middle of the 18th Century, there were only two Mumme breweries left in Braunschweig, the breweries Nettelbeck and Firma Franz Steger. The latter abandoned production in 1954, while Brauerei H. Nettelbeck KG, still markets a Mumme in the can. This product is now a rich, but non-alcoholic, soft drink brewed from barley and hops. It tastes similar to the modern Malta from Mexico. Also, an alcoholic Mumme facsimile — though of uncertain authenticity — is still made in Bremen once a year. It is served only one day a year — the second Friday in February — in the Ratskeller (the city councillors' pub in the basement of the old city hall).

Mumme — the first global beer

In its heyday, Mumme made its way on sailing ships around the globe. The brew emerged in part as one of the trading beers of the Hanseatic League, the powerful merchant association that ran virtually all of the trade in Europe from the 13th Century onward until it formally dissolved in 1669.

At the root of the League was a treaty of mutual protection and commercial cooperation, fashioned in 1241 between the Baltic port city of Lübeck and the

MUMME by the numbers

OG	1.040–1.048
FG	1.024–1.031
SRM	39
IBU	40
ABV	1.2–3.1%

RECIPE

Mumme's the Word Ale

(5 gallons/19 L, all grain)

OG = 1.048 FG = 1.024
IBU = 40 SRM = 39
ABV = 3.2%

Ingredients

3.2 lbs. (1.5 kg) pale ale malt (~2.5 °L)
3.75 lbs. (1.7 kg) caramel barley malt (~60 °L)
3.75 lbs. (1.7 kg) caramel wheat malt (~50 °L)
10.75 AAU US Tettnang hops (2.4 oz./68 g at 4.5% alpha acid)
Wyeast 1338 (European Ale) or White Labs WLP011 (European Ale) yeast

Step by Step

Using a single-step infusion mash at a liquor-to-grist ratio of 3:1, mix the coarsely milled approximately 11 lbs. (4.9 kg) of grain with about 3.8 gallons (15 L) of water. Let the mash rest at 156 °F (69 °C) for about one hour. Then use 180 °F (82 °C) sparge water to raise the mash temperature to about 170 °F (77 °C). In the process, the grain bed passes 162 °F (72 °C), the point at which alpha amylase activity peaks.

Stop the sparge after the kettle gravity has reached approximately 1.043 (10.75 °P). Bring the brew to a boil. Add the bittering hops 15 minutes into the boil. Continue to boil for 45 minutes. Evaporation losses during the boil should raise the kettle gravity to the target of OG 1.048 (12 °P). Extend the boil a bit or liquor the brew down if necessary.

Let the trub settle for about half an hour after shut-down. Then heat-exchange the wort to room temperature into the primary fer-

recipe continued on page 20

recipe continued from page 19



menter, pitch the yeast and aerate. Primary fermentation should start within just a few hours. Primary-ferment your brew at room temperature for two to three days. Rack. Secondary-ferment for another day or two. Check the gravity at this point. Do not let it drop below the target FG of 1.024 (6 °P).

Rack again, transferring the brew either into a Cornelius keg for conditioning without priming.

Dispense the beer directly from the keg, starting within two or three days from the final transfer. If the beer becomes too foamy during dispensing, purge the built-up CO_2.

However, be aware that the brew will continue to attenuate in the keg and thus become less authentic the longer you allow it to sit. The tail-end of your brew will no longer be a real Mumme! However, if you store the keg at near-freezing temperatures, the ale yeast should not be active, and further attenuation should not be a problem.

Mumme's the Word

(5 gallons/19 L, extract w/ grains)
OG = 1.048 FG = 1.024
IBU = 40 SRM = 29 ABV = 3.2%

Ingredients

- 4.0 lbs. (1.8 kg) of pale ale liquid malt extract (5.5 lbs/2.5 kg maximum)
- 2.35 lbs. (1.065 kg) caramel barley malt (~60 °L)
- 2.35 lbs. (1.065 kg) caramel wheat malt (~50 °L)
- 10.75 AAU US Tettnang hops (2.4 oz./68 g at 4.5% alpha acid)
- Wyeast 1338 (European Ale) or White Labs WLP011 (European Ale) yeast

Step by Step

Steep the 4.7 lbs. (2.1 kg) of specialty grains, coarsely milled or cracked, in three muslin bags, in about two to three gallons of 156 °F (69 °C) water for about one hour. Then rinse each bag with five cups of cold water, without squeezing the bags. Augment the liquid that results with additional water to a volume of five gallons. Bring this to a boil. Turn off the heat and gradually add pale ale liquid malt extract. Measure the gravity periodically. Continue adding liquid malt extract until you reach a kettle gravity of approximately 1.043 (10.75 °P). Bring this wort to a boil. Add the bittering hops 15 minutes into the boil. Continue to boil for 45 minutes. Evaporation losses during the boil should raise the kettle gravity to the target of OG 1.048 (12 °P). Add a bit more liquid malt extract to wort or liquor the brew down if necessary.

For fermentation and kegging, follow the corresponding instructions for all-grain Mumme.

Mumme's the Word

(5 gallons/19 L, extract only)
OG = 1.048 FG = 1.044
IBU = 40 ABV = 3.2%

Ingredients

- 3 lb. 10 oz. (1.6 kg) plain dark (30°) liquid malt extract such as Coopers, John Bull or Muntons
- 3 lb. 10 oz. (1.6 kg) Weyermann Bavarian Hefeweizen liquid malt extract
- 10.75 AAU US Tettnang hops (2.4 oz./68 g at 4.5% alpha acid)
- Wyeast 1338 (European Ale) or White Labs WLP011 (European Ale) yeast

Step by Step

Heat up your brewing liquor, turn off the heat. Stir in the liquid malt extract and bring back to a boil. Then follow the corresponding instructions for all-grain Mumme.

North Sea port city of Hamburg, on either side of the Danish Peninsula. These cities set up joint representations in distant places as far as Novgorod, Russia, to deal with the czar, and London, England, to deal with the king.

Soon thereafter, other German cities joined the alliance, and it gradually evolved into the Hanseatic League, an official organization that eventually grew to comprise some 200 cities, including the North Sea port city of Bremen and such cities further inland as Einbeck, Brunswick, Breslau, Magdeburg, Dortmund and Cologne. The League created, in effect, the first European common market, free of tariffs and artificial trade restrictions.

It traded in almost any commodity, including wine, oil, grain, leather, cloth, copper, iron, salt and beer. It fought and won its own wars and signed its own peace treaties with foreign governments. One such was the Treaty of Stralsund (1370), which gave it a virtual trade monopoly in all of Scandinavia. Henceforth, no Danish king could be crowned without the League's approval.

Soon the breweries of Hamburg and Bremen were busy to capacity, producing casks of export Mumme. In addition, wagonloads of ales would rumble down the dusty northern highways on their way to the harbor storehouses of the Hanseatic merchants. Bremen took the early lead in beer exports, sending casks of German ale to the then-known world.

By the end of the 13th Century, thanks to the skills of Bremer brewers and to the sheer size of the markets of the Hanseatic League, no beer was more popular and plentiful in Europe than that brewed in Bremen. The Hamburgers, too, soon entered the international beer business and, during the 14th Century, started to eclipse their rivals from Bremen. Hamburg emerged as the brewing city of the League.

By 1376, Hamburg recorded 457 burgher-owned breweries, by 1526 there were 531. Together, they brewed almost 25 million liters per year (more than 6.6 million gallons) and employed almost half the city's wage earning population. It was within this bustling brewing culture that,

by the end of the 15th Century, the Mumme ale style became solidified to represent the glory of northern German brewing — at a time when that other German beer culture, the Bavarian lager culture, was being born at the opposite end of the country.

Mumme variations

It is not certain from the records how the grain bill of an authentic Mumme ought to be composed. It seems that in some cities, notably in Bremen and Brunswick, Mumme tended to be made mostly or entirely from barley, while in Hamburg and Hanover, among other cities, it tended to be made from a mix of barley and wheat. In the northwestern part of Germany, these medieval ales were called Keutebier.

Apparently, Keutebiers were hopped, reddish to dark-brown, with an up-front sweetness and a viniferous aftertaste. Keutebier is considered the medieval forerunner of the modern altbier. Perhaps the closest present-day brew to the original Keutebier is Pinkus Alt from the Wesphalian town of Münster.

The Pinkus brewery, unlike the altbier breweries in and around Düsseldorf, makes its unusual alt from 60% barley malt and 40% wheat malt. Pinkus beers are available in the United States through the import channels of Merchant du Vin.

In Hanover, Mumme-style beers were called Broyhan-Bier or Breyhan Bier. Broyhan beer took its name from a Cord Broyhan, a brewmaster and Hanoverian native, who had left his home town to go apprentice with a Hamburg brewer. There he learned the secrets of Hamburger beer. When he returned home, in 1526, he started his own brewery and made his variation on the Hamburg Mumme theme, a well-hopped, light brown ale, probably mashed from one third wheat and two thirds barley.

Soon other entrepreneurs jumped on the Broyhan bandwagon and opened up competing breweries. In 1609, the city council of Hanover began to regulate the quality and brewing techniques of the local Broyhan beer. It limited the number of licensed brewer burghers to 317, combined all of them into one guild, and incorporated the guild as a company. This Gilde Brauerei (guild brewery) survived into the current millennium as a stock holders' company and the oldest enterprise in Hanover. In January 2003, it was acquired by Belgian brewing giant InBev.

Mumme reconstruction

Northern German medieval beers, not unlike modern German beers, tended to be brewed from wort with a starting gravity of about 1.040 to 1.048 (10 °P to 12 °P). Because Mumme had an apparent attenuation of only about 35–40%, it finished at a relatively high FG of 1.024 to 1.031 (6–7.8 °P).

In attenuation power, these old northern German yeasts were far inferior to their contemporary Bavarian bottom-fermenting relatives. Because all modern brewing yeasts are bred specifically for high attenuation levels, usually between



60–75%, we must play a few tricks if we want to imitate this unusually malty beer. In the mash, we produce as many unfermentable sugars as possible and we interrupt fermentation by kegging the the brew a little early (bottling is discouraged, see **warning** ahead).

In the mash tun, the Mumme's low attenuation level calls for plenty of caramel barley malt, perhaps up to 70% of the total grain bill, at a color value of perhaps 40 to 60 °Lovibond. Use a regular pale ale malt for the rest. If you prefer to make a more Bremen-style Mumme, use only caramel barley malt. If you prefer a more Hamburg–style Mumme, or a Broyhan-Bier or Keutebier, replace some of the caramel barley malt with caramel wheat malt.

The starting grain bed temperature should be a relatively high 156 °F (69 °C). This is just 2 °F (1 °C) below the temperature at which beta amylase, the enzyme that produces fermentable sugars is denatured. While beta amylase is very weak at this temperature, alpha amylase, the enzyme that produces unfermentable sugars is very strong.

> "In the mash, we produce as many unfermentable sugars as possible and we interrupt fermentation by kegging the brew a little early."

Boil the brew as you normally would, for about one hour, to isomerize the hop's alpha-acids. For hop varieties, you are really free to choose whichever you like, except for Pacific Northwest varieties, because we are making a European brew. Hops, like yeasts, obviously have changed since the Middle Ages, so it is really difficult to be authentic. Subjectively, I find that hop varieties with citrus notes, such as Tettnanger, provide the best bittering balance for this rather malty-sweet beer. There is only one bittering addition to this brew, no flavor or aroma hops.

In the yeast department, too, let freedom reign, because in the old days, of course, brewers yeasts were always mixed, not pure, strains. Avoid strains that have a high alcohol tolerance: You want the opposite! Generic European ale yeast such as Wyeast 1338 or White Labs WLP011 are good choices for fermenting this brew.

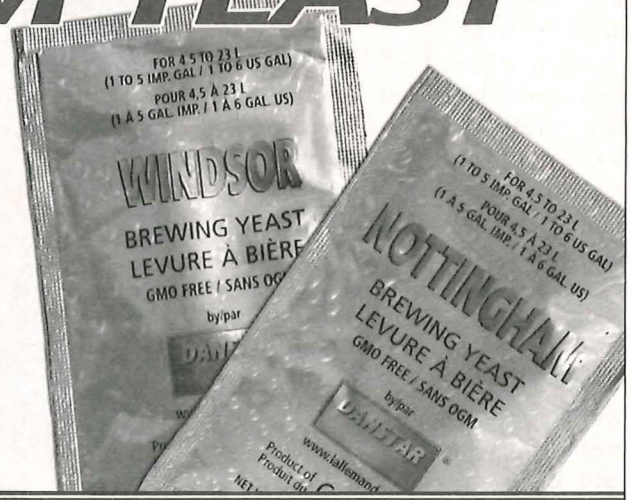
Warning: We strongly advise against bottling this brew as there is a significant danger of exploding bottles and injury. Kegging with cold storage is the preferred method of packaging this beer, as the keg is a stronger container, and the cold temperature storage

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will greatly reduce yeast activity and rapid consumption. Purge the built-up CO_2 periodically.

Pasteurize — if you must!

If you have no other choice than to bottle your Mumme, you must pasteurize your bottles within two days from bottling to kill all living yeast! Two days is sufficient to build up effervescence.

To pasteurize your Mumme, place as many bottles as will fit into a canning cooker or into your brew kettle. Fill the pot with water to cover all bottles entirely. Heat the water slowly to 145 °F (63 °C) and maintain it at that temperature for 30 minutes to ensure that the beer reaches the same temperature as well.

Use your thermometer frequently to confirm that the kettle content remains at the correct temperature. Repeat this pasteurization until all bottles have been pasteurized! Leave at least one inch (about 2.5 cm) of head space in the bottle to allow for expansion of the liquid during pasteurizing. Also, filtration before bottling is an extra measure that will help reduce the number of active yeast cells.

Mumme and extract

Mumme is a difficult beer to make for extract-plus-grain brewers, because there is a relatively high proportion of specialty malts in this recipe and because it is always difficult to predict the contribution to gravity of the steeped grains. Perhaps the best routine for extract-plus-grain brewers is to steep the 4.7 lbs. of specialty grains, coarsely milled or cracked, in three muslin bags, in about two to three gallons of 156 °F (69 °C) water for about one hour, to produce the desired unfermentable sugars and to extract flavor and color.

Add pale ale liquid malt extract gradually to the kettle, measuring the kettle gravity frequently, until you reach a kettle gravity of approximately 1.043 (10.75 °P). With evaporation losses during the boil this method should result in a green beer with the target of OG 1.048 (12 °P).

If the steeped grain made no contribution to gravity, the entire grain bill of about 6.7 lbs. (3.025 kg) would require a liquid malt extract substitution of about 5.5 lbs. (2.5 kg) of pale ale liquid malt extract. This should give you some idea as to how much pale ale liquid malt extract you should have on hand for a worst-case scenario.

Authentic Mumme is next to impossible to make for extract-only brewers, because there just is not liquid malt extract on the market with the required high proportion of unfermentable sugars, although Laaglander may come close. Perhaps the best compromise is a 50/50 mix of dark British ale and German Hefeweizen extract as a malt base. The resulting brew will be slightly paler than the brew made with mashed or steeped grains.

Horst Dornbusch writes "Style Profile" in each issue of Brew Your Own. *He is also the author of* Bavarian Helles *and* Altbier *(Brewers Publications).*

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It's 2 AM, and you're lying in bed happily contemplating your next batch of homebrew. A fruit beer, perhaps. Ah, yes. A richly flavored framboise. But your pleasant daydream hits a snag as you wonder whether real raspberries, raspberry puree or raspberry extract would best enhance the flavor. If only you could instantly find out what a national champion would do in this situation. Well, thanks to advances in technology and several dedicated, award-winning experts, you can. The information is merely a mouse click and moments away — in a podcast. No really, it is. And it's not difficult to do. Here's how it works, and a rundown of some of the best brewing podcasts around:

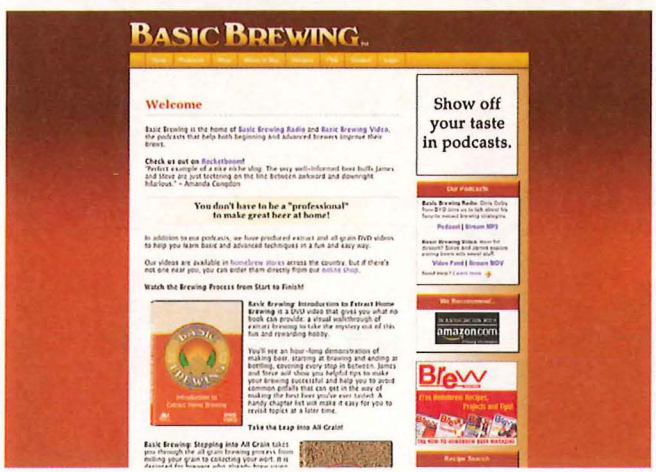
The "P" Word

For starters, if you cringe at the thought of technology, don't be intimidated by the term "podcast." This simply refers to an audio file (like a radio program) or a video file (like a television show) that you can watch or listen to on your computer or a portable device, such as an Apple iPod.

Do you need an iPod to run a podcast? No. In fact, all you need is a computer and an Internet connection to enter this relatively new world of free expert advice, instruction, and discussion, all focused on homebrewing. Other portable MP3 players besides iPods can also be used for playback.

"People should just be able to browse to the website, click on a podcast link, and it should play. It's really easy," says Jamil Zainasheff, host of The Jamil Show at The Brewing Network, and winner of numerous homebrewing awards, including the Ninkasi Award at the 2004 National Homebrew Competition.





Screen shots from The Brewing Network (top) and Basic Brewing Radio (bottom). Both sites have links to their podcasts and the software you need to play them back. Basic Brewing has both audio and video shows.

If your computer isn't equipped with a player — such as MediaPlayer, Winamp or iTunes — you will need to download one. This is as simple as clicking on a link, which is usually provided on most websites that offer podcasts.

"Downloading a podcast is pretty straight forward, and I think once people do it, they'll be hooked," says James Spencer, host of Basic Brewing Radio and Basic Brewing Video. Fortunately, once you do get hooked on a particular show, you can subscribe to it. Once subscribed, new epidodes of the the podcast will be automatically downloaded to your computer at regular intervals, free of charge.

All past episodes can be downloaded at any time, so if you enjoy a particular show, you can go back and listen to or watch every episode. "I got an e-mail this week from a guy who listened to a full year of audio and video podcasts in ten days," Spencer says. "I told him, 'You must be tired of hearing my voice by now.'"

Homebrewing podcasts run the gamut from offering tips on the basics of homebrewing, to walking you through award-winning recipes, to attempting innovative brewing experiments. Think you can't homebrew a six-pack or a 21.4% all-grain brew? Think again, and tune in to your favorite brewing podcast to find out how.

Brewing Podcast Shows

The following podcasts are all free of charge. Special guests regularly contribute to these shows and some podcast episodes are recorded on location at various brewing competitions or other places of interest. Many beer-related podcasts are available, but here are four excellent homebrewing-specific destinations to get you started:

The Brewing Network (www.TheBrewingNetwork.com)

After winning awards for every recognized style of beer and becoming a BJCP National Judge, Jamil Zainasheff is sharing his knowledge of homebrewing through his show, The Jamil Show, which is one of three shows offered by The Brewing Network.

Each episode of The Jamil Show focuses on a specific style of beer such as Russian imperial stout, Maibock, Octoberfest, Bavarian weizen and fruit beers.

B·R·E·W·I·N·G PODCASTS



(Hint: if you want the answer to the earlier question of when to use real fruit, fruit puree or fruit extract when brewing various types of fruit beer, download the April 24, 2006 episode of Jamil's program.)

"In each episode, we cover a style from the BJCP style guide," Zainasheff explains. "The show starts off with a personal story about beer, then we get into answering some listener emails, we give a very brief history of the beer, and then a description of the beer, including the aroma, flavor, and appearance. Next, we get into the recipe — the type of hops, yeast, fermentation temperatures — all the things you need to know to brew the beer we're describing."

"Even if you're not interested in that specific style of beer," Zainasheff continues, "there should be something in the discussion in that hour that covers some aspect of brewing that could be useful to you. There's some universal information in every show. We try to keep that balance there. It's fast-paced."

Read the caption to any episode of The Jamil Show to detect the balance of expertise and entertainment. Take the July 17, 2006 episode about American Brown Ale, for example. The show description reads, "In this show, Jamil and Jon cover brewing two different types of American Brown Ale. We cover the difference between commercial American Brown and homebrew American Brown Ales and provide two award-winning recipes. Reader e-mail on needing to mash Munich malt, and Jon insults Jamil's looks."

Why would Zainasheff openly divulge his award-winning recipes for free to homebrewers? "When I started out, there were lots of people who gave me lots of good advice," he says. "So now, I'd like to do the same for someone else. The more information we can share, the better people can brew beer, and the better the beer will be out there."

Although The Jamil Show first aired in January, 2006, the show's popularity is already surging. "I'm seeing probably a couple hundred new listeners per month coming on," Zainasheff says.

The show is broadcast live every other Monday from 10 AM to 11 AM (Pacific Standard Time), so listeners can call in via a toll-free number or visit a chat room dedicated to the show as the program is in progress. Of course, the show is also available for download after the live broadcast.

The Brewing Network also features Lunch Meet and The Brewcasters. Lunch Meet, which airs on Fridays from 12 PM to 1 PM (PST) offers entertaining beer talk and prizes. The Brewcasters airs on Sundays from 5 PM to 7:30 PM (PST) and covers topics such as how to get started in brewing, tips for the frugal brewer, entertaining and other brew-related information.

Basic Brewing Radio and Video
(www.BasicBrewing.com)

Basic Brewing offers both an audio and a video podcast. "We look at the audio podcast as the 'NPR Science Friday' of homebrewing," James Spencer, host of the shows, says with a chuckle. "We interview experts and we answer emails from listeners." Despite the word "basic" in the title, Basic Brewing covers both

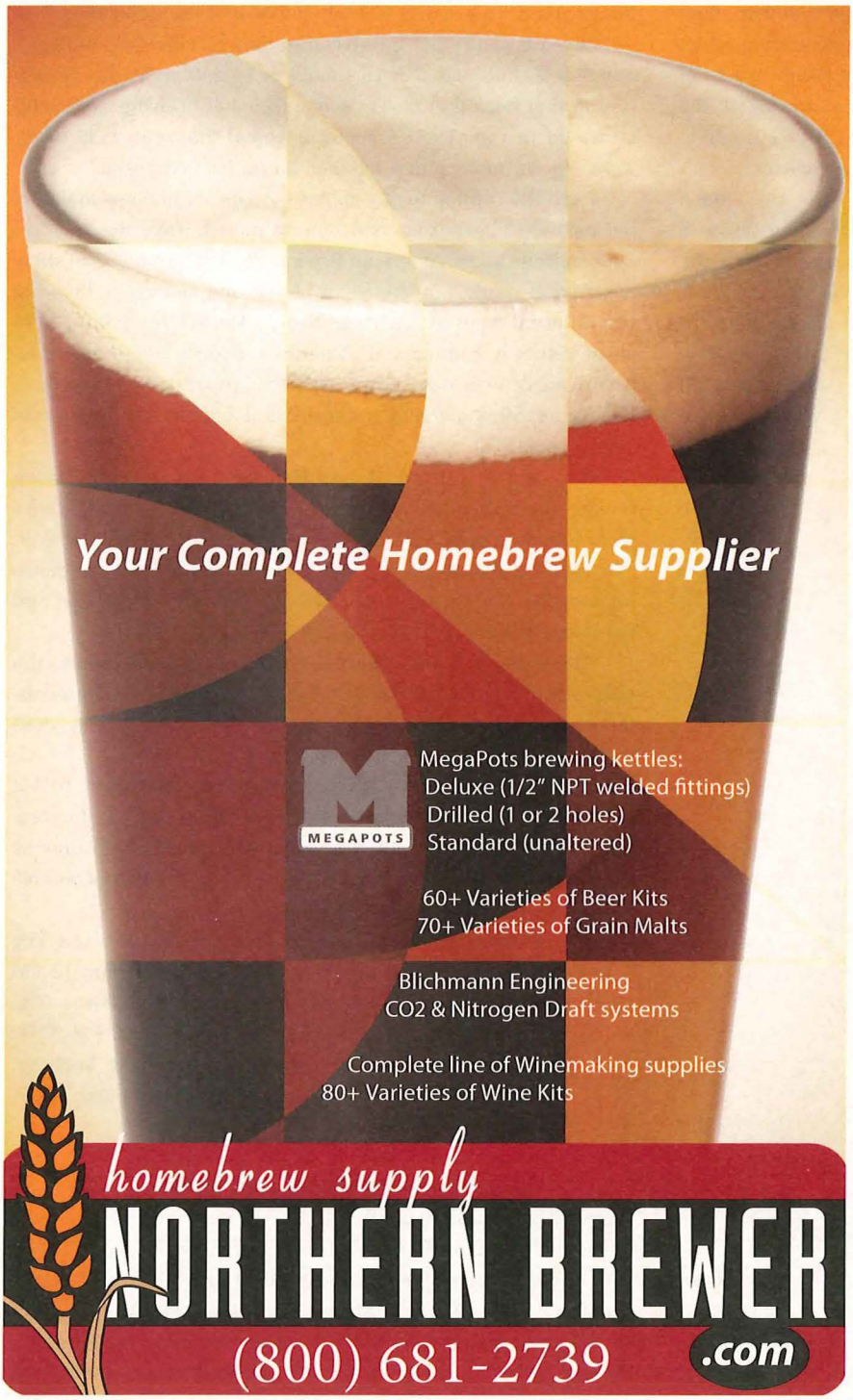
By **Kristin Grant**

beginning and advanced homebrewing topics. "We get pretty geeky on the audio side," says Spencer.

"We do cover a lot of advanced topics. I want to balance that so that advanced homebrewers get the information they need to be better brewers, and at the same time, beginning brewers aren't scared off or intimidated."

"We try to have a little more fun on the video side," Spencer says. "We do experiments and demonstrations, because you can see what's going on."

Have you ever tried to brew your own six-pack? Spencer has, as seen firsthand by his many viewers, over a series of video podcast episodes. "We made a very small batch," he says of his homebrewed IPA. "We figured out the volume we would need to make a six-pack of beer, so our goal was to make three-quarters of a gallon of beer. We did it in a growler."



If you're interested in hearing whether Spencer succeeded in his experiment, you're not alone. "One thing people do enjoy about the video podcasts is that it's like a soap opera. How's that six-pack of IPA going to come out?"

In true soap opera form, Spencer's experiment had its unexpected twists and turns, which did not go unnoticed by viewers. "They really pay attention to what we're doing, because we primed with carbonation drops, with one drop in each bottle, and when we were priming the six-pack IPA, we accidentally double primed one of the bottles," he says. "I noticed when we were on camera, but I didn't let on. Afterwards, I marked that one so I would be sure to be careful with it when we opened it. But we got several e-mails from people saying, 'Hey, be careful! Number four is double-primed!'" Spencer laughs. "So, we made a big deal out of it when we opened the bottle. I was wearing safety glasses, a beer protection shirt, and work gloves, and we wrapped the bottle in bubble wrap. It didn't blow up or anything."

In the end, Spencer wound up with seven or eight beers. His fearless, innovative approach to brewing has propelled the video podcast to the top of the charts. "Our video podcast is consistently in the top ten video podcasts in the iTunes directory. Right up there with the NPR and CBS podcasts," Spencer notes. With experts like Chris Colby, John Palmer and Randy Mosher as guests, Basic Brewing never has a shortage of solid homebrewing advice.

Spencer focuses only on homebrewed beers. "We don't review commercial beers," he says. "We do talk to commercial brewers, like I talked to Tony Simmons from Pagosa Brewing Company, but it's because he came up with the recipe for Poor Richard's Ale, and I wanted to know how he researched that, and how he came up with that historical recipe."

The CraftBrewer's Radio Program

(radio.craftbrewer.org — no "www")

This Australia-based beer-centered podcast is widely regarded as the first brewing podcast available. So, how exactly did this, the first brewing podcast,



get up-and-running?

"I think it was about 2004 that I heard of this new cutting-edge technology called podcasting," says Graham Sanders, host of the show. "It was all theory back then, but I saw the potential straight away. Well, talking to our computer oracle that runs the webpage, we stumbled our way through it, and before long we were up there, the first proper beer program podcasting to the world."

Prior to implementing the podcast, Sanders hosted a radio show dedicated to brewing, so the transition from airwaves to Internet wasn't too difficult from the standpoint of content, Sanders said.

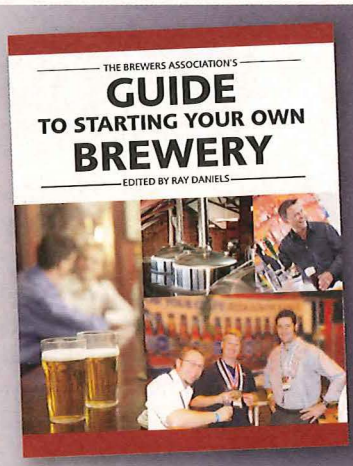
Sanders keeps his audience growing by covering a diverse range of beer-related topics. In addition to technical information about some aspect of brewing, which he includes in every show, he features skits, songs, experiments, interviews, roving reporters, and history, all related to beer, of course. "We try to have a good mix of entertainment, fun, and serious brewing topics as well. The key is we don't labor any one point too long," he says.

Brew CrAzY
(www.BrewCrAzY.com)

The motto of this podcast, first launched in July, 2006, describes the serene nature of this show: "The podcast for those of us who brew our own damn beer!" Of course, the program is actually far from serene and features an unlikely pair of hosts. John McKissack III, aka "Johnny Max," won the Gold Medal for the Bock beer style at the 2006 National Homebrew Competition. His co-host, "Captain Ron," is, well, a wild-eyed rat terrier dog.

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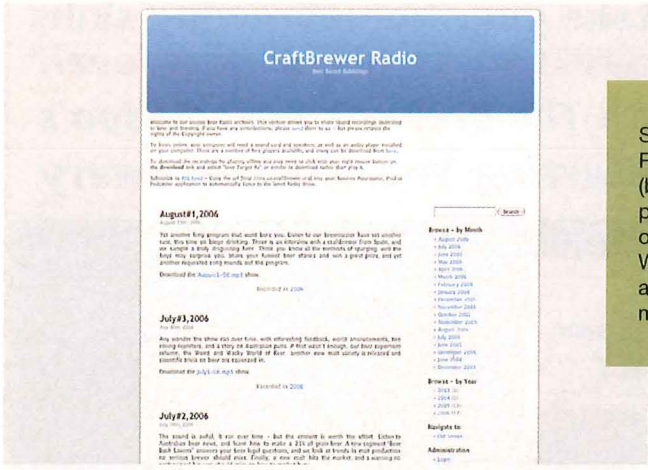
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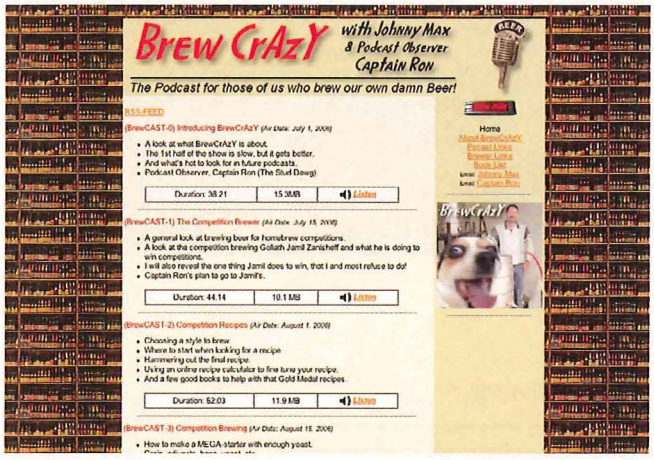
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Screen shots of CraftBrewer Radio (top) and Brew CrAzY (bottom). Download times for podcasts depend, of course, on your connection speed. With a fast connection, most audio shows take only a minute or so.

The show is sure to push the limits of brewing. "I will get into the details of how I made a 21.4% [alcohol] all-grain brew," McKissack said. "Some said it couldn't be done."

While at a homebrew club meeting, a member told McKissack that he'd read that it was impossible for a homebrewer to pass 16%. At that moment, according to McKissack, "The challenge was on."

Brew CrAzY will also feature a series on designing the perfect gold-medal recipe and delve into the use of unlikely ingredients, such as sour cream, in the beer brewing process. Other podcast topics include how to create a "MEGA-starter" with lots of yeast, how to modify a standard bottle to eliminate foaming, how to make your own carbonation drops, and how to use online recipe calculators.

Other Homebrewing Podcasts

You can find three episodes of KGB radio, a podcast of the Houston homebrewing club Kuykendahl Gran Brewers, at **kgbradio.blogspot.com** (no "www"). The episodes are for January, February and March 2006, with no indication if further episodes are planned. Also, at **www.swillburgbrewery.com**, there are 15 short video podcasts. These deal more with stand-

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ing around drinking homebrew than information on how to homebrew.

Other Brewing Related Podcasts

Of course, there are also podcasts related to beer and brewing that are not homebrewing related.

One of the better-known shows is Craft Beer Radio, which can be found at **www.craftbeerradio.com**. For most episodes of the show, the hosts — Jeff Bearer and Greg Weiss — review several commercially brewed craft beers. They may also discuss the history of the beer styles or a related topic. For example, in the episode on Pilsners, they discuss the science of skunking. Although none of the shows revolve around homebrewing, the hosts do sometimes mention their own homebrewing experiences.

There are many, many other beer-related podcasts out there, too many to review here. But a few warrant a quick mention. PodBeer (at **www.podbeer-.com**), The Good Beer Show (at **www.goodbeershow**) and Pacific Brew News (at **www.pacificbrewnews**) all have their moments.

Finding New Podcasts

The world of brewing podcasts is likely to get bigger in the future. To search for new podcasts — or podcasts on any topic — there are several on-line directories. These websites — including **www.podcast.net**, **www.podcastdirectory.com** and **podcasts.yahoo.com** — allow you browse for podcasts by category. Homebrewing is usually categorized under food or hobbies. You can also search for podcasts by keywords, such as "homebrewing," "brewing" and "beer." This is usually a quicker way to find an appropriate podcast.

Reaching Homebrewers Everywhere

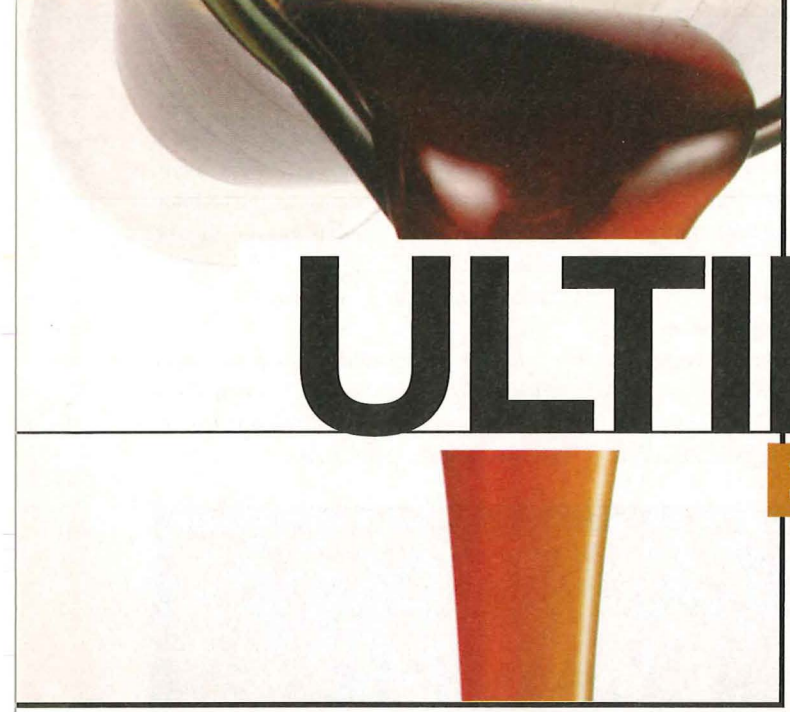
Podcasts certainly make the world of homebrewers just a little bit smaller. Spencer has developed a relationship with a homebrewer in India thanks to his podcast. And Sanders' podcast has reached brewers who have literally brewed beer at the ends of the earth. "I had a listener who was stationed in Antartica, I think Mawson Station," Sanders says. "Poor guy was trying to brew beer at -40 °C (-40 °F) and wanted advice. He had dramas you just couldn't imagine, and that includes only once a year being able to get supplies, and space was limited on the supply vessel. That's about as remote as one gets."

Both Spencer and Sanders were able to help their international brewing pals through their brewing obstacles.

The sharing of information about brewing through technology will surely create a world of better brewers. And if podcasts can cause this much excitement, what could possibly be next on the technology horizon? One man has just the answer. "Holograms," says Spencer with a smile. "I'll be standing in your kitchen."

Kristin Grant wrote "Food and Beer Pairing" in the July-August 2006 issue and "Plant a Backyard Beer Garden" in the March-April 2006 issue.





ULTIMATE EXTRACT chart

These days, homebrewers have access to a wide variety of malt extracts. These include hopped beer kits and concentrated brewers worts. It also includes hopped and unhopped malt extract in both liquid and dried form.

BYO contacted the manufacturers and compiled a chart of every beer kit and malt extract available in North America — our Ultimate Extract Chart.

Hopped Beer Kits

Most hopped beer kits are designed to make beer using the no-boil method. The extract is simply heated in a small amount of water to Pasteurization temperature (160 °F/71 °C) and held for a short amount of time. The wort is then cooled, diluted to working strength and pitched with the supplied yeast.

In the hopped beer kit section, we list the amount of extract in each kit, the amount of yeast provided and the amount of beer the kit is designed to yield. For most kits, the level of bitterness (in IBUs), color (in °Lovibond) and percent alcohol by volume (ABV) are also listed. The bitterness and color values refers to the beer, when made to the specified volume, not the extract itself. (i.e. If you make more or less beer, these values will change.) The percent alcohol is an estimate based on the projected final gravity, given an average fermentation.

Concentrated Brewers Worts

Most of these kits contain lightly concentrated wort that brewers add water to and then ferment, similar to a wine kit.

For each type of concentrated wort, we give the amount supplied by the kit — in either pounds (and kg) or gallons (and liters) — and the amount of yeast included. All concentrated brewers worts are designed to make 6 gallons (23 L) of beer. In most cases, the IBUs of the final beer is also given.

Dried and Liquid Malt Extracts

Finally, we list individual types of dried and liquid malt extract. For each extract, the color is given at a specific wort gravity. For hopped malt extracts, the level of bitterness (in IBUs) is also given. For some of the extracts, the grains used to make the extract are listed.

Making Extract Kits and Extract Beers

You can make these kits per the manufacturers' instructions with success, or you can modify them to suit your needs. See Marlon Lang's article, "Kick Up Your Kit," in the March 2004 issue, for our guide to customizing your kit beer. Extract users may also want to review "Method to Your Madness," in the September 2006 issue, for an outline of the different methods of making extract beer on their stovetop.

However you approach your extract beer making, have fun with the process and enjoy the final product. Cheers!

opped Extract eer Kits	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Color in °Lovibond	Alcohol by Volume	Comments* * Description provided by manufacturers
rth American Lager							
v Canada Canadian Lager	4.2 lbs. (1.9 kg)	5 g	6 gal (23 L)				Bright and golden smooth with genuine Canadian taste.
v Canada Canadian Pilsener	4.2 lbs (1.9 kg)	5 g	6 gal (23 L)				Bright gold in color with a light, delicate flavor and well balanced fruity character.
bers International Mexican erveza	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				This premium beer is light in style with a fresh clean taste.
master American Light	4 lbs. (1.8 kg)	6 g	6 gal (23 L)	18 - 27	< 4	4.8%	This delicately flavored lager made from lightly hopped malt extract gives a pale golden hue.
n Bull American Beer	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	12 - 18	< 3.5		A pale, dry, lightly hopped beer, designed to be at its most refreshing when served chilled.
tons Connoisseurs Pilsner	4 lbs (1.8 kg)	6 g	6 gal (23 L)	25 - 35	< 4	4.8%	A light, refreshing, thirst-quenching beer popularized in warm climates.
tons Premium American Light	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	18 - 27	< 4	4.0%	A delicate light lager, subtly flavoured yet refreshing.
tons Premium Mexican-Style Cerveza	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	45 - 55	3 - 5	4.0%	A delicate light lager subtly flavoured, yet refreshing.
ropean Pale Lager							
k Rock Colonial Lager	3.3 lbs (1.5 kg)	5 g	6 gal (23 L)				New Zealand style lager.
k Rock Dry Lager	3.3 lbs (1.5 kg)	5 g	6 gal (23 L)				Light colored, refreshing, dry, with crisp, clean finish.
k Rock Export Pilsner	3.3 lbs (1.5 kg)	5 g	6 gal (23 L)				Traditional Czech beer in Pilsner style.
k Rock Lager	3.3 lbs (1.5 kg)	5 g	6 gal (23 L)				Light, blend of hop varieties give bitterness and aroma.
vferm Gold	3.3 lbs (1.5 kg)	6 g	3.16 gal (12 L)			5.5%	Luxury thirst quenching, full taste, pleasant bitterness.
vferm Pils	3.3 lbs (1.5 kg)	6 g	3.16 (12 L) or 5.26 gal (20 L)			4.5%	Light, blond, thirst quenching.
vmaker Deluxe Pilsner	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	36 - 44			A fairly dry, European style Pilsner hopped to similar levels as Czech Lagers.
bers Brewmaster Pilsner	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				A good example of a light pale lager with a particularly clean palate, mild flavors and a crisp Saaz hop.
bers International Bavarian Lager	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Straw color with golden hues and a lacy white head. Subtle hint of malt and appropriate bitterness for style.
bers Original Lager	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Light floral aromas follow through on a light to medium bodied palate with subtle malt and hop flavors.
bers Premium Heritage Lager	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Rich yellow-gold color, prominent European aroma hop generous mouthfeel produces a clean finish.
IE Microbrewery Classic Pilsner	4 lbs. (1.8 kg)	6 g	6 gal (23 L)	25 - 35	3 - 5	4.8%	Light and delicate, this pilsner is a great thirst quencher.
IE Superbrew Lager	4 lbs. (1.8 kg)	6 g	6 gal (23 L)	45 - 55	3.5 - 5.5	4.8%	Golden crisp beer popular in northern Europe. Light and refreshing.
master Special Lager	4 lbs. (1.8 kg)	6 g	6 gal (23 L)	25 - 35	3 - 5	4.8%	The lightly hopped malt extract used for this lager style beer gives a copper colored brew.
n Bull Lager	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	36 - 44	3.5 - 5		Famed for its clear, bright appearance and light refreshing taste, this is a classic lager.
n Bull MasterClass Bavarian Lager	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	36 - 44	3.5 - 5		European lager with a clear color and a fresh, crisp finish.
n Bull MasterClass Export Pilsner	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	22 - 28	3.5 - 5		A golden colored, slightly dry beer, with a fresh fragrance and flowery bouquet.
n Bull Pilsner	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	27 - 33	3.5 - 5		Strong, dry premium pale lager with a fragrant, flowery bouquet and an elegant, dry, hoppy finish.
n Bull Sherwood Ale avarian Pilsner	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	22 - 28	3.5 - 5		Strong, dry premium pale lager with a fragrant, flowery bouquet giving a refreshing slightly sharp taste.
ntmellick Light Lager	4 lbs (1.8 kg)			25 - 35	3 - 5		
tons Connoisseurs Continental Lager	4 lbs. (1.8 kg)	6 g	6 gal (23 L)	45 - 55	6 - 8	4.8%	This is a light amber hoppy lager modeled on the full-bodied beer available across mainland Europe.
tons Connoisseurs Export Pilzner	4 lbs. (1.8 kg)	6 g	6 gal (23 L)	25 - 35	3 - 5	4.8%	Originating from Bohemia. This is a full-bodied lager for the more discerning palate.

pped Extract er Kits	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Color in °Lovibond	Alcohol by Volume	Comments* * Description provided by manufacturers
ons Gold Continental Pilsner	6.6 lbs. (3.0 kg)	6 g	6 gal (23 L)	25 - 35	3 - 5	4.5%	Continental Pilsner embodies the full character of European lager style beers - light and delicate, yet richly satisfying.
ons Premium Lager	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	25 - 35	3 - 5	4.0%	Golden crisp beer popular in northern Europe. Light and refreshing.
ons Premium Pilsner	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	25 - 35	< 4	4.0%	Light and delicate, this pilsner is a great thirst quencher.
ds European Pilsner	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	45 - 55	3 - 5	4.0%	Light and delicate, this pilsner is a great thirst quencher.
ds Lager	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	25 - 35	3 - 5	4.0%	Golden crisp beer popular in northern Europe. Light and refreshing.
t Ale							
Rock New Zealand Draught	3.3 lbs. (1.5 kg)	5 g	6 gal (23 L)				Full malt draft.
Canada Canadian Blonde	4.2 lbs. (1.9 kg)	5 g	6 gal (23 L)				A refreshing new Canadian flavor that is light gold with a milder hop character than most other beers.
Canada Canadian Light	4.2 lbs (1.9 kg)	5 g	6 gal (23 L)				Lighter in color with a slightly fruity aroma and clean, crisp taste.
ers International Canadian onde	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Pale Straw color, crisp pale malt aromas with a hint of spicy hops, and a light-bodied palate.
ers Premium Sparkling Ale	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				The big brother of Coopers Original Pale Ale, displays fruity esters on the nose, full malty palate with generous hops.
ons Premium Canadian-Style Ale	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	25 - 35	3 - 5	4.0%	A dark sweet yet subtle beer brewed to quench the thirst and satisfy the hunger.
ons Premium Gold Midas Touch lden Ale	8 lbs. (3.6 kg)	6 g	6 gal (23 L)	35 - 45	15 - 20	5.0%	This is a refreshing light pale ale with a rich golden color and a distinctive hoppy taste.
fordes Great Eastern	6.6 lbs. (3.0 kg)	6 g	6 gal (23 L)	35 - 45	4 - 6	4.5%	A pale golden beer with a teasing blend of lager malt flavors and hop aromas.
ers, Pale Ale & Amber Ale							
Rock New Zealand mpany Bitter	3.3 lbs (1.5 kg)	5 g	6 gal (23 L)				Rich, strong, satisfying.
Canada Canadian Draft	4.2 lbs. (1.9 kg)	5 g	6 gal (23 L)				Fresh, smooth taste coupled with a pronounced hop character. A light flavored, easy drinking style.
ferm Gallia	3.3 lbs (1.5 kg)	6 g	3.16 gal (12 L)			5.5%	Amber, noble bitterness, soft refreshing flavor.
maker Deluxe Strong port Bitter	4 lbs (1.8 kg)	5.5 g	4.8 gal (18 L)	40 - 50			A full bodied and full flavored beer, full of roasted malt flavors and hop aroma.
maker Deluxe Yorkshire Bitter	4 lb (1.8 kg)	5.5 g	6 gal (23 L)	36 - 44			A traditional bitter from the Yorkshire region of England, this is a well hopped ale, with a deep bronze color.
ers International Australian le Ale	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				The finest 2-row barley, hops and specially selected yeast produce a beer with fruity and floral characters.
ers Original Bitter	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Deep golden-copper color with a creamy white head. Overt fruit and malt aromas, a full bodied palate.
ers Original Draught	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Light yellow-gold color with a tightly packed white head, floral nose with a hint of malt, medium bodied palate.
ers Original Real Ale	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Bright golden color with a strong head. Pleasant blend of fruit and malt on the nose with generous mouthfeel.
ers Premium Australian Bitter	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				True to our popular Australian commercial bitters, light in color, clean mouthfeel with a pleasant bitter finish.
ers Premium Traditional Draught	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				An outstanding beer using a hop/malt combination set to delight the most discerning draught lovers.
E Microbrewery Original Draught	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	3 - 5	4.8%	Classic English pub bitter—well balanced and full of taste.
E Superbrew Bitter	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	10 - 14	4.8%	Classic English pub bitter —well balanced and full of taste.
E Superbrew Yorkshire Bitter	4 lbs (1.8 kg)	6 g	6 gal (23 L)	32 - 40	10 - 13	4.8%	Typical of the smooth, easy-drinking beers of the Yorkshire region of North East England.
aster Special Bitter	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.8%	A ruby colored bitter beer with a taste which will improve with age. This is very much an old English bitter

pped Extract er Kits	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Color in °Lovibond	Alcohol by Volume	Comments* * Description provided by manufacturers
aster Special Export Ale	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	19 - 23	4.8%	This full flavored beer is made with crystal malt added to give the dark amber color and malty taste.
Bull Best Bitter	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	36 - 44	10 - 13.5		A classic example of this dark clear brew with a smooth, dry character and full bodied flavor.
Bull MasterClass Executive ter	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	36 - 44	12 - 15		A classic English well-hopped ale with a deep bronze color.
Bull Sherwood Ale Best Bitter	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	35 - 45	10 - 13.5		A classic English well-hopped ale with a deep bronze color.
Bull Sherwood Ale Finest emium Forest Bitter	8 lbs (3.6 kg)	5.5 g	6 gal (23 L)	35 - 45	10 - 13.5		A smooth malty, well-hopped deep bronze colored bitter.
tmellick Export Ale	4 lbs (1.8 kg)			25 - 35	3 - 5		
ons Connoisseurs Traditional Bitter	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.8%	The classic English ale, well hopped with a rich malty flavor
ons Connoisseurs Yorkshire Bitter	4 lbs (1.8 kg)	6 g	6 gal (23 L)	32 - 40	10 - 13	4.8%	Typical of the smooth, easy-drinking beers of the Yorkshire region of North East England.
ons Gold Old English Bitter	6.6 lbs (3.0 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.5%	This fine Old English beer rekindles the full bodied, rich ales of Victorian Britain.
ons Premium Bitter	3.3 lbs. (1.5 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.0%	Classic English pub bitter—well balanced and full of taste.
ons Premium Gold Smugglers ecial Ale	8 lbs (3.6 kg)	6 g	6 gal (23 L)	35 - 45	15 - 20	5.0%	Balance is achieved with choice aromatic and bittering hops and the use of finest English 2-row ale malt.
ds Best Bitter	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	32 - 40	10 - 13	4.0%	Classic English pub bitter—well balanced and full of taste.
ds Export Ale	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.0%	Full bodied satisfyingly dark with good hoppy overtones.
fordes Nelsons Revenge	6.6 lbs (3.0 kg)	6 g	6 gal (23 L)	35 - 45	6 - 8	5.0%	The rich and floral aromas initially excite the tastebuds.
fordes Wherry	6.6 lbs (3.0 kg)	6 g	6 gal (23 L)	35 - 45	6 - 8	3.8%	With a fresh zesty aroma, the flavor is everything you could wish for from a 3.8% beer.
ttish Ale							
maker Deluxe Scottish Heavy	4 lbs (1.8 kg)	6 g	6 gal (23 L)	40 - 50		4.6%	The malt and hop combination together, make this a smooth and well balanced brew.
ons Gold Highland Heavy	6.6 lbs (3.0 kg)	6 g	6 gal (23 L)	45 - 55	19 - 23	4.5%	Distinctive rich bitter flavor with a dark, malty profile, balanced by a generous helping of hops.
ons Premium Scottish Heavy Ale	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	45 - 55	19 - 23	4.0%	Full bodied satisfyingly dark with good hoppy overtones.
Rock East India Pale Ale	3.3 lbs (1.5 kg)	5 g	6 gal (23 L)				Medium hopping.
ers Brewmaster IPA	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Amber and golden hues, malt aromas and a hint of fruit, flavors with balanced Styrian Golding hop bitterness.
E Microbrewery English IPA	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.8%	This classic English Pale Ale has the depth of malt flavor and hop bite of the orginal IPAs.
E Superbrew IPA	4 lbs (1.8 kg)	6 g	6 gal (23 L)	46 - 55	10 - 13	4.8%	IPA Bitter is a light, delicately balanced beer.
aster India Pale Ale	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	6 - 8	4.8%	A hint of crystal malt is added to give the beer its pale amber color and a perfect balance of malt and hops.
Bull India Pale Ale	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	17 - 23	10 - 13.5		A British pale ale originally made for the Indian Empire.
Bull MasterClass India Pale Ale	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	36 - 44	5 - 7		A British pale ale originally made for the Indian Empire.
Bull Sherwood Ale India Pale Ale	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	36 - 44	5 - 7		A pale ale with lots of hop character, with a smooth well-balanced body.
ons Connoisseurs IPA Bitter	4 lbs (1.8 kg)	6 g	6 gal (23 L)	17 - 23	9 - 11	4.8%	IPA Bitter is a light, delicately balanced beer.
ons Gold India Pale Ale	6.6 lbs. (3.0 kg)	6 g	6 gal (23 L)	17 - 23	9 - 11	4.5%	Recreate India Pale Ale, brewed to the Troops Tipple at approximately 1041° strength.
wn Ale							
Rock Mild	3.3 lbs (1.5 kg)	5 g	6 gal (23 L)				Medium-light color, low hopping levels, smooth, mild.

opped Extract eer Kits	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Color in °Lovibond	Alcohol by Volume	Comments* * Description provided by manufacturers
ewferm Oud Vlaams Bruin	3.3 lbs (1.5 kg)	6 g	3.16 gal (12 L)			5.5%	Very aromatic, dark brown, liquorice overtones, medium alcohol content.
opers Original Dark Ale	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Rich mahogany color and a creamy head. Roasted malt aromas with a hint of chocolate, with hop bitterness.
ME Superbrew Brown Ale	4 lbs (1.8 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.8%	Dark and smooth, a brown ale with a slightly "nutty" character.
ME Superbrew Mild Ale	4 lbs (1.8 kg)	6 g	6 gal (23 L)	17 - 23	34 - 38	4.8%	A dark sweet yet subtle beer brewed to quench the thirst and satisfy the hunger.
nmaster Northern Brown Ale	4 lbs (1.8 kg)	6 g	6 gal (23 L)	17 - 23	34 - 38	4.8%	A very dark beer with a slight residual sweetness and a very delicate hoppy aftertaste which you are sure to enjoy.
nn Bull Brown Ale	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	22 - 28	27 - 30		The famous English regional ale with characteristic dark clear color and slightly sweet, nutty flavor and aroma.
nn Bull Mild	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	27 - 33	44 - 54		A lightly hopped, malty and tasty dark beer that is low in bitterness, giving a soft smooth brew.
nn Bull Sherwood Ale Dark Oak Ale	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	22 - 28	25 - 32		A lightly hopped malty and tasty dark beer, which is low in bitterness giving a soft smooth brew.
untmellick Brown Ale	4 lbs (1.8 kg)			15 - 25	32 - 38		
ntons Connoisseurs Nut Brown Ale	4 lbs (1.8 kg)	6 g	6 gal (23 L)	17 - 23	34 - 38	4.8%	Dark and smooth, a brown ale with a slightly "nutty" character.
ntons Premium Midland Mild Ale	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	17 - 23	34 - 38	4.0%	A dark sweet yet subtle beer brewed to quench the thirst and satisfy the hunger.
fords Nut Brown Ale	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	45 - 55	19 - 23	4.0%	Rich and warming with an unmistakable "nutty" flavor.
ed Ale							
ew Canada Canadian Red	4.2 lbs (1.9 kg)	5 g	6 gal (23 L)				The distinctive rich copper color and delicious malty flavors have made this one of Canada's favorites.
ewferm Ambiorix	3.3 lbs (1.5 kg)	6 g	3.95 gal (15 L)			6.5%	Copper colored, light sourness, sweet aftertaste.
ME Microbrewery Red Ale	4 lbs (1.8 kg)	6 g	6 gal (23 L)	45 - 55	19 - 23	4.8%	Rich and warming with an unmistakable "red " color.
nglish & Scottish Strong Ale							
ewmaker Deluxe Victorian Bitter	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	40 - 50			A dark traditional bitter with a well hopped bitterness aroma give this brew a distinctive, full body and flavor.
ME Superbrew Strong Ale	4 lbs (1.8 kg)	6 g	3.6 gal (14 L)	45 - 55	19 - 23	7.5%	Full bodied satisfyingly dark with good hoppy overtones.
nn Bull MasterClass Victorian Bitter	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	40 - 50	17.5 - 21		Victorian Bitter is a dark, full-bodied bitter with a sweeter finish; balanced by a high level of bitterness.
nn Bull Sherwood Ale Finest Premium Woodland Ale	8 lbs (3.6 kg)	5.5 g	6 gal (23 L)	40 - 50	17.5 - 21		A dark bitter, with well-hopped bitterness and a distinctive hop aroma.
nn Bull Sherwood Ale Traditional Ale	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	40 - 50	17.5 - 21		A darker and well hopped bitter in the English tradition, full-bodied with a dark malt character
hn Bull Traditional English Ale	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	40 - 50	17.5 - 21		A darker, well-hopped bitter in the English tradition, full-bodied and dark malt character.
ntons Premium Old Ale	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.0%	Rich and warming with an unmistakable "aged" flavor.
ntons Premium Gold Old Conkerwood Black Ale	8 lbs (3.6 kg)	6 g	6 gal (23 L)	35 - 45	32 - 36	5.0%	Old Conkerwood is a distinctive black-colored beer with an aromatic yet hoppy character.
odfordes Norfolk Nog	6.6 lbs (3.0 kg)	6 g	6 gal (23 L)	35 - 45	32 - 36	4.5%	This is a smooth, reddish-black, rich and rounded 'Old Ale' with a velvety texture.
arleywine & Imperial Stouts							
ME Superbrew Barley Wine	4 lbs (1.8 kg)	6 g	1.8 gal (7 L)	45 - 55	19 - 23	8.5%	An extra strong beer for the special occasion.
hn Bull MasterClass Barley Wine	6.6 lbs (3.0 kg)	5.5 g	3 gal (11 L)	36 - 44	12 - 15.5		An extra strong ale with a dark clear color, characteristic of this aromatic malty ale.

pped Extract er Kits	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Color in °Lovibond	Alcohol by Volume	Comments* * Description provided by manufacturers
tons Gold Imperial Stout	6.6 lbs (3.0 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.5%	Captures the essence of this truly classic beer, with its full body, rich black color and distinctive dry bitterness.
tons Premium Barley Wine	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	45 - 55	10 - 13	4.0%	An extra strong beer for the special occasion.
dfordes Headcracker	6.6 lbs (3.0 kg)	6 g		35 - 45	6 - 8	7.0%	This pale beer is strong and full-bodied, rich and filling.
cks							
k Rock Bock	3.75 lbs (1.7 kg)	5 g	6 gal (23 L)				Robust, full flavored, German style dark.
tons Connoisseurs Bock Bier	4 lbs (1.8 kg)	6 g	6 gal (23 L)	17 - 23	34 - 38	4.8%	A dark lager famous in the Bavarian region of Germany.
rter							
E Superbrew London Porter	4 lbs (1.8 kg)	6 g	4.5 gal (17 L)	50 - 60	85 - 104	6.0%	A light hop character and full malt flavor underlie a rich color, possible by the subtle use of the best roasted malts.
n Bull London Porter	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	36 - 44	44 - 54		A roasted malt brew with a lovely smooth finish.
n Bull MasterClass Porter	6.6 lbs (3.0 kg)	5.5 g	6 gal (23 L)	36 - 44	44 - 54		A London style roasted-malt brew with a lovely smooth finish.
tons Gold Docklands Porter	6.6 lbs (3.0 kg)	6 g	6 gal (23 L)	17 - 23	34 - 38	4.5%	A light hop character and full malt flavor underlie a rich color, possible by the subtle use of the best roasted malts.
rds Porter	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	17 - 23	34 - 38	4.0%	A light hop character and full malt flavor under lie a rich color, possible by the subtle use of the best roasted malts.
uts							
k Rock Miner's Stout	3.75 lbs (1.7 kg)	5 g	6 gal (23 L)				Dark, smooth, West Coast coal miner's meal.
wmaker Deluxe Irish Velvet Stout	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	45 - 55			An extra dark, highly roasted brew with a velvety smooth finish.
pers Brewmaster Irish Stout	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				A rich, dark brew displaying coffee, chocolate and licorice aromatics, roasty bitter notes with a dry finish.
pers Original Stout	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Dark brown color, exceptional mouth feel, dark malt characteristics and hop bitterness results in a dry finish.
IE Microbrewery Extra Stout	4 lbs (1.8 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.8%	Very dark and very hoppy, a rich beer of great character.
IE Superbrew Irish Stout	4 lbs (1.8 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.8%	Very dark and very hoppy, a rich beer of great character.
master Irish Stout	4 lbs (1.8 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.8%	This kit will produce a dry stout with a roasted barley aroma and a thick creamy head.
n Bull Irish Stout	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	17 - 23	60 - 75		A black roasty brew, well rounded and smooth with a familiar hoppy finish.
n Bull MasterClass Chocolate Stout	6.6 lbs (3.0 kg)	5.5 g	6 gal (23 L)	45 - 55	60 - 75		The blend of roasted malted barley and chocolate bring a full-bodied, smooth tasting and chocolatey stout.
n Bull MasterClass Irish Stout	6.6 lbs (3.0 kg)	5.5 g	6 gal (23 L)	45 - 55	60 - 75		An extra dark, highly roasted brew with a smooth hoppy finish.
ntmellick Irish Stout	4 lbs (1.8 kg)			50 - 60	85 - 104		
tons Connoisseurs Export Stout	4 lbs (1.8 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.8%	Strong and full of body, serve chilled to appreciate this very dark, very hoppy stout.
tons Premium Irish Stout	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.0%	Very dark and very hoppy, a rich beer of great character.
rds Shamrock Stout	3.3 lbs (1.5 kg)	6 g	6 gal (23 L)	50 - 60	85 - 104	4.0%	Very dark and very hoppy, a rich beer of great character.
heat Beers							
vferm Grand Cru	3.3 lbs (1.5 kg)	6 g	2.37 gal (9 L)			8.0%	Gold colored beer with subtle herbal aroma, full malty flavor, light fruitiness.
vferm Tarwebier	3.3 lbs (1.5 kg)	6 g	3.95 gal (15 L)			5.0%	Thirst quenching, super light, slightly cloudy blond.
pers Brewmaster Wheat Beer	3.75 lbs (1.7 kg)	7 g	6 gal (23 L)				Hazy gold, floral aromas follow through on a very clean, medium-bodied palate with a soft wheaty mouthfeel.
IE Microbrewery Wheat Beer	4 lbs (1.8 kg)	6 g	6 gal (23 L)	25 - 35	< 4	4.8%	Made from a careful balance of wheat and barley malt, this is a crisp refreshing, distinctive beer.
IE Superbrew Wheat Beer	4 lbs (1.8 kg)	6 g	6 gal (23 L)	25 - 35	< 4	4.8%	Made from a careful balance of wheat and barley malt, this is a crisp refreshing, distinctive beer.

opped Extract eer Kits	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Color in °Lovibond	Alcohol by Volume	Comments* * Description provided by manufacturers
n Bull MasterClass Wheat Beer	6.6 lbs (3 kg)	5.5 g	6 gal (23 L)	16 - 20	3.5 - 6		A pale colored brew with a distinctive delicious complex of fruitiness, with its own unique flavor.
n Bull Wheat Beer	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	16 - 20			Pale colored, medium hopped, with the distinctive flavor and head retention of this classic European beer style.
ntons Connoisseurs Wheat Beer	4 lbs (1.8 kg)	6 g	6 gal (23 L)	25 - 35	< 4	4.8%	Made from a careful balance of wheat and barley malt, this is a crisp refreshing, distinctive beer.
rong Belgian Ale							
wferm Abdij	3.3 lbs (1.5 kg)	8 g	2.37 gal (9 L)			8.0%	Dark brown, full body, malty flavor, requires long aging.
wferm Diabolo	3.3 lbs (1.5 kg)	6 g	2.37 gal (9 L)			8.0%	Fiery gold, soft flavor, high alcohol content.
wferm Triple	3.3 lbs (1.5 kg)	7 g	2.37 gal (9 L)			8.0%	Golden, soft but strong , malty flavor, light fruitiness.
uit/Herb Beer							
wferm Framboos	3.3 lbs (1.5 kg)	6 g	3.16 gal (12 L)			5.5%	Refreshing with delicate but delicious aroma.
wferm Kriek	3.3 lbs (1.5 kg)	6 g	3.16 gal (12 L)			5.5%	Slightly acidic, sweet tasting, fine aroma, full head.
ppers Premium Ginger Beer	2.16 lbs (980g)	7 g	5.25 gal (20 L)				A traditional flavored ginger beer with a hint of spice and plenty of bite, sure to quench the deepest thirst.
ristmas Beer							
wferm Christmas	3.3 lbs (1.5 kg)	6 g	1.84 gal (7 L)			7.5%	Strong brown beer, pleasant malty flavor, requires long maturation
ntons Premium Gold Santa's Winter Warmer	8 lbs (3.6 kg)	6 g	5.4 gal (21 L)	36 - 45	6 - 8	5.7%	This fun festive brew with its distinctive malty flavor is sure to make the season go with a BANG!
w-Carb Beers							
n Bull Low Carbohydrate Bitter	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	36 - 44			A low carbohydrate bitter suitable for consumption by those on a reduced sugar diet such as diabetics.
n Bull Low Carbohydrate Lager	4 lbs (1.8 kg)	5.5 g	6 gal (23 L)	27 - 33			A low carbohydrate lager suitable for consumption by those on a reduced sugar diet such as diabetics.

oncentrated rewers Worts	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Comments* * Description provided by manufacturers
rth American Lager					
ons American Light	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Low alcohol beer with a golden straw color and a smooth mellow flavor.
ons American Steam Lager	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Pale golden color with slight hop bitterness. A special blend of blond malt, rice for a full nutty flavor.
ons Canadian Draught	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Creamy beer with a sparkling golden color. Lightly hopped to bring out the true flavor of pub draughts.
ons Canadian High Test	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Higher alcohol content of a strong beer, smooth and flavorful, robust and bold, for the brave-hearted.
ons Canadian Lager	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Similar color and flavor to commercial varieties without the additives.
ons Canadian Pilsner	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Slightly more hop flavor than typical domestic lagers, light in color, but full in flavor.
ons Mexican Cerveza	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Light and easygoing, with that special hint of flavor. Nothing quenches better then this summertime beer.
w House American Premium Lager	3.95 gal (15 L)	5 g	6 gal (23 L)	8	This favorite is a refreshing, straw-colored lager with a subtle aroma.
w House Mexican Cerveza	3.95 gal (15 L)	5 g	6 gal (23 L)	10	Light bodied and crisp—Perfect for the patio or beach!
wers Spring Draft	2 gal (7.5 L)	5 g	6 gal (23 L)	18	Creamy Draft features a flavorsome hop character that distinguishes it from other lagers.

oncentrated ewers Worts	Extract Included	Yeast Included	Yield (U.S. gallons)	Bitterness (IBUs)	Comments* * Description provided by manufacturers
wers Spring Lager	2 gal (7.5 L)	5g	6 gal (23 L)	20	A bright, golden, smooth refreshing beer with a crisp, clean taste.
wers Spring Mexican Lager	2 gal (7.5 L)	5 g	6 gal (23 L)	20	Clean, crisp and light in color with a dry finish.
ta Brew Blonde Lager	6 gal (23 L)	11.5 g	6 gal (23 L)	11	A yellow colored, crisp beer with a genuine lager yeast. An all-malt lager brewed with no adjuncts.
ropean Lager					
ons Dutch Lager	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		A crisp, golden lager character and smooth spicy hoppiness rounding out to a gentle, grassy finish.
w House Pilsner	3.95 gal (15 L)	5 g	6 gal (23 L)	35	Golden in color, medium bodied and easy drinking with a dramatic finish.
wers Spring Pilsner	2 gal (7.5 L)	5 g	6 gal (23 L)	27	A golden Pilsner with distinctive hoppy characteristics and flowery aroma
ta Brew Continental Pilsner	6 gal (23 L)	11.5 g	6 gal (23 L)	23	A well rounded, golden European-style lager with a noticeable hop profile and all-malt character.
ght Ale					
ons Canadian Golden Ale	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Beautiful pale colored beer with slightly more hop flavor than typical Canadian beers.
w House Cream Ale	3.95 gal (15 L)	5 g	6 gal (23 L)	22	West Coast style, dark in color and full malty taste.
w House Honey Blonde Ale	3.95 gal (15 L)	5 g	6 gal (23 L)	18	Full bodied and smooth, round palate of honey and slightly sweet finish.
wers Spring Light	2 gal (7.5 L)	5 g	6 gal (23 L)	11	Our version has a smooth, mellow flavor and clean, crisp taste.
ta Brew Cream Ale	6 gal (23 L)	11.5 g	6 gal (23 L)	13	A medium bodied, slightly fruity ale style. Deep golden color with a delicate hop aroma and flavor.
tter & Pale Ale					
ons Redwood Ale	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		A copper color cream ale with traditional Canadian hop flavor and aroma.
w House Pale Ale	3.95 gal (15 L)	5 g	6 gal (23 L)	30	Crisp, amber colored and aromatic, typical English classic.
ta Brew Pale Ale	6 gal (23 L)	10 g	6 gal (23 L)	25	A deep golden colored, hoppy, fruity pale ale with pleasant flavors and aromas of fresh hops.
A					
ons Pale Ale	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Rich, chestnut color with a slightly higher hop bitterness for a true English pale ale flavor.
w House India Pale Ale	3.95 gal (15 L)	5 g	6 gal (23 L)	50	Copper/golden in color, higher gravity and hop rates makes this a winner!
d Ale					
ons Amber Ale	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Slightly more bitter than typical ales but its maltiness gives a nice balance between sweet and bitter.
w House Red Ale	3.95 gal (15 L)	5 g	6 gal (23 L)	18	Copper red in color with a balanced hop bitterness and floral aroma, this beer is sure to please.
ta Brew Red Ale	6 gal (23 L)	11.5 g	6 gal (23 L)	13	Moderate malt body and pleasant mild sweetness. Moderate hop bitterness, and low hop aroma.
own Ale					
ons Brown Ale	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Smooth, clean and crisp. Pale golden color with slight hop bitterness.
ta Brew Brown Ale	6 gal (23 L)	10.5 g	6 gal (23 L)	15	Pleasantly roasted, mid-bodied malt profile with low hop flavor/aroma and moderate hop bitterness.
ck & Dark Lager					
w House Munich Dark Lager	3.95 gal (15 L)	5 g	6 gal (23 L)	20	Delicate sweet malt notes with a toasted nutty flavor
ta Brew Bock	6 gal (23 L)	11.5 g	6 gal (23 L)	16	A classic dark, malty, strong German style bock beer, finishes moderately sweet.
out					
w House Stout	3.95 gal (15 L)	5 g	6 gal (23 L)	30	Dark and rich with bold roasted flavors, hint of chocolate and espresso like finish.
ta Brew Double Oatmeal Stout	6 gal (23 L)	10.5 g	6 gal (23 L)	28	An opaque, full-bodied ebony ale with two types of oats, a pleasant roast malt character, subtle malt sweetness and slight hop flavor.
heat Beers					
ons Canadian Wheat Ale	19.6 lbs (8.9 kg)	7 g	6 gal (23 L)		Pale yellow color with its own unique full-bodied flavor made by high quality wheat malt.
w House Prairie Wheat	3.95 gal (15 L)	5 g	6 gal (23 L)	10	Light bodied with a subtle hop character—a Canadian classic.
ta Brew Wheat	6 gal (23 L)	11.5 g	6 gal (23 L)	9	A clean, light straw color wheat beer with low hop bitterness. Refreshing and thirst quenching.
w-Carb Beer					
ta Brew LowCarb	6 gal (23 L)	11.5 g	6 gal (23 L)	9	All malt, no adjuncts. Very light straw color and light bodied with a dry finish

Dry and Liquid Unhopped Malt Extract	Extract Name	Dried (DME) or Liquid Malt Extract (LME)	Color in °Lovibond	Bitterness if Hopped (IBUs)	Comments*
					* Description provided by manufacturers
XTRA LIGHT					
iess CBW®	Pilsen Light	LME	1.5 - 3.0 @ 8° Plato		Pilsen Malt and Carapils Malt, appropriate style use: all styles of beer
iess CBW®	Pilsen Light	DME	1.5 - 3 @ 8° Plato		Pilsen Malt and Carapils Malt, appropriate style use: all styles of beer
aglander Spray	Extra Light	DME	< 6		Add to American Style Beers and Lagers to give extra body and character.
untons	Super Light	LME	<6		Add to American Style Beers and Lagers to give extra body and character.
untons Spraymalt	Extra Light	DME	< 4		Adds extra body and richness. Useful for American Style Beers and Lagers.
rthwestern Extract Co.	Extra Light	LME	1.9 - 5		Adds extra body and richness. Useful for American Style Beers and Lagers.
GHT					
exander's Sun Country Pale	Pale	LME	2.2		
erkeller Plain	Light	LME	< 6		A base for lagers or use to add extra body and character to any beer
iess CBW®	Golden Light	LME	2 - 6 @ 8° Plato		Base Malt and Carapils Malt, appropriate style use: all styles of beer
iess CBW®	Golden Light	DME	2 - 6 @ 8° Plato		Base Malt and Carapils Malt, appropriate style use: all styles of beer
opers Brewery	Light	LME	2.5		2-row pale malt is ideal for brews intended to be light in color.
hn Bull Bulldog Blends	Light	LME	5 - 8		Imparts rich flavor compounds, and improves the clarity of the product
hn Bull Bulldog Hopped	Light	LME	5 - 8	27 - 33	A great base for your own unique lager.
aglander Spray	Light	DME	< 12		Add extra body and character to any beer.
ountmellick	Light	LME	3-5		
untons	Light	LME	8-12		Adds extra body and richness. Useful for American Style Beers and Lagers.
untons Spraymalt	Light	DME	3 - 5		Adds extra body and richness. Useful for American Style Beers and Lagers.
rthwestern Extract Co.	Light	LME	4 - 9		
rthwestern Extract Co.	Gold	DME	5 - 10		Good for: Pilsner, Lager, Pale Ale, Dortmunder, Märzen, Low Calorie/Alcohol
rthwestern Extract Co.	Gold	LME	5 - 10		Good for: Pilsner, Lager, Pale Ale, Dortmunder, Märzen, Low Calorie/Alcohol.
eyermann Bavarian Pilsner	Gold	LME	6-8		Brewed to match true German beer style.
MBER					
erkeller Plain	Amber	LME	15 - 21		A great base to produce an outstanding ale
iess CBW®	Sparkling Amber	LME	8 - 13 @ 8° Plato		Base Malt, Caramel 60L Malt, Munich Malt, for complex flavor and rich color.
iess CBW®	Sparkling Amber	DME	8 - 13 @ 8° Plato		Base Malt, Caramel 60L Malt, Munich Malt, for complex flavor and rich color.
opers Brewery	Amber	LME	8.2		2-row pale malt & crystal malt is ideal where more depth is required.
hn Bull Bulldog Blends	Amber	LME	15 - 21		Crystal malts add depth and flavor to produce ales and bitters
hn Bull Bulldog Hopped	Amber	LME	15 - 21	36 - 44	The addition of crystal malt brings depth and flavor to your English bitters.
hn Bull Bulldog Blends	Dark Amber	LME	30 - 36		Make your own unique Old English Bitter or add something extra to your beer.
aglander Spray	Amber	DME	42 - 51		Brings depth and flavor to produce ales and bitters of supreme quality
ountmellick	Amber	LME	5-8		
untons	Medium	LME	27-33		Boosts the beer's natural body and adds rich malt flavor, ideal for bitters.
untons Spraymalt	Medium	DME	10 - 13		Boosts the beer's natural body and adds rich malt flavor, ideal for bitters.
rthwestern Extract Co.	Amber	DME	10 - 15		Good for: Amber, India Pale Ale, Munich Style, Märzen, Bock
rthwestern Extract Co.	Amber	LME	10 - 15		Good for: Amber, India Pale Ale, Munich Style, Märzen, Bock.
eyermann Munich Amber	Amber	LME	8.8-11.1		Brewed to match true German beer style.
ARK					
erkeller Plain	Dark	LME	97 - 121		A fantastic base for a mild, porter or stout
opers Brewery	Dark	LME	33		2- row pale, crystal malt & roasted barley is excellent for dark brews.
iess CBW®	Traditional Dark	LME	25 - 45 @ 8° Plato		Base Malt, Caramel 60L Malt, Munich Malt, Black Malt, for dark beer styles.
iess CBW®	Porter	LME	120 - 150 @ 8° Plato		Base Malt, Caramel 60L Malt, Wheat Malt, Chocolate Malt, Roasted Barley.
iess CBW®	Traditional Dark	DME	25 - 45 @8° Plato		Base Malt, Caramel 60L Malt, Munich Malt, Black Malt, all dark beer styles.
iess CBW®	Porter	DME	120 - 150 @ 8° Plato		Base Malt, Caramel 60L Malt, Wheat Malt, Chocolate Malt, Roasted Barley.
hn Bull Bulldog Blends	Dark	LME	97 - 121		Roasted malts give rich mocha flavor and aroma to mild, porter and stout.
hn Bull Bulldog Hopped	Dark	LME	97 - 121	45 - 55	Colored using roasted malt gives rich mocha flavor and aroma to any stout.
aglander Spray	Dark	DME	91 - 121		Give a rich mocha flavor and aroma to mild, porter and stout brews
ountmellick	Dark	LME	85-104		
untons	Dark	LME	50-60		Great for stout, porter or brown ale, adding rich malt flavor and natural color.
untons Spraymalt	Dark	DME	13-23		Great for stout, porter or brown ale, adding rich malt flavor and natural color.
rthwestern Extract Co.	Dark	DME	15 - 20		Good for: Dark, Octoberfest, Bock, Doppelbock, Brown Ales
rthwestern Extract Co.	Dark	LME	15 - 20		Good for: Dark, Octoberfest, Bock, Doppelbock, Brown Ales.
HEAT					
exander's Sun Country Wheat	Wheat	LME	5		
iess CBW®	Bavarian Wheat	LME	2 - 6 @ 8° Plato		Wheat Malt and Base Malt, wheat beer or for improved head retention.
iess CBW®	Bavarian Wheat	DME	2 - 6 @ 8° Plato		Wheat Malt and Base Malt, wheat beer or for improved head retention.
opers Brewery	Wheat	LME	2.2		50%wheat/50%pale for softer mouth-feel and improved head retention
hn Bull Bulldog Blends	Wheat Syrup	LME	5 - 8		Make your own unique weizen beer or zest up your beer.
untons Spraymalt	Wheat	DME	< 4		Great for all traditional wheat beer styles. Adds extra body and richness.
rthwestern Extract Co.	Weizen	DME	6 - 10		Good for: Bavarian Style Weizen, Berliner Style Weiss, Dunkel Weizen.
rthwestern Extract Co.	Weizen	LME	6 - 10		Good for: Bavarian Style Weizen, Berliner Style Weiss, Dunkel Weizen.
eyermann Bavarian Hefeweizen	Weizen	LME	9.8-13.6		Brewed to match true German beer style.
IASTATIC					
hn Bull Bulldog Blends	Diastatic	LME	< 9		Allows clearer, stronger brews with a dry palate through enzyme conversion.

Brew Your Own
THE HOW-TO HOMEBREW BEER MAGAZINE

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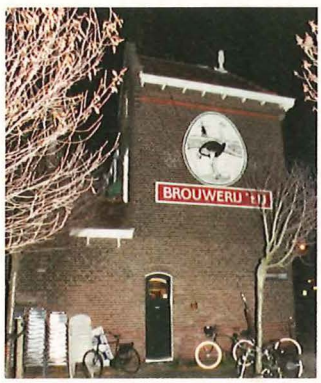
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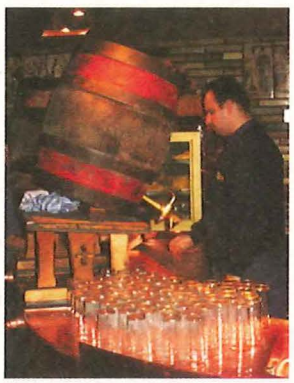
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COUNTERTOP

PARTIAL MASHING

Add flexibility to your stovetop brewing with this straightforward technique.

by **Chris Colby** photos by **Jennifer Colby**

PARTIAL MASHING PLUS BATCH SPARGING (IN A SMALL, UNMODIFIED COOLER) PLUS THE EXTRACT LATE METHOD ADD UP TO A GREAT WAY TO MAKE HOMEBREW ON YOUR STOVETOP.

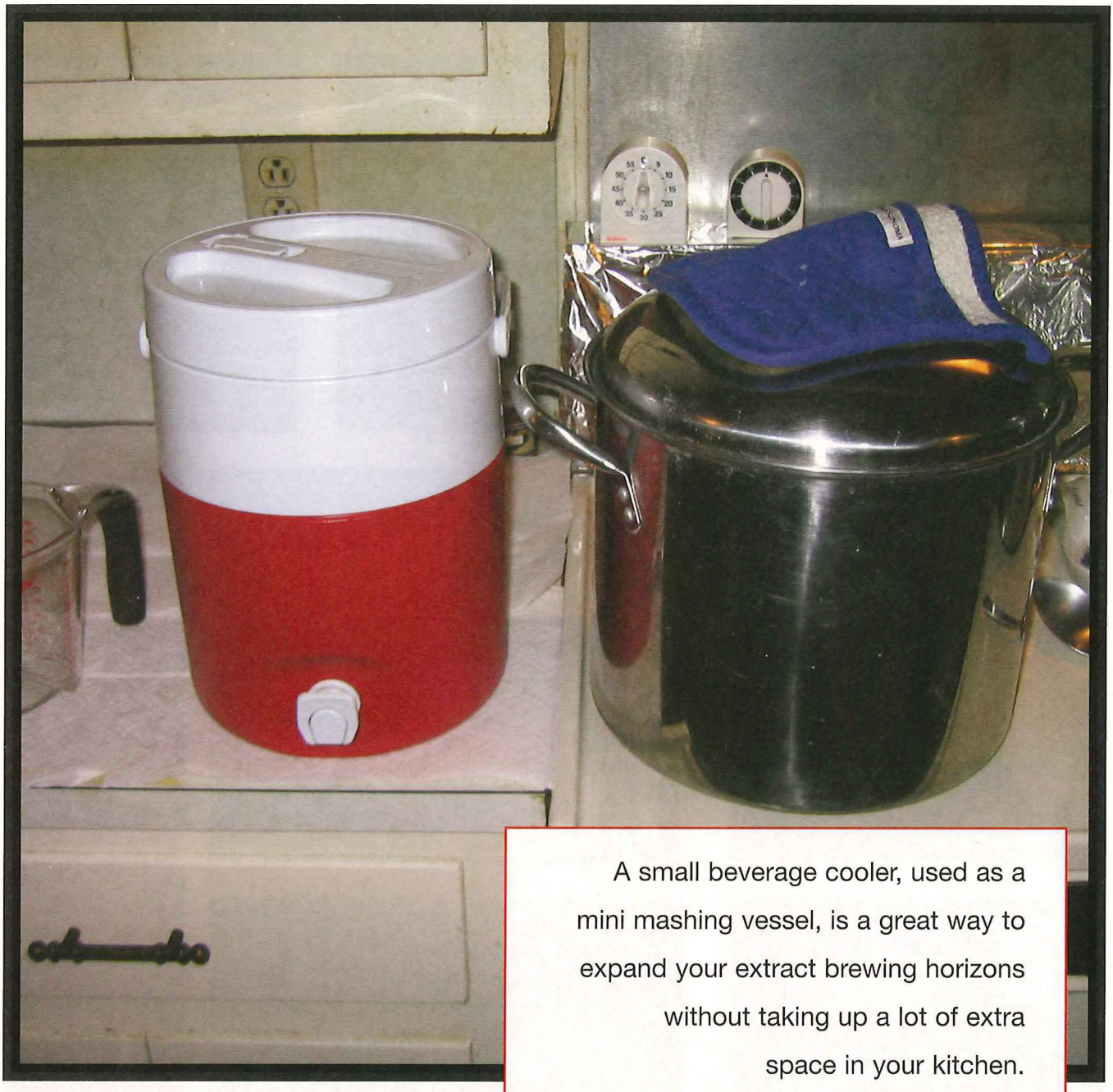
Most homebrewers identify themselves either as extract or all-grain brewers, but there's another division that may be just as important — stovetop brewers or outside brewers. Generally, extract brewers brew in their kitchen, on their stovetop, whereas most all-grain brewers are outside brewers — or at least outside-of-the-kitchen brewers. However, there are many exceptions. Some all-grain brewers do brew in their kitchen, using their kitchen stove to heat their kettle. Likewise, some extract brewers boil their wort with a turkey fryer out on their driveway or patio.

Back when I was an apartment dweller, living in Boston, I was a stovetop brewer — starting with extract beers and moving on to all-grain later. In the cramped space of my apartment kitchen, I found problems with both methods. When I made extract beer — boiling a "thick" wort, then diluting it in my fermenter — my beer always turned out too dark and not hoppy enough. When I made all-grain beers, the equipment took up a ton of space and I had difficulty bringing the 6 gallons (23 L) of wort I would collect to a rolling boil on my stove.

These days, I live in a house in Texas and brew out on my carport, but sometimes, there are problems with that, too. For example, last year, when I brewed the official batch of *BYO*'s 10th Anniversary Ale, it was 110 °F (43 °C) outside. Under my carport, with all the burners going, it was 113 °F (45 °C). Inside, my kitchen was air-conditioned. That day, I started thinking about a way to brew in my kitchen again. I wanted a method that avoided the problems associated with boiling a thick, extract wort, but had (at least most of) the flexibility of all-grain brewing. Then one day, walking through The Sports Authority — an Austin sporting goods store — it dawned on me.

All the bits and pieces of my solution have been presented in *Brew Your Own* before. Back in the October 2002 issue, Mark Henry wrote an article titled "Beer The Partial Mash Way," outlining one method of partial mashing. In the same issue, Steve Bader wrote an article on the then-new "extract late" method of extract brewing. And finally, in the January 2004 issue, Denny Conn wrote about batch sparging, a lautering method for all-grain brewers.

All these disparate threads came together when I saw a 2-gallon (7.6 L) insulated beverage cooler in the camping section of Sports Authority. (And no, the thought of exercising never occurred to me while in the store, I was only there



A small beverage cooler, used as a mini mashing vessel, is a great way to expand your extract brewing horizons without taking up a lot of extra space in your kitchen.

looking for camping gear that I could convert into equipment for my home brewery.)

The basics of my idea are this: You mash 4.0 lbs. (1.8 kg) of grain in a 2.0-gallon (7.6-L) beverage cooler. To avoid having to make any conversions to the cooler, you use a batch sparge procedure for collecting your wort. The roughly 3.0 gallons (11 L) of wort you make in the mini-mash is boiled, along with your hops, down to 2.5 gallons (9.5 L) on your stovetop. At or near the end of the boil, you add light liquid malt extract to achieve the total amount of fermentables you require. Finally, after cooling your wort, you dilute it with water to 5.0 gallons (19 L).

This method combines the benefits of the "extract late" method of extract brewing, with the flexibility of partial mashing — and it can all be done in your kitchen, while only taking up an extra foot or two of counter space.

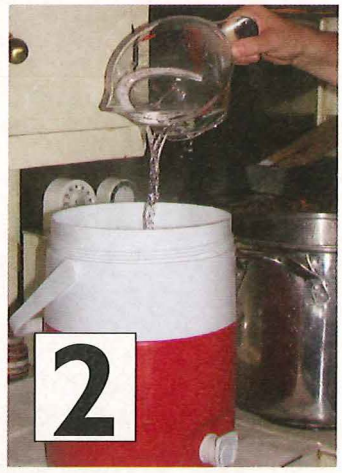
There are many other benefits to this procedure and I'll explain them — as well as the one potential pitfall — as I walk you through a brewday of countertop partial mashing.

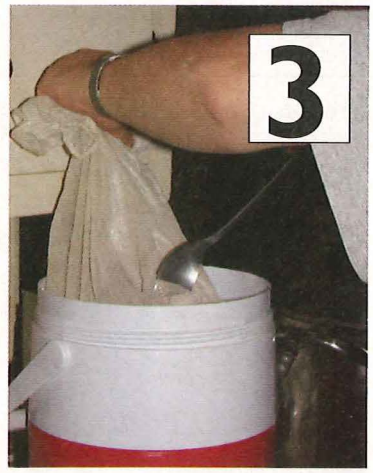
Four Pounds of Grain

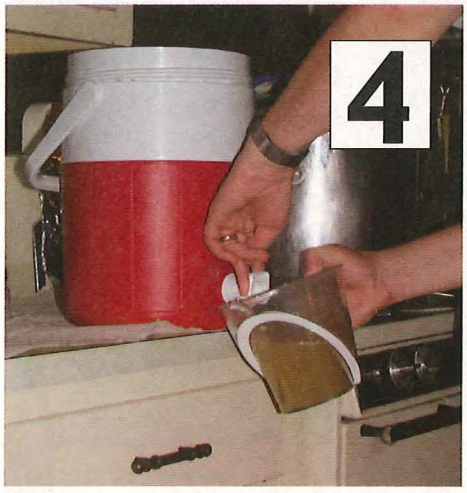
At the heart of this method is 4.0 lbs. (1.8 kg) of grain — whatever specialty grains the recipe calls for with the remainder being base malt. And, you can use any base malt you want. For example, you can use 2-row pale or pale ale malt, including malts made from Maris Otter or Golden Promise barley. You can use Munich or Vienna malt. You can use wheat or rye malts. Many of these base grains are either unavailable or hard to find in malt extract form.

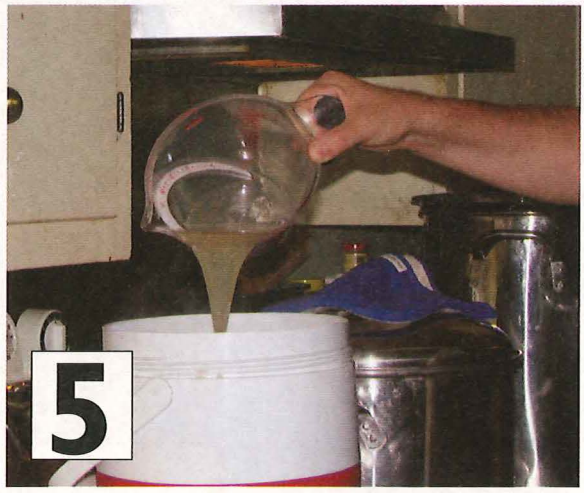
You can even use a limited amount of starchy adjuncts — such as flaked maize, flaked oats or flaked barley — up to



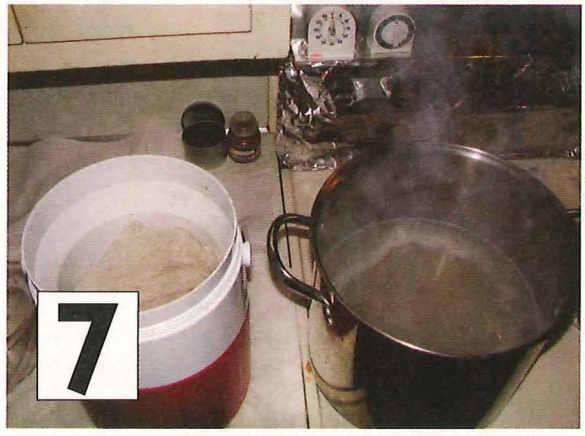












1. All you need, beyond your regular brewing equipment, is an (unmodified) 2-gallon (7.6-L) beverage cooler, a large grain bag and a measuring cup or beer pitcher.
2. The first step is to heat 5.5 qts. (5.2 L) of mash water to 11 °F (6.1 °C) above your target mash temperature, then add it to your cooler.
3. Slowly dunk the crushed grains, in the bag, into the hot water. Use a brewing spoon to poke and prod at the bag to ensure the grain and water mix thoroughly.
4. Draw off your wort by simply opening the spigot. Let the wort run down the side of your collection vessel to avoid splashing as much as possible.
5. The first few quarts of wort will be cloudy and need to be poured back on top of the grain bag. This filters out large chunks of husk and clarifies the wort somewhat.
6. After the recirculation step, the first wort is added to your kettle. It only takes a couple minutes to drain the cooler. Then the whole process is repeated to make your second wort.
7. Once the first and second worts are collected, and combined with the boiling water in your kettle, proceed with your brewing as you normally would.

around 13 oz. (0.36 kg) per 5.0-gallon (19-L) batch when mashed with most 2-row pale malts. (You can use up to 19 oz. (0.54 kg) of starchy adjunct if you use a 6-row base malt.) Starchy adjuncts can't be steeped, but using a partial mash procedure allows stovetop brewers to utilize these grains in their brewing. Basically — with my countertop, batch sparging, partial mash procedure — you can use any base malt available to all-grain brewers, and limited amounts of any starchy adjunct.

As with a full, all-grain mash, you can mash at a "low" mash temperature — 148–152 °F (64–67 °C) — and make a highly fermentable wort. Likewise, you can mash at a "high" mash temperature — 156–162 °F (69–72 °C) and make a less fermentable wort. Your overall wort fermentability will depend both on your mash temperature (and hence the fermentability of your mini-mash wort) and the amount and fermentability of your malt extract.

Why 4.0 lbs. (1.8 kg) of grain? Well, if you pick a reasonable mash thickness for the batch sparge, 4.0 lbs. (1.8 kg) of grain and the required amount of water fill a 2-gallon (7.6 L) cooler almost to the top. In my recipes, I use 1.375 quarts of water per pound of grain (2.9 L/kg). This translates to 5.5 qts. (5.2 L) of water per 4.0 lbs. (1.8 kg) of grain.

From the four pounds (1.8 kg) of grain, you will yield about 20 "gravity points" in a 5-gallon batch. In other words, the partial mash alone will make 5 gallons (19 L) of beer at a specific gravity of 1.020. This is, incidentally, approximately the amount of fermentables that a 3.3-lb. (1.5-kg) can of liquid malt extract yields. The exact specific gravity you achieve will depend on many variables, most notably what grains you mash and how well they are crushed. For a low-gravity beer, almost half of the fermentables can come from your partial mash.

You can also mash your grains in a 3-gallon (11-L) beverage cooler, using 6 lbs. (2.7 kg) of grain. To convert the recipes in this story to a 3-gallon (11-L) partial mash, add 2.0 lbs. (0.91 kg) of the specified base grain to your recipe and an extra 2.75 quarts (2.6 L) of water to your mash water. Subtract 1 lb. 2 oz. (0.51 kg) of dried malt extract (or 1.5 lbs./0.68 kg





RECIPES

Colby House Porter

(5 gallon/19 L, partial mash)

OG = 1.048 FG = 1.011

IBU = 44 SRM = 58 ABV = 4.8%

This is my house ale, converted to the countertop partial mashing procedure. 48% of the extract weight — the amount of fermentable and non-fermentable sugars that contribute to the original gravity (OG) of the beer — comes from the mini-mash.

Ingredients

1.0 lb. (0.45 kg) 2-row pale ale malt (Maris Otter)
1.0 lb. (0.45 kg) Munich malt
1.0 lb. (0.45 kg) crystal malt (40 °L)
7.0 oz. (0.20 kg) chocolate malt
6.0 oz. (0.17 kg) black patent malt
3.0 oz. (85 g) roasted barley (500 °L)
6.0 oz. (0.17 kg) Muntons Light dried malt extract
3.3 lbs. (1.5 kg) Muntons Light liquid malt extract (late addition)
12 fl. oz. (355 mL) molasses (15 mins)
1 tsp. Irish moss (15 mins)
11 AAU Northern Brewer hops (60 mins) (1.2 oz./35 g of 9% alpha acids)
1.25 AAU Fuggles hops (15 mins) (0.25 oz./7.1 g of 5% alpha acids)
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast (1 qt./~1 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

Heat 5.5 qts. (5.2 L) of water to 169 °F (76 °C) and mash grains, starting at 158 °F (70 °C), for 30 minutes. While mash is resting, boil 0.5 gallons (1.9 L) of water in your brewpot and heat 5.5 qts. (5.2 L) of water to 180 °F (82 °C) in a large kitchen pot. Recirculate 3 quarts (~3 L) of wort then run off first wort and add it to the boiling water in kettle. Add 180 °F (82 °C) water to cooler until liquid level is the same as during the first mash. Let rest for 5 minutes, then recirculate and run off second wort. Bring wort to a boil, add dried malt extract and bittering hops and boil for 60 minutes. Add liquid malt extract, molasses, Irish moss and flavor hops with 15 minutes left in boil. After boil, cool wort, transfer to fermenter and add water to make 5 gallons (19 L). Aerate and pitch yeast. Let ferment at 70 °F (21 °C).

BYO.COM bonus: Two more recipes using the countertop partial mash procedure.

Kluster Kreme (Cream Ale)

(5 gallon/19 L, partial mash)

OG = 1.044 FG = 1.008

IBU = 15 SRM = 4 ABV = 4.6%

This interpretation of an American cream ale uses the classic American hop, Cluster. 52% of the extract weight comes from the mini-mash.

Ingredients

3.0 lb. (1.4 kg) 6-row pale malt
1.0 lb. (0.45 kg) flaked maize
1.0 lb. (0.45 kg) corn sugar
2.75 lbs. (1.2 kg) Coopers Light liquid malt extract (late addition)
4 AAU Cluster hops (60 mins) (0.57 oz./16 g of 7% alpha acids)
1 oz. Irish moss (15 mins)
¾ tsp. yeast nutrients (15 minutes)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or US56 dried yeast (1.5 qt./~1.5 L yeast starter)
1.0 cup corn sugar (for priming)

Step by Step

Heat 5.5 qts. (5.2 L) of water to 163 °F (73 °C) and mash maize and crushed grains, starting at 152 °F (67 °C) for 45 minutes. Recirculate, run off first wort and add it to 0.5 gallon (1.9 L) of boiling water in your kettle. Add 190 °F (88 °C) water to cooler, let rest for 5 minutes, then recirculate and run off second wort. Bring wort to a boil, add corn sugar and bittering hops and boil for 60 minutes. Add Irish moss and yeast nutrients with 15 minutes left in boil. After boil, stir in liquid malt extract and let wort rest (covered) for 15 minutes before cooling. Cool wort, transfer to fermenter and add water to make 5 gallons (19 L). Aerate and pitch yeast. Ferment at 68 °F (20 °C).

Strauss in the Haus Vienna Lager

(5 gallon/19 L, partial mash)

OG = 1.051 FG = 1.013

IBU = 20 SRM = 13 ABV = 5.0%

46% of the extract weight comes from the mini-mash.

Ingredients

3.5 lb. (1.6 kg) Vienna malt
7.5 oz. (0.21 kg) CaraMunich II® malt (45 °L)
0.5 oz. (14 g) chocolate malt
0.75 lbs. (0.34 kg) Briess Light dried malt extract
4.0 lbs. (1.8 lbs) light liquid malt extract (late addition)
5 AAU Tettnang hops (60 mins) (1.25 oz./35 g of 4% alpha acids)
0.25 oz. (7.1 g) Hallertau hops (10 mins)
1 tsp. Irish moss (15 mins)
Wyeast 2206 (Bavarian Lager), White Labs WLP820 (Octoberfest/Märzen) or White Labs WLP920 (Old Bavarian Lager) yeast (3 qt./~3 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step

Heat 5.5 qts. (5.2 L) of water to 167 °F (75 °C) and mash, starting at 154 °F (68 °C) for 45 minutes. Collect first and second worts, then add dried malt extract and boil combined wort for 60 minutes, adding hops and Irish moss at times indicated in the ingredient list. Add liquid malt extract with 15 minutes left in the boil. Ferment at 54 °F (12 °C). Diacetyl rest at 60 °F (16 °C). Lager at 40 °F (4.4 °C).

liquid malt extract) to account for the added base malt. With a 3-gallon (11-L) partial mash, you can either collect, and boil down, a few more quarts of wort, or you can quit collecting wort when you reach the amount specified in a typical 2.0-gallon (7.6-L) partial mash recipe (around 3.0 gallons (11 L).

Mashing In

To begin your brewing session, heat 5.5 qts. (5.2 L) of water to 11 °F (6.1 °C) over your target mash temperature. While the water is heating, put your crushed grains into a large nylon steeping bag. Tie the bag off at the very end, leaving as much space for the grain to expand as possible. Once the water is heated, pour it into the cooler, then slowly lower the grain bag into the hot water. (Note: you do not need to modify the cooler in any way.)

Use a clean brewing spoon to poke and prod at the bag as you lower it into the hot water. You do not want any pockets of dry grain in the middle of your mash. Once the bag is submerged, make a mental note of how high the liquid level is in the cooler, then put the lid on and set a timer for 30–45 minutes.

Adding the grain to the water is the point in the procedure you need to be most careful about. Lower the grain bag very slowly into the hot water and use your spoon to vigorously poke at the bag. You may even want to bob the bag up and down slightly as you lower it into the hot water. If you just dunk the bag quickly, and are too dainty with your spoon, it is very possible — almost guaranteed, really — that pockets in the crushed grain will not be in contact with water. If this happens, your extract efficiency can be greatly diminished. So, go slowly — it should take a couple minutes to lower the grain into the water. And, wield your spoon like you mean it.

During the time the mash rests, the starch in the base grains will dissolve and enzymes from the grain will convert the starch to simple sugars. After mashing in (mixing the grain and water), feel around on the cooler. If any part — such as the lid — feels hot, cover that part with a towel or pot holder to conserve heat.

After the mash is completed, you will drain all the wort in the cooler (the first wort), then add more hot water (sparge water) and collect the second volume of wort (the second wort). While the grains are mashing, begin heating 5.5 quarts (5.2 L) of sparge water to 180–190 °F (82–88 °C) in a large kitchen pot. In addition, begin heating 0.5 gallon (1.9 L) of water to a boil in your brewpot.

Collecting the First Wort

After the mash is completed, open the lid on the cooler. Take a beer pitcher or large measuring cup (or any other similar container), hold it below the cooler's spigot and run off about a couple pints of wort. Pour this wort carefully back into the cooler, on top of the grain bag. Repeat a few times until the wort clears somewhat and no large bits of husk are seen in the runoff. You shouldn't need to recirculate more than a few quarts total. (Sometimes, especially when light-colored grains are used, the wort won't seem to clear much as you draw it off. If this happens, don't worry, the beer will clear during the boil.)

Next, open the spigot and collect all the wort that runs off. Pour this wort immediately into the 0.5 gallon (1.9 L) of boiling water in your brewpot. (Pouring the wort into the boiling water will stop any enzymatic activity and "fix" the fermentability of that wort. This serves the same purpose as a mash out does in a full mash.) When the flow of wort from the spigot slows to a trickle, keep collecting for a minute or so, then stop. You have now collected the first wort from your mash. Keep heating this wort in your kettle while you collect the second wort. When it comes to a boil, adjust your heat to produce a moderate boil.

When collecting your wort from the cooler, tilt the collection vessel so that wort runs down the side. Don't let the hot wort fly through the air and splash into the bottom of the vessel. Likewise, when you pour wort back on the top of the mash or into your brewpot, pour as "quietly" as possible. If you splash your wort around too much while it is hot, you may prime it to become stale faster during conditioning and aging. Small amounts of wort agitation are inevitable when running the wort off or pouring it into your brewpot, so don't sweat the small stuff. Do your best to collect and transfer the hot wort with as little splashing as is practical and the quality of your beer will not suffer.

Collecting the Second Wort

Leave the grain bag in the cooler and pour the 180–190 °F (82–88 °C) sparge water you have been heating into the cooler. Fill the cooler to the same fill level as during the mash. This will require slightly less water than before as the grain husks will have absorbed some water during the mash. The combination of 180–190 °F (82–88 °C) water and wet, hot grains should produce a grain bed temperature of less than 170 °F (77 °C). You do not want your grain bed or second wort to exceed 170 °F (77 °C) or you will begin extracting tannins from the wort. This leads to astringency in the finished beer. The first time you try this partial mash procedure, heat the sparge water to 180 °F (82 °C); if the temperature of the grain bed is lower than 170 °F (77 °C), try using hotter sparge water the next time around.

Poke around at the grains with your spoon again, then let the mash sit (with the cover on) for about 5 minutes. Next, recirculate and drain the mash as before. At the end of the runoff, you should tip the cooler to try to collect every last bit of the second wort that you can. With the first and second worts collected, and the 0.5 gallon (1.9 L) of boiling water you started with, you should now have around 3 gallons (11 L) of wort in your kettle. This wort should have a specific gravity around 1.033. (There's no need to measure it at this point, unless you want to.) Bring this wort back to a boil, add your bittering hops — and dried malt extract, if the recipe calls for it — and begin the 60-minute boil.

One benefit of this procedure is that you do not need to elevate a hot liquor tank above your grain bed, as you do when continual sparging (or fly sparging). You also do not need a "whirligig," or other device, to deliver the water to your grain bed. In a cramped kitchen, an elevated vessel full of hot water not only takes up precious real estate, it can also be a scalding hazard.

Finishing the Brew

Once you've collected your first and

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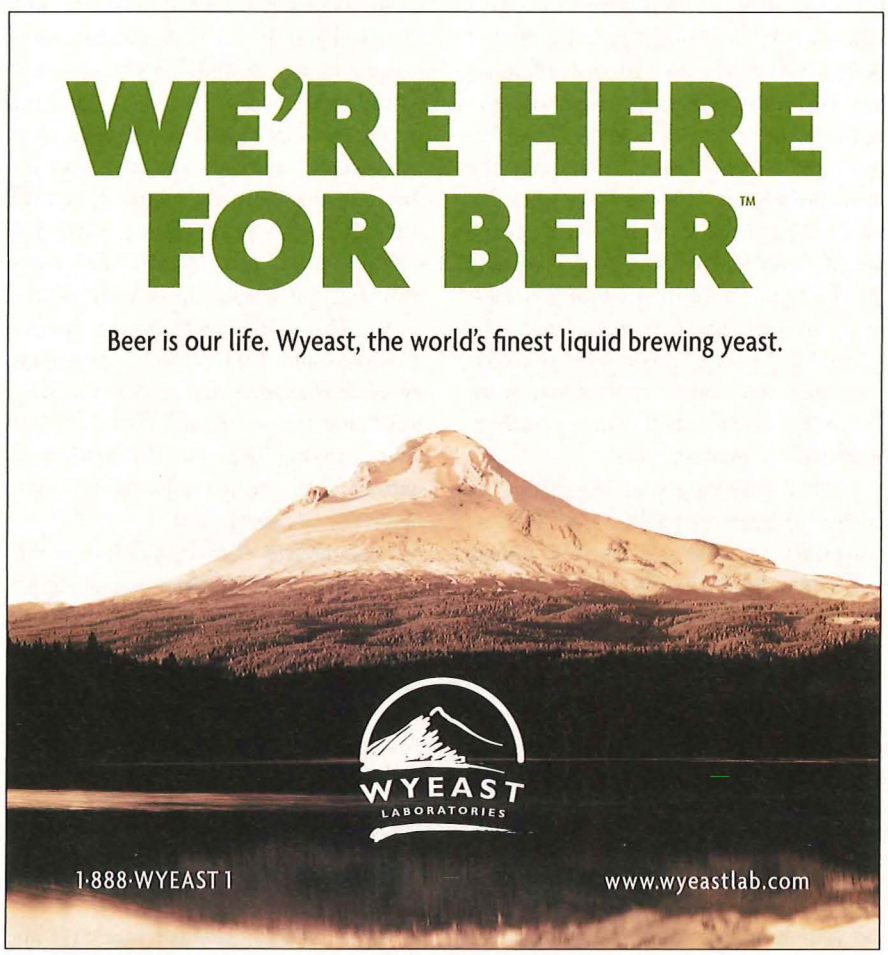
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second wort and brought it to a boil, finish your beer as you would any "extract late" brew. Boil your hops in the wort from the partial mash (perhaps with some added dried malt extract), but withhold the addition of liquid malt extract until at or near the end of the boil. Make sure the late extract is heated or steeps in hot wort for 15 minutes to sanitize it, but don't boil, heat or steep it for longer than that.

Next, cool your wort in your brewpot — either with a copper wort chiller or by cooling the pot in your kitchen sink. Once the wort is cool, transfer it to your fermenter and add cool water to make 5 gallons (19 L) of wort. Aerate the wort well and pitch your yeast. Ferment, condition and package your beer as usual.

Cleaning Up

Once your brew day is finished, make sure to clean your mash tun (beverage cooler). If you leave it for later, the wet grains will stink to high heaven when you go to clean it. Wash the cooler in warm, soapy water and let it dry completely — with the lid off — before putting it away. Be sure to drain some soapy water through the spigot while cleaning. Likewise, don't put the spent grains in your kitchen garbage; it will reek by the next morning.

Conclusion

That's all there is to it. You can perform this countertop partial mash procedure without a lot of extra equipment — all you need is a cooler and a big grain bag. And, with all the varieties of grain to choose from, you can expand your brewing horizons beyond just steeping specialty grains. Plus, it's easy to boot. And most importantly, it makes great beer.

On page 44, I give three recipes that use this technique. Another two recipes can be found at BYO.com. And, it's easy to convert your existing extract recipes to recipes that use this procedure. Take good notes the first time you try this and you will know if there are any tweaks you need to apply the second time.

Whether you're a dedicated stovetop brewer, or just returning to the kitchen for the occasional indoor brewing session, I think you will like this technique.

Chris Colby is Editor of BYO.

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A BARREL of FUN

Story and Photos by **Paul Dienhart**

I have vivid memories of serving a barleywine aged in a bourbon barrel to dinner guests. After the first sip, they stared at me wide-eyed. "This is the *best* beer I've ever had in my *life*," sincerely pronounced one guest, an ex-bartender who has tasted a few beers in his time. They each left cradling a gift bottle of the barleywine like they had been presented with the Holy Grail. Talk about validation!

John Moore of Barley John's Brewpub in New Brighton, Minnesota, credits barrel brewing with putting him on the map when his Dark Knight barleywine scored a 100 on the *ratebeer.com* site. "I've had people call from as far away as France about getting shipments of our barrel-aged beer," he says. "Our first bourbon-barrel beer lasted six months on tap. Now, it's hard to keep up with the demand, and we're going through more barrels than ever before."

About five years ago, Todd Ashman, then a brewer at a small brewpub south of Chicago called Flossmoor Station, supplied a bourbon-barrel-aged blend of barleywine and brown ale called Train Wreck O' Flavors to a beer tasting conducted by beer writer Stephen Beaumont. The tasting pitted upstart American beers against classics like J.W. Lee's Harvest Ale. Ashman's beer fared so well he ended up being featured in a *Wall Street Journal* article on extreme beers.

"There's no doubt that barrel-aging can get you attention," says Ashman, now sales coordinator and staff brewmaster of Brewers Supply Group.

Not surprisingly, barrel brewing has gone mainstream. Wood and Barrel-Aged Beer was the second most-entered category at the 2005 Great American Beer Festival (GABF) with 75 entries. It is fairly common now to find a bourbon-barrel-aged offering at a brewpub. And more and more homebrewers are forming groups to brew 55 gallons (208 L) of beer for barrel aging – which only makes sense considering that adventurous homebrewers were among the first to experiment with bourbon-barrel aging.

It was in the early 1990s when Ashman heard about Chicago-area homebrewers holding "brew ins" to ferment



homebrew in bourbon barrels. Chicago's Goose Island Beer Company began to make commercial beer in bourbon barrels, shortly followed by Ashman at Flossmoor Station.

When Goose Island entered a bourbon barrel brew in the GABF in 1995, the judges loved it but had no idea how to categorize it. They decided to award it an honorable mention, anyway.

Barrel brews then moved into the GABF experimental category, but were so popular by 1999 that they no longer qualified as experimental. By 2002, the GABF viewed barrel brewing as "sustainable" and opened a new category: Wood and Barrel-Aged Beer.

"Now loads of breweries and brewpubs are doing this, and the beers are getting more creative," says Ashman, who is one of the founders of the annual Festival of Barrel-Aged Beer in Chicago.

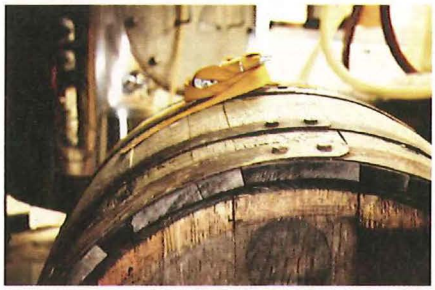
It is not that difficult for homebrewers to get into barrel brewing. In fact, you just might just find it the most rewarding experience you've had in homebrewing. I did. Here are some simple tips to keep it a rewarding experience. We'll start by looking at bourbon barrels, then get into wine barrel use and the rising interest in using barrels for "wild brews," a term Jeff Sparrow popularized in his book of the same name.

Anatomy of a Barrel

Before you roll out the barrel, you should know its anatomy. All the different parts of a barrel, and their interfaces, have a name.

The two ends of a barrel are called heads. The curved pieces of wood that connect the heads are called staves and the metal straps around the barrel are called hoops. The place where one stave meets another is called a joint. (The place where one head piece meets another is a head joint.) The circular groove where the flat head pieces meet the round "hood" around the head is called the croze. (The tool that the barrel-maker, or cooper, uses to make this groove is also called a croze.)

When the barrel contains liquid, the wood swells and the joints become watertight. (Barrels that have dried out may leak when first filled with liquid. Adding hot water is a quick way to get the wood to swell.) When some of the liquid evaporates from a barrel, the resulting headspace is called the ullage. The bulging middle portion of the barrel is called the bilge. In the middle of the bilge is a hole in the barrel called the bung hole, which can be "corked" with a bung.



ALREADY A MAJOR TREND AMONG BREWPUBS, CONDITIONING BEER IN BOURBON AND WINE BARRELS IS CATCHING ON AS A REWARDING ACTIVITY FOR HOMEBREWERS.

Most barrels used in the production of alcoholic beverages are made of oak. Bourbon barrels are made from American oak. French oak is preferred by many winemakers, but some — lead by the Australians — have started using American oak. Barrels are toasted, or charred, inside to varying degrees.

Finding the Barrel

Barrels are easy to obtain, but not any barrel will do. (See the sidebar on barrel sources on page 51.) You want a freshly dumped barrel that still smells sweetly of bourbon. If the barrel has an off aroma or the bourbon smell is faint, don't waste your time.

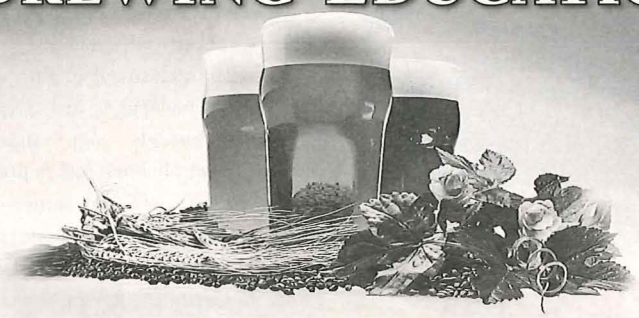
At the 2003 American Homebrewers Association convention in Chicago, every attendee was presented with a commemorative bottle of bourbon-barrel Russian imperial stout. They were all sour. The brewers had used a barrel that had sat for nine months at a local pub. Once the alcohol dried from the wood, lactic acid bacteria flourished.

The bourbon in the wood is your friend. About one gallon (3.8 L) of bourbon will be soaked into the wood of a freshly dumped bourbon barrel. No beer-souring microorganisms can live in wood saturated with 80-proof alcohol. So get a fresh barrel and do not rinse it. To keep the barrel fresh until you're ready to fill it, pour in a quart or two (1–2 L) of whiskey and roll the barrel around about three times a week. Alternate which head you stand it on.

Bourbon barrels are relatively cheap, but the cost of shipping may be two to three times the barrel cost. When you call a supplier like Jack Daniels' Lynchburg General Store, emphasize that you need a freshly dumped barrel for a brewing project. Ask if "No. 1 Selects" are available. If you can supply a commercial address with a loading dock, like your local homebrew store, you will save on shipping. You can order and take delivery of a barrel in about a week.

Bourbon barrels are very economical for a group of 10 or 11 brewers. Figure each individual will pay about $13 to cover the barrel and shipping.

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Once you get the barrel, pop out the plastic plug that should have been placed in the bunghole immediately after dumping. If you're not adding beer soon, pour in the sanitizing whiskey and use a number 10.5 rubber stopper as a bung. Keep the barrel indoors, out of sunlight and away from any fumes that could enter the wood. When you're ready to fill the barrel, dump out any whiskey that hasn't seeped into the wood. (Don't throw it out; drink it!)

Why not save all the bother and simply fortify the beer with bourbon? "You want those rich vanilla and coconut-like flavors that the oak can provide," Ashman says. "Beers that are fortified — the fake bourbon-barrel beers — really show that chemistry. I can pick them up from a mile away."

Beers for Barrels

When it comes to bourbon-barrel brewing, think big. "You need big beers to stand up to the flavor of bourbon and wood," advises Moore. "I think barrel brewing has changed the brewpub industry. Four or five years ago, brewpubs weren't making a lot of big beers except for Belgians. Today, there's been an explosion of big beers, and I think barrel brewing has been part of that."

The usual suspects for barrel aging are barleywine and Russian imperial stout. Imperial porters and imperial brown ales also are popular. "Higher gravity and darker beers tend to work better," Ashman says. "The stronger beers allow for longer aging, which allows more complex effects from the wood."

Part of the fun of barrel projects is sampling commercial beers doctored with a few drops of bourbon. The testing might knock out seemingly logical candidates like an imperial IPA. Bourbon absolutely kills hops, so it is a struggle to get a pronounced hop bitterness and nose from beer aged in a fresh bourbon barrel.

Commercial as well as amateur brewers are getting more adventurous in the brews they select for the barrels. Meads, ciders, historical beers, Belgians and fruit beers have all been tried with some success.

Almost all these beers are high gravity — starting from at least 15.5 °Plato (specific gravity 1.065), according to

Ashman. The rule of thumb is to age the beer one month for every percentage point of alcohol. It takes at least four to six months to start to get a complex wood character in the beer, so beers of 9 to 12% alcohol, or even higher, are promising barrel candidates.

Today, most barrel brewers these days use the barrel for tertiary conditioning. So the beer has already gone through primary and secondary fermentation prior to going into the barrel. The barrel is for extended aging.

Filling and Aging

To fill, barrels need to be horizontal with the bung pointing up. Making a stand can be as simple as two 4 X 4s with a 2 X 4 chock on each side of the barrel. Or if woodworking appeals to you, make your own stand. Our group made one of hand-hewn oak with "Fellowship of the Barrel" carved into the wood.

Purge the barrel with carbon dioxide (CO_2), then fill it by racking beer from carboys on a high table, or simply force the beer with CO_2 from Cornelius kegs.

However, you must make sure that the beer filling the cask isn't contaminated. Every beer going into the barrel should be tasted. Our group has a "rule of two." If two of the 11 members feel that the beer is contaminated — or simply too poor an example to mix with the others — they have veto rights. We never employed this rule, but we should have — once. We now have a barrel-aged imperial porter with the distinct taste of the wild yeast *Brettanomyces*. Most of us like the beer, but we didn't set out to give it a sour character.

After the problem was detected, several members admitted that they caught a hint of *Brett* in one of the batches, but they didn't want to be a bad guy and call for its exclusion. Anyone saving the group from sour beer deserves congratulations. On the other hand, barrel brewing is very forgiving to beers with style flaws. If the beer isn't contaminated and is reasonably close to style, it's generally fine for the barrel. The mixing, the bourbon and the wood-aging does wonders to bring the various contributions together into a harmonious whole.

Our group likes to collect a one-cup sample of each brewer's beer into a one-

SOURCING A BARREL

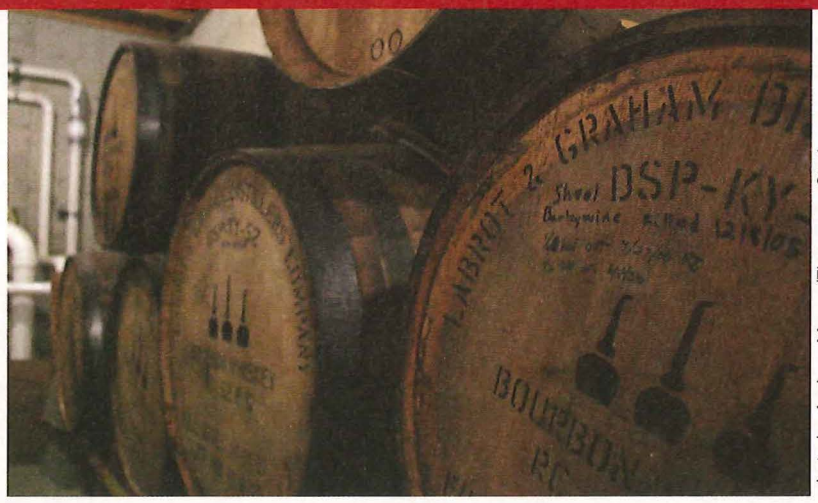


photo by Andrew Mason/Flossmoor Station

Bourbon barrels There are a number of online sources for used 53-gallon (201-L) bourbon barrels. But try to get on the phone and talk to a real human being, making it clear that the barrel is for a brewing project, not planters. Be friendly and tell them you need a freshly dumped barrel, preferably a No. 1 Select. Most suppliers will be responsive to this plea.

Suppliers include:
The Lynchburg General Store (Jack Daniels): (931) 759-4200.
KelvinCooperage.com
BluegrassCooperage.com

There are even independent suppliers like Tom Griffin of Madison, Wisconsin. Griffin hauls up premium, 12-year-old bourbon barrels from Kentucky and supplies them to brewpubs around the country. He also sources Scotch and port barrels. You can contact him at: bourbonbarrel@yahoo.com

If you're friendly with your local brewpub, it may have a source of barrels. But beware because some brewpubs get free barrels from their liquor suppliers. Liquor distributors don't tend to have much understanding of brewing, so these "free" barrels can be leaky or far from freshly dumped — not much of a bargain.

Wine barrels Most states and provinces have wineries, so your best source to avoid shipping expenses may be calling your local vintner. Our group scored two beautiful 60-gallon (227-L), French-oak barrels from a local winery. The cost ($100 each) was cheaper than mail-order bourbon barrels. Again, it really helps to talk personally to the supplier. Avoid wines that had malolactic fermentations.

Wineries want fresh barrels for their wines. After two to five years, barrels are of little use to wineries unless they are taken apart, scraped and reconditioned. But used barrels work fine for brewers, who don't want the heavy oak character of fresh barrels. Wine barrels are preferred for sour beers, but you can use them for other styles if you're careful about sanitation.

Remember, the alcohol in the wood is less potent than bourbon barrels. Burning sulfur sticks, citric acid rinses and other techniques are needed. The winery should perform the initial sanitation procedure.

Other sources for wine barrels:

- Worldcooperage.com
- nwcooperage.com
- BarrelsUnlimited.com
- 1000oaksbarrel.com
- TheBarrelmill.com



You will need to brew at least 60 gallons (227 L) of beer to fill a 53-gallon (201-L) bourbon barrel. Beer will evaporate through the joints over time and the barrel will need to be topped up. Once you're finished, the beer can be pushed by CO_2 pressure (as shown in the photo above) into Cornelius kegs.

gallon jug and set it aside so we can get an idea of the mixed beer without barrel aging. It's just one more activity to make these projects fun.

Groups make sense for barrel brewing because you will need a good 60 gallons (227 L) of beer to adequately fill and top-off a 53-gallon (201-L) bourbon cask. Group dynamics in a barrel-brewing project can be incredibly rewarding — or an incredible pain. Recruit members as much for compatibility as for brewing skills. If people get along, the greatest reward of these projects is the personal interaction of discussing which style to brew, developing a recipe and turning out for the big filling and emptying events. If you're lucky, the beer is just a bonus.

After fitting an airlock into a drilled 10.5 bung, let the beer sit for months. Impatient brewers who remove the beer from the cask after only a few weeks or months are missing much of the wood-aged flavor. The barrel will evaporate 3 to 7 gallons (11–26 L) a year, so keep an extra keg handy for topping off. At the same time you top off, use a wine thief to take a sample and see how the beer is doing.

Oxidation can be a concern in barrel brewing because wood is porous to oxygen. Keeping the barrel topped off helps avoid oxidation — and the dry wood in the head space that can nurture souring microorganisms. If you're short of beer, flooding the head space with CO_2 can help for awhile — before the gas is absorbed by the beer. If you can find it, argon is a heavy gas that will provide the best oxygen barrier.

Sophisticated barrel brewers try to subject the barrel to temperature swings of 20 °F (11 °C). Commercial brewers like Ashman roll their barrels into and out of walk-in coolers to achieve the temperature differential.

"As the temperature changes, the liquid expands and contacts, going in and out of the wood," Ashman says. "You pick up color from the char (the crystallized oak sugars on the burned interior of bourbon barrels) and you get *all* this flavor. But keep in mind that if you have any *Lactobacillus* in your beer, warming it above 50 °F (10 °C) will allow the bug to flourish."

Emptying Day

While removing beer from a barrel too soon is the more common problem, it is possible to "overcook" a barrel brew. "Wood can definitely overwhelm a beer," Ashman says. "But if you don't age it long enough, you get more of a fortified beer than barrel-aged — like pouring bourbon into it."

Homebrewers have an advantage over commercial brewers in that they don't need to rack a beer from a barrel in order to keep bar taps flowing. They can afford to wait that nine months to a year for the wood to do its magic.

When the beer is about 75% of the way to being done, taste it periodically. Use a wine thief for samples, but be sure to top-off with more beer or purge the head space with CO_2.

When you are ready to drain the barrel, one option is a pump. But our group and some brewpubs have had great success using CO_2 pressure. Simply get a drilled number 10.5 rubber bung and drill a second hole in it. Insert a long racking cane into one hole and a short length of plastic or stainless steel tubing into the other. Through the short tube, pump CO_2 at 5 to 10 pounds per square inch (PSI) into the barrel. At this pressure, a firmly pressed bung stays in place just fine.

Beer traveling through the racking cane goes by plastic tubing into a Cornelius keg. You don't even need to open the kegs. Just pop up the relief valve and use a connector on the keg's out-post to let beer travel directly into a keg protected by CO_2. A bathroom scale can tell you when it's time to fill the next keg.

With any luck, you are filling your kegs with a distinctive and fantastic example of beer. Toast each other, salute your patience and celebrate a successful project. Barrel emptying day should be a festive event.

Reusing a Barrel

This topic is a bit controversial. "As a purist, I advocate using a bourbon barrel just once," says Ashman. "Doing 55 gallons (208 L) of high gravity beer that you condition for six or more months is simply too much work and expense to have failures." Relenting slightly, he allows that re-using a barrel is OK if you don't run into sour issues.

Moore, on the other hand, has used barrels up to three times. His Dark

Knight Returns barleywine was done in the same barrel as the original Dark Knight, using the same recipe. "It's funny," he says, "some of my customers will drink only one or the other. The bourbon is stronger in the original Dark Knight, but I think both are good."

The times that Moore has used a barrel a third time, he gets very little bourbon character but still picks up the vanilla and tannin notes from the wood. It will be more difficult to pick up wood character from a third-use barrel, so choose a huge beer that can be in the barrel for many months.

"If you *must* re-use a barrel, do more than a simple rinse," says Ashman. "It's similar to the problem of trying to sanitize something that's still dirty." He suggests filling the barrel with 170 °F (77 °C) water, letting it soak, then rinsing until the water runs clear.

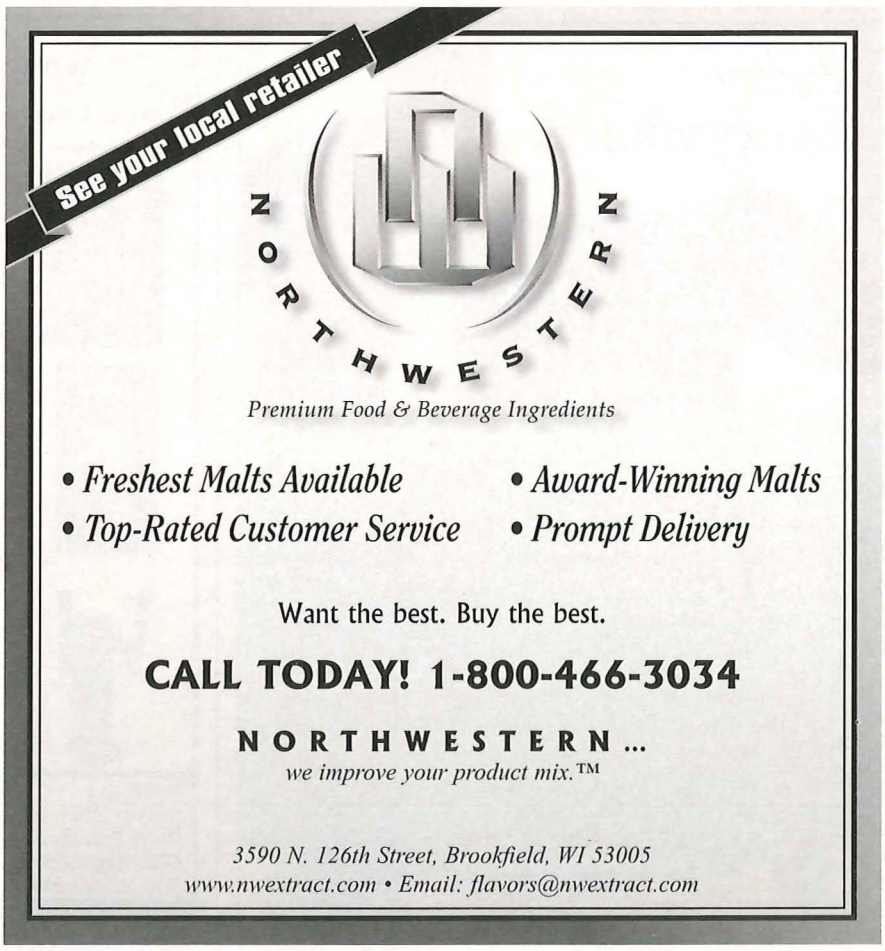
Our group has had success in timing our brews so that we refill the barrel the same day we empty it. In between, we add about 15 gallons (57 L) of boiled water that is still very hot, slosh it around and dump it. It takes some muscle to manipulate a barrel that is 100 lbs. (45 kg) when empty, and be very careful around scalding water.

Another possibility suggested by Moore is to rinse the barrel with cold water, then pour in alcohol, such as a gallon (3.8 L) of bourbon, to use as a sanitizer. Roll the barrel around periodically to soak up the alcohol. After about a month, refill.

For longer term storage between batches, you could try some techniques employed at wineries. World Cooperage suggests rinsing and draining until clear, then apply burning sulfur sticks to the drained barrel. Store the barrel in a cool and humid area, then rehydrate it with 3 gallons (11 L) of 180 °F (82 °C) water. Make sure to stand it on each head for three to four hours.

Dry barrels not only breed souring microorganisms, they run the risk of leaky staves or heads. If you are concerned about the barrel drying out or getting moldy, you can rinse the barrel and fill it with water containing two ounces of potassium metabisulfite for every five gallons (2.9 g/L). Change the solution every two months.





Fellowship of the Barrel Barleywine

(5.5 gallons/21 L, all-grain)

OG = 1.104 FG = 1.026

Eleven Minnesota brewers formed "The Fellowship of the Barrel" to fill a used Jack Daniels barrel with this barleywine. This beer took gold in every regional contest we entered, including the Dixie Cup, and took a bronze medal in AHA Nationals in 2005. The recipe was developed by Steve Piatz, Brew Your Own *contributor and BJCP Grand Master II judge.*

Ingredients

12 lbs. (5.4 kg) American 2-row malt
1.0 lb. (0.45 kg) crystal malt (10 °L)
2.5 lbs. (1.1 kg) Belgian aromatic malt
0.75 lbs. (0.34 kg) wheat malt
0.25 lbs. (0.11 kg) black patent malt
3.0 lbs. (1.4 kg) liquid light malt extract
3.3 lbs. (1.5 kg) honey
34 AAU Willamette whole hops (90 mins)
(7.5 oz./ 213 g of 4.5% alpha acids)
1 oz. (28 g) Willamette hops (20 mins)
1 oz. (28 g) Willamette hops (15 mins)
1 oz. (28 g) Willamette hops (10 mins)
1 oz. (28 g) Willamette hops (5 mins)
2 oz. (57 g) Willamette hops (0 mins)
2 oz. (57 g) Fuggles hops (dry hop)
White Labs WLP007 (Dry English Ale) yeast

Step by Step

Mash at 152 °F (67 °C) for one hour. Add malt extract and honey in last 15 minutes, dissolving it in hot wort before adding it back to the kettle. Add rehydrated Irish moss for last 15 minutes. After nine months in the bourbon barrel, keg it and dry hop with 2 oz. (57 g) of Fuggles hops.

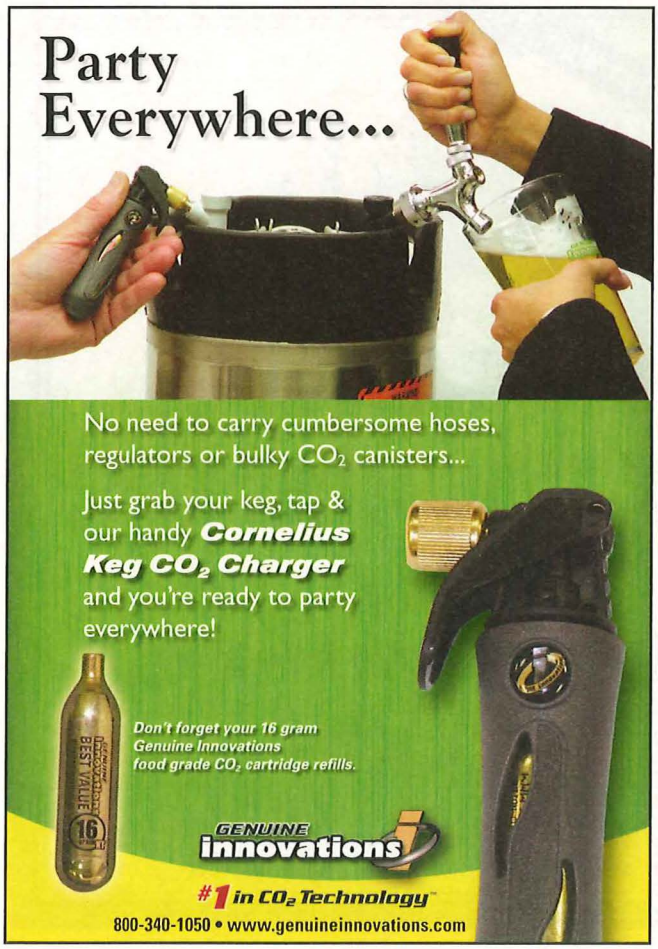
These are just a few of the ways to tend to barrels. There is even a commercial product available called Barrel OxyFresh. If you use bourbon barrels multiple times or obtain used wine barrels — with their much lower concentration of alcohol in the wood — you will want to employ some of these cleaning and sanitation techniques.

There is one other alternative — embrace those souring microorganisms and do some wild brewing.

Going for Sour

Peter Bouckaert, Master Brewer at New Belgium Brewing Co., talks of using barrels as a vehicle for "providing oxygen and microorganisms to the beer." Brewers who enjoy beers such as lambic and Flanders red ales may find that wood barrels provide an ideal environment for these brews.

To quote Jeff Sparrow in his book, "Wild Brews" (2005, Brewers Publications): "The wooden barrel provides beer-souring microorganisms with a place to live and breed. Many of these organisms





require at least small amounts of oxygen to live and propagate. *Brettanomyces*, in particular, ferments better in the presence of oxygen."

The traditional sour-beer brewers of Belgium age their beers in wooden barrels for two years or even longer.

Tomme Arthur of the award-winning Pizza Port brewpub in California likes bourbon barrels for sour beers. He believes that the char — the wood sugars in the burned interior — provides sugars for the microorganisms, allowing for a prolonged fermentation. But the majority of brewers using barrels for sour beers seem to prefer wine barrels — specifically, used French-oak wine barrels.

New barrels will overwhelm the beer with oak, so a used barrel is the ticket. French oak — which is more porous than American white oak, and also imparts a slightly different wood character — is preferred because they allow more oxygen. Many brewers of sour styles claim wine barrels provide a more mellow character than bourbon barrels.

Vinnie Cilurzo of Russian River Brewing Co. in Santa Rosa, Calif., came out of the wine industry and is rapidly gaining a reputation for his excellent sour beers. For sour beers, he uses wine barrels exclusively. Sour styles are ideal for beer that could stay in the barrel for years.

"The *Brett* is continually fermenting and thus exhausting CO_2, which helps protect the beer from too much oxidation," Cilurzo explains. "A pellicle (yeast film) forms on top of the beer, which also helps protect it from oxidation."

(See the October 2005 issue for clone recipes of Tomme Arthur's Mo' Betta Bretta and Vinnie Cilurzo's Sanctification.)

Patience is even more of a virtue with sour beers. *Brettanomyces* can take six months to develop flavors, and *Lactobacillus* and *Pediococcus* bacteria can take a good nine months before contributing tart and sour character.

Cilurzo offers a few more tips for barrel-aging sour beers: If the beer gets contaminated or ropey in the barrel, don't worry. It typically passes with time.

Don't bottle until the gravity is down to a specific gravity of 1.006. Any residual sugars mean that the beer will become over-carbonated in the bottle.

If you use a barrel for sour brews, don't use it for anything else. It is almost impossible to remove the souring microorganisms from the wood.

Our group took Cilurzo's advice to heart. When our imperial porter developed a *Brett* character, we decreed that the barrel would henceforth be used for Flanders red. After a mere six months in the barrel, we already think our Flanders is another prize-winner. But we will be patient. As an avid barrel brewer once told me, "Give it time and the results will be sweet."

Paul Dienhart has been involved in barrel-brewing projects with members of the Minnesota Homebrewers Associa-tion and the St. Paul Homebrewers. This is his first article for Brew Your Own.

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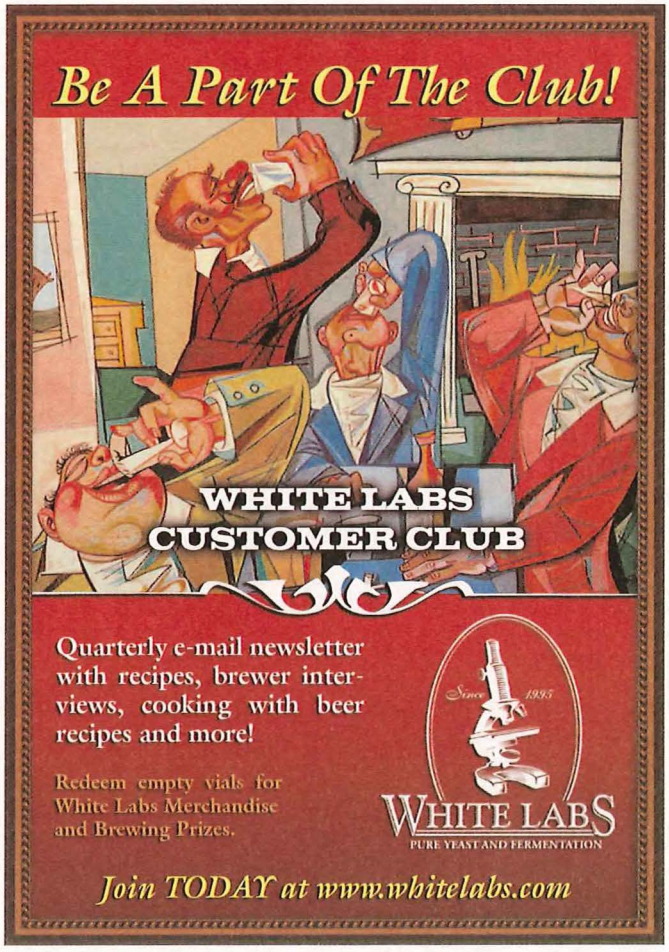
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Round Mash Tun

A simple project for going all-grain

Story and photos by Forrest Whitesides

You've been considering making the jump from extract brewing to an all-grain process, you already know that a good mash tun is the single most critical piece of equipment you'll need to add to your existing arsenal of brewing gear. Building your own mash tun is inexpensive and simple, even for those of us that don't qualify as DIY experts. This project will walk you through the construction of a round mash tun using either a 5-gallon (19-L) or 10-gallon (38-L) round picnic-style cooler.

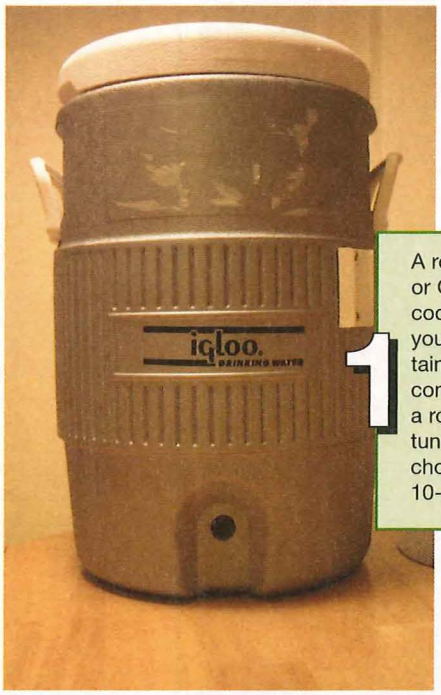
Why a round mash tun?

A round mash tun will give you the ability to experiment with both fly sparging (which is more efficient with a round-shaped tun) and batch sparging (the mash efficiency of which generally isn't affected adversely by tun shape).

The total cost will vary depending on the seasonal availability of coolers in your area, whether you choose brass or stainless steel for the weldless fittings, and if you opt to use a plastic false bottom or a stainless steel model. For a 5-gallon (19-L) tun with stainless steel parts, the cost should be about $75.

PARTS:

- Igloo/Gott style round cooler (5-gallon/19-L or 10-gallon/38-L) (Fig. 1)
- Kewler Kitz weldless cooler conversion kit (Fig. 2)
- False Bottom (9" for 5-gallon/19-L, 12" for 10-gallon/38-L) (Fig. 3)
- ½" MPT to ⅜" Hose barb fitting
- 1 foot of ⅜" ID high-temp vinyl tubing
- 2 feet of ½" ID vinyl tubing
- Roll of Teflon pipe tape



1 A round igloo or Gott-style cooler will be your main container to be converted into a round mash tun. You can choose a 5 or 10-gallon size.

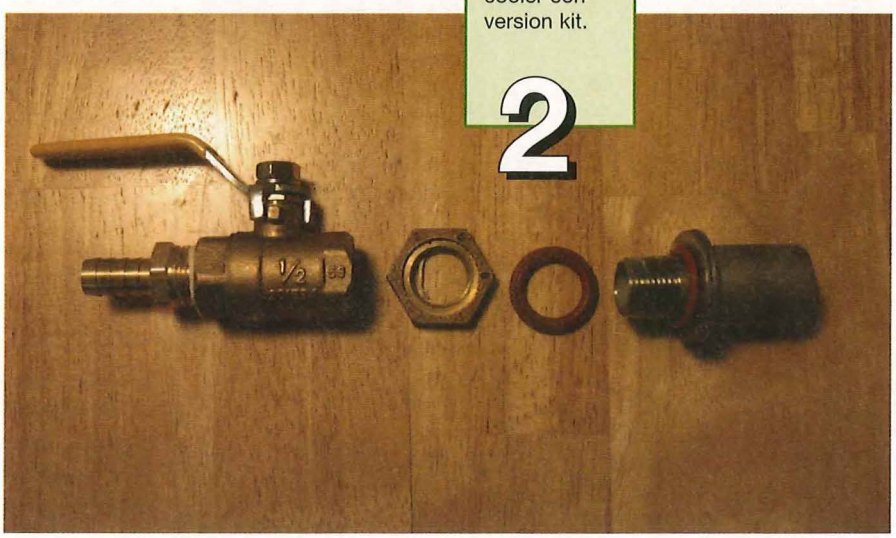
Step 1: Place the false bottom

The reason we're putting the false bottom in first is because, depending on the exact inner circumference of your cooler, you might not be able to fit it in easily once the bulkhead and hose barb fitting are installed. This likely won't be a problem, but playing it safe by putting the false bottom in first is a good idea.

First, remove the factory cooler spigot by unscrewing it from the inside of the cooler. Once that's out, just place the false bottom in the cooler with the attached barb facing up (Fig. 4).

Step 2: Install the bulkhead

The cooler conversion kit is composed of two main parts: a bulkhead fitting and a ball valve. The bulkhead is further composed of parts that screw together to form a water-tight seal through which your wort will flow when lautering and sparging. The ball valve allows you to control the rate of flow through the bulkhead. Start by putting the bulkhead fitting (the cylindrical silver-looking part) through the spigot hole from the inside of the cooler (Fig. 5). Make sure the small rubber seal goes on the inside of the cooler. Next, put the large rubber seal over the threads of the bulkhead on the outside of the cooler (Fig. 6). Now tighten the brass nut on the outside of the cooler, making sure that the grooved side of the nut (Fig. 7) faces in towards the



2 All of these parts can be purchased as a kit. We used a Kewler Kits weldless cooler conversion kit.



3 Here is the false bottom that will be installed in the mash tun. The diameter is 9" for 5-gallon/19-L size or 12" for 10-gallon/38-L.

Step 3: Install the hose barb

The ⅜" brass hose barb fitting screws into the bulkhead, so that the outlet barb on the false bottom (which is also ⅜") can connect to the bulkhead via high-temp tubing.

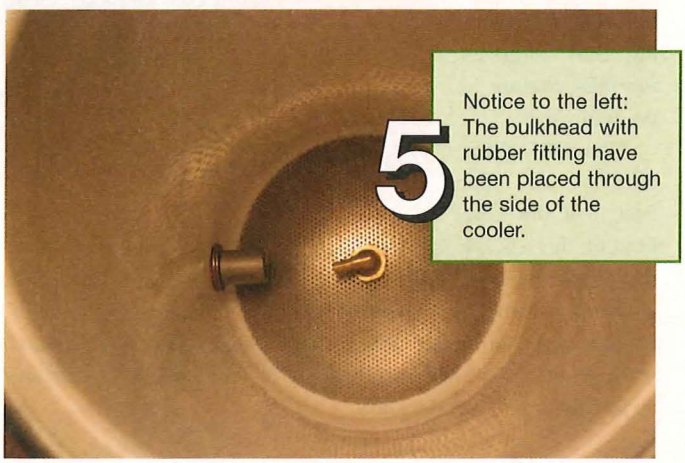
First, you will need to give the threads on the brass barb a few wraps of teflon pipe tape. This will help to insure a water-tight seal. Next, screw the hose barb into the bulkhead. The inside of your mash tun should now look similar to figure 9.

Step 4: Connect the bulkhead to the false bottom

We're almost done on the inside. All we need to do now is use a short piece of high-temp ⅜" ID tube to connect the barb on the false bottom to the barb on the bulkhead. Between 2" and 3" should do it. See figure 10 for an example of the finished inside plumbing job.

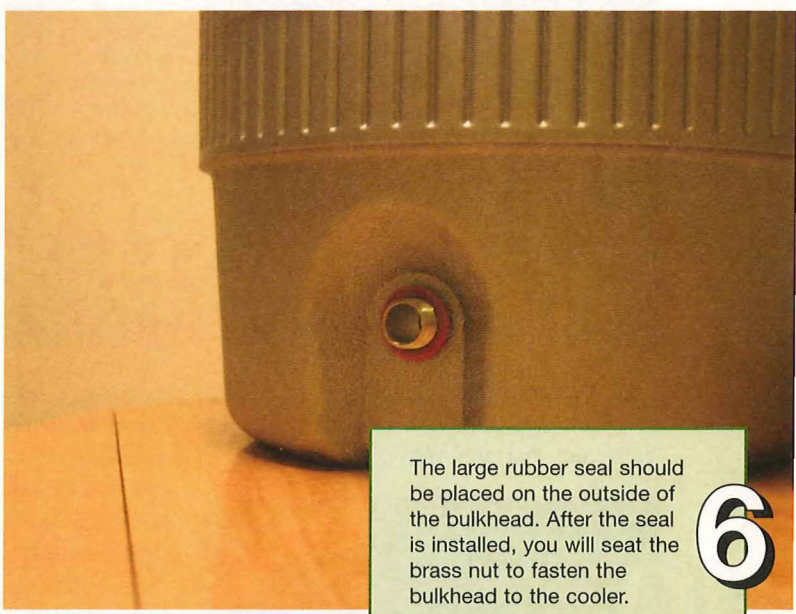


4 Here you can see the false bottom installed in the cooler with the barb facing up.

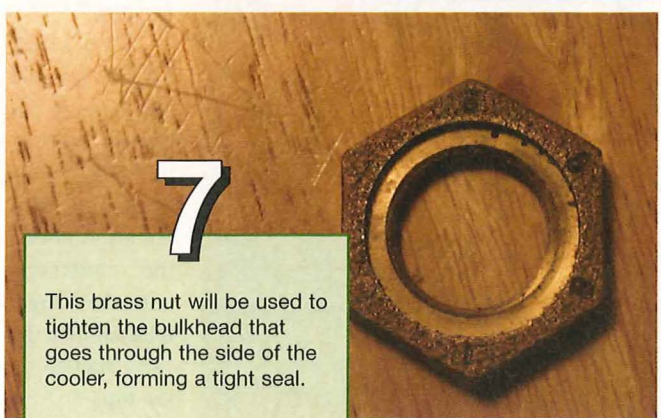


5 Notice to the left: The bulkhead with rubber fitting have been placed through the side of the cooler.

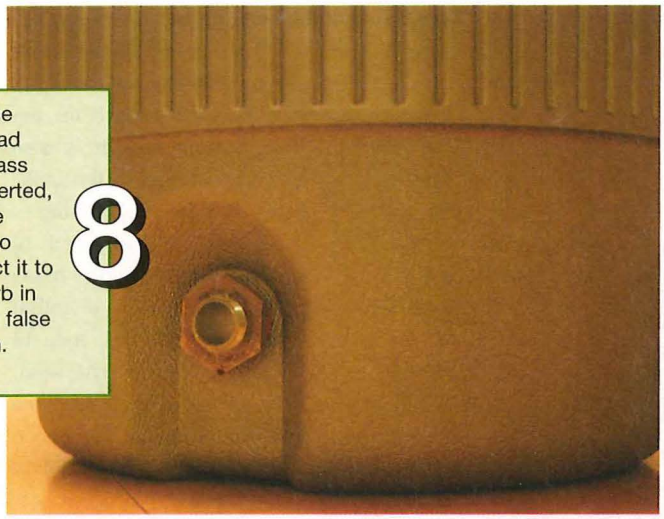
large rubber seal. Tighten the nut just until you get some resistance. Hand-tighten the whole assembly from the inside of the cooler by turning the bulkhead. Once it's good and tight from the inside, you can use an adjustable wrench to tighten down the nut on the outside. At this point, your project should look something like figure 8.



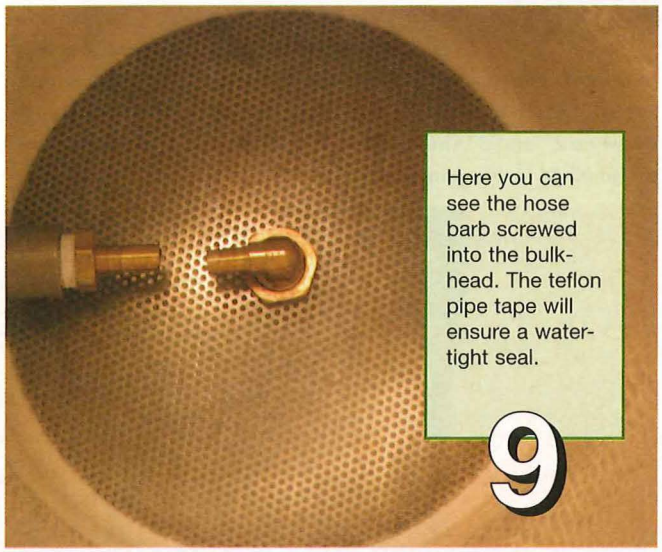
6 The large rubber seal should be placed on the outside of the bulkhead. After the seal is installed, you will seat the brass nut to fasten the bulkhead to the cooler.



7 This brass nut will be used to tighten the bulkhead that goes through the side of the cooler, forming a tight seal.



8 With the bulkhead and brass nut inserted, you are ready to connect it to the barb in the the false bottom.

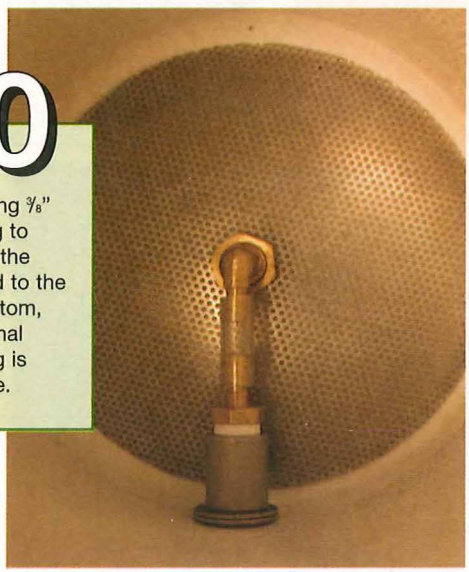


9 Here you can see the hose barb screwed into the bulkhead. The teflon pipe tape will ensure a watertight seal.

Step 5: Connect the ball valve

Now, screw the ball valve into the outside threads of the bulkhead. The only tricky part here is that it can be hard to make the ball valve assembly line up with the valve handle facing up (see Fig. 11).

If you screw the ball valve on and it does not line up correctly, use your wrench to turn the brass nut on the bulkhead until the handle lines up with the valve handle on the top.



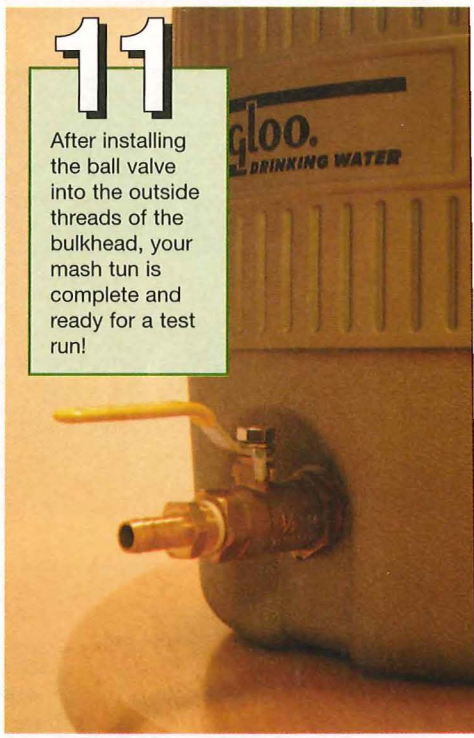
10 After using ⅜" ID tubing to connect the bulkhead to the false bottom, the internal plumbing is complete.

Step 6: Test the integrity of the valve assembly

We need to make sure that the all of the fittings and connections are watertight. Even a very slow leak is a bad thing during the course of a mashing and sparging. Put at least 2.5 gallons of water in the cooler and let it sit for 30 to 45 minutes. If there are no leaks whatsoever, then it's time to have a homebrew and congratulate yourself on a job well done. If you notice a leak, you need to work backwards, re-tighten each connection and test again.

Adding grain and water

Now that the mash tun has been assembled and tested, you can go ahead and get started with an all-grain recipe. Some brewers like to add all the grain to the tun and then the water, and some do the exact opposite. With a round tun design, I prefer to add about a third of the total grain bill to the tun and then add about a third of the water. Then I stir for a minute to break up any clumps of grain. Then I add the next third of grain and water and repeat the stirring, and then add the final third. You may find that another method works better for you, so experiment and take good notes!



11 After installing the ball valve into the outside threads of the bulkhead, your mash tun is complete and ready for a test run!

After all the grain and water has been added, a thorough stirring will also help even out the temperature in the tun so that cold spots or hot spots in the mash are minimized. Be careful when stirring not to dislodge the tubing that connects the false bottom to the ball valve.

Because of the nature of the design of the false bottom, there is a small "dead spot" at the very bottom center of the mash tun. After the bulk of the wort has been drained into your brew kettle, you may want to lean the mash tun forward to try to recover the residual wort that's hiding in the dead spot. It won't amount to much, but if you are as fanatical about efficiency as I am, every drop counts.

Monster Mashing

If you would like in-depth techniques and step-by-step guides on the process of mashing and sparging, there are a number of great resources available. You can start with "Cheap and Easy Batch Sparging" in the January–February 2004 issue of *BYO*!

Forrest Whitesides is the new Projects contributor for BYO.

Hoppy Days

Tales from a Washington family farmer who grows hops

by Bill Pierce

Homebrewers with a small hop garden who recently have harvested their crop may wonder about those who grow hops for a living. Recently, I spoke at length with a longtime grower who offered some fascinating insights into *Humulus lupulus*, this most interesting of plant species and very important brewing ingredient, as well as what is involved in growing them commercially on a large scale.

Diana Puterbaugh is a partner in Puterbaugh Farms, a family operation located near Mabton in the Yakima Valley of south central Washington. They grow and sell hops to breweries worldwide and also offer hops and a number of related products to homebrewers and others under the name Hops Direct (www.hops-direct.com).

A legacy of Prohibition

Diana's husband Stacey's family, who came originally from France by way of Canada, settled the area during the very early 1900s. In 1932, with the imminent end of Prohibition, his grandfather was contacted by Anheuser-Busch about the possibility of growing hops. Over the course of more than 200 years, the center of American hop growing had moved gradually westward to Washington State. The fertile volcanic soil and dry climate east of the mountains (hops are susceptible to mildew), along with an irrigation source from snowmelt in the nearby Cascade Range, have proven nearly ideal for hops, along with other crops. About two-thirds of American hops now are grown in the Yakima Valley; most of the remainder comes from the Willamette Valley of Oregon and the Snake River Valley in Idaho.

That first field on the Puterbaugh family farm was planted in Clusters, which were the dominant American hop variety into the 1990s. "We call it the 'grandma yard,'" Diana says. In the ensuing years, the operation has grown to 450–500 acres (180–200 hectares) of hops today, more than 80% of their total acreage under cultivation. Their other crops include sweet cherries, apples and pumpkins. "Diversification is mandatory for agriculture," she says. "Life is good, but markets change."

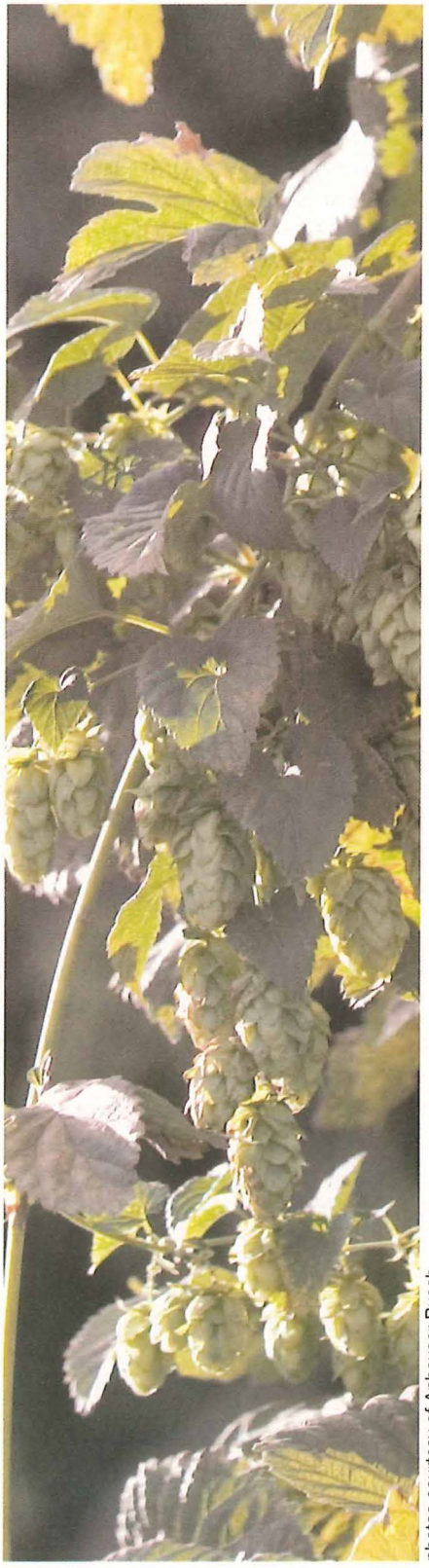
Today the original field (known as a *hopyard* by growers) continues to be planted in Clusters, but the farm now grows about a dozen different hop varieties. Puterbaugh says the most popular today are Cascade and Willamette, with Centennial also increasing in production. "Commercial hop growing requires a lot of volume in order to support the specialized machinery," she points out. This includes harvesting machinery designed and manufactured specifically for hops, as well as other equipment such as drying kilns and hop balers.

Times of the season

For the Puterbaughs, the hop season begins in February and extends into November. During late winter, the hopyards are prepared for spring. New yards require the installation of tall poles (18–21 feet or 6–7 meters high) and trellis wires to support the vines. All the fields are laid out in a grid so that the vines can be trained to climb up smaller wires to the trellises after they emerge from the ground. The size of each hopyard varies, but Puterbaugh indicates that 60 acres (24 hectares) is an average.

Hop rhizomes — the thick, finger-sized roots that are planted about 6 inches (15 cm) deep in the ground — are dug and cut from existing fields, some for replanting and others that are offered for sale to commercial growers and homebrewers. In the Yakima Valley, hop planting occurs in early March once the ground has fully thawed. Hops like cool soil (Puterbaugh compares them to mums and irises) and are quite tolerant of light to moderate frosts.

Late March and April are spent stringing stakes and smaller wires for the young shoots as they emerge. "Stringing



photos courtesy of Anheuser-Busch

is quite an operation," says Puterbaugh. The stringers are ambidextrous and perform the task with both hands at the same time. "It requires a lot of dexterity."

By early May, the young vines are trained by hand to twine around the wires and they begin to grow quite rapidly in the warm spring air and abundant sunlight. Eventually they climb up the nearly vertical wires and spread out across the wire trellises supported by the poles above.

Irrigation of the fields begins in early April and continues until just before the harvest. The Yakima Valley lies in the rain shadow of the mountains and is almost entirely dependent upon irrigated water. Normally every 7–10 days, water pumped from the river and channeled into canals by the local irrigation district is directed into the fields and applied by drip irrigation, although one hopyard with less dense soil is sprayed. The ground is thoroughly soaked, but it is then allowed to dry completely in order to prevent mildew.

Trouble in paradise

Any problems typically show themselves by late spring or early summer. These include aphids and spider mites, which damage the plant by sucking the juices from the leaves. Pests tend to be seasonal, worse in some years than in others. Diana Puterbaugh mentions that her roses are a good indicator of aphid infestation. "When they move in, you have to act quickly and follow up," she says. "We try to use low-invasive methods." The usual remedy is insecticidal oil that is sprayed on the plants and smothers the bugs. Once the blooms appear, growers are prohibited by law from using any pesticides.

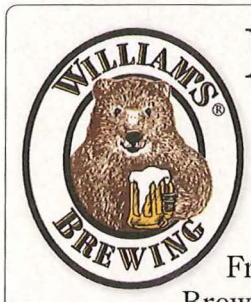
Mildew can also be a problem if the spring weather is damp. According to Puterbaugh, "Mildew percolates up from the soil. It shows itself as white spots on the lower leaves. The best thing to do is to strip the leaves below waist height." This allows for airflow and better circulation and minimizes the effect on the higher leaves and the rest of the plant. "Once they are established and there is healthy leaf growth, they tend to take care of themselves," she adds.

Blooming (the green flowers are called *burrs*) occurs in very late June and early July, following the summer solstice as the hours of sunlight begin to diminish. The burrs become the characteristic hop cones that grow and ripen throughout the rest of the season. By July 10, it is possible to have an idea of the size and quality of the crop. When we spoke to Puterbaugh in mid-July she was optimistic about the 2006 crop.

"It's all Mother Nature," she says. "You have to be willing to work with her, not against her."

You reap what you sow

Harvest of the cones begins in mid-August and lasts for approximately one month. Each variety matures at a slightly different time, which is fortunate for the farm's busy schedule at that season. The hopyards are examined on a daily basis. "That's something my husband's been



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Many homebrewers grow their own hops. Hops are easy to tend, grow large decorative bines and — of course — produce hop cones that can be used in homebrewing.

Harvesting hops

A commercial hop harvest is amazing to witness. This year I visited Anheuser-Busch's Elk Mountain Farm near the beginning of their harvest and saw hop cones being harvested, separated from the bine and leaves, dried and packaged in bales.

All the while I was watching this, I was thinking how much easier we homebrewers have it. Because of our smaller scale, we can simply pick hop cones right off the vine. When the cones start changing color, from a dark green to a greenish-yellow, they are ready to pick. Although the visual cues are easy to spot, you should also monitor the aroma of the hops. When harvest time is close, pick a few cones each day, rub them in your palms and inhale the aroma slowly and deeply. While the hops are still maturing, you will smell a lot of "green plant" aromas on top of the hoppy goodness. When the hops are ready to harvest, the grassy aromas will fade into the background, leaving mostly the smell of the hop oils.

The cones on a hop bine will all mature at roughly the same time. You can either pick on the day that most of the cones look ready, or pick cones as they "ripen" over a few days.

In order to pick the cones over several days, you will need a ladder to reach the hops. If you are harvesting all your cones at the same time, you can just cut the bine down. (If you do this, consider cutting the vine down from the top, then restringing it once the cones are picked. The added time that the leaves are exposed to the sun can help build up the rhizome for next year.)

Drying hops

To use your hops in brewing, you must first dry them. At a commercial hop farm, hops are dried at around 145–150 °F (63–66 °C), then baled.

As a homebrewer, you have a few options for drying your hops. The first is to spread them out on a screen and let them dry at a warm, dry location in your house or outside. In a day or two under these conditions, they will be dry. To test for dryness, seal some hops in a glass jar and place it in your fridge overnight. If there is condensation inside the jar, the hops need to be dried longer.

A somewhat better option would be to use a large food dehydrator. These are available at many outdoor and hunting shops (for preserving meat) or anywhere food preservation equipment is sold.

Packaging and storing hops

Once dried, you can bag your hops in ziplock bags. If you can, flush your bag with carbon dioxide (CO_2) or nitrogen (N_2) before sealing it. You can also use a vacuum sealer to package your hops. Whatever you do, you want to minimize the hops exposure to oxygen during storage. You may want to store several bags of hops within a larger plastic bag, to keep them all together and further protect them from oxygen. Store your hop bags in a freezer, preferably one that is not frost-free.

On each bag, you should record the variety of hop and what year you harvested it. Your hops should remain in prime condition for at least a year — in time for next year's harvest.

Brewing with homegrown hops

Most homebrewing experts will tell you that, because you don't know the alpha acid levels of your homegrown hops, you should only use them only for flavor or aroma hops — bittering your brew with commercial hops, for which you know the alpha acid levels. I think this is needlessly cautious. By the third year of growing your own hops, the alpha acid levels should have risen into their varietal-specific range. Pick a value in the middle of this range and use this for your alpha acid estimate. If your beer is a little more or less hoppy than planned, is it really the end of the world? If you absolutely can't let go of your brewing software security blanket, brew a small batch of beer with a single addition of bittering hops. Taste the beer and estimate the alpha acid levels from the flavor. Compare it with commercial beers of known IBUs, if needed.

You can also brew a "harvest ale," using freshly harvested hops that have not been dried. You will get more green, grassy flavors in a beer like this, but they can be fun to brew. Using dried bittering hops will cut down on the grassy flavors. — *Chris Colby*

born with," Diana Puterbaugh says. "He's married to his farm. He walks the fields and sees them every day. He can tell when they're ready."

The harvest begins when a tractor equipped with a cutter severs the vines about a foot (30 cm) off the ground, leaving enough to provide the plant with nutrition for the fall and to maintain a good rootstock for the winter. A combine follows, pushing an empty hop truck in front. It trims the vines and deposits them in the bed of the truck. Once filled, the truck returns to a picking machine that inverts the vines and strips the cones. The vine residue is saved to be used later as mulch on the fields in the fall.

The cones exit onto a conveyor belt that carries them to a gas-fired kiln to be dried. They are spread in the kiln to a thickness of 2–3 feet (70–100 cm) and heated to a temperature of 145–150 °F (63–65 °C) for from 8 to 12 hours, depending on the hop variety and moisture content.

Diana Puterbaugh says hop drying is something of an art. Her husband's brother Parris — whose skill she likens to that of a baker, who must know exactly when a recipe is done — supervises drying operations on the farm. Once dried, the cones are spread out on a concrete floor in a cooling shed, where they remain for an additional 6 to 12 hours. Then they are put on another conveyor and transported to the baler, which partially compresses them and wraps the bales in either burlap or plastic, depending on the customer's preference. A standard US hop bale weighs 200 lbs. (91 kg).

By law, the hop bales must be inspected. A state-certified inspector comes every day during the harvest and removes cores from randomly selected bales. These are measured for the percentage of undesirable leaves, stems and seeds, and a sample is sent to a laboratory for analysis of such critical values as the moisture and alpha acid content. Once the lab report is received, the bales can be shipped. The farm maintains a cold storage facility so that the hops remain fresh, but often they are shipped within a day or two of being kilned.

Puterbaugh Farms numbers among their customers breweries both large and small throughout the world, including some very well known names. Diana Puterbaugh says their largest customer is an English brewery, but Anheuser-Busch remains a valued customer, just as in her husband's grandfather's day. "They've been very good to us over the years," she is quick to mention, "and we try to be good to them in return." Orders range from entire truckloads of hop bales to quantities as small as a pound (0.45 kg) for customers who are homebrewers.

Life on the farm

After the busy harvest season, the pace of the farm slows somewhat. Organic fertilizer in the form of seasoned cow manure from local farms is applied on the fields and very lightly worked into

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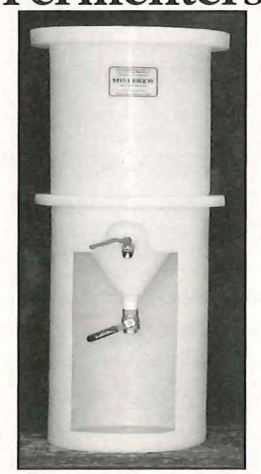
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the soil beginning in October, and the vine residue from the harvest, dried and separated from any weeds, is spread as mulch on top. Puterbaugh says the process is completed by Thanksgiving. This leaves the roots in good shape for the winter. "We try to give everyone a few months off. Of course there is always equipment and shop maintenance. It's never quite a total rest."

As with most activities, hop farming has become more expensive than it used to be. Puterbaugh cites energy costs, water for irrigation and labor as the largest expenses. Washington has a high minimum wage, and up to 50 workers are employed during the harvest season, with a regular crew of about 20 during most of the remainder of the year.

"It's harder than it was years ago," Diana Puterbaugh says. "There is more paperwork, more health and safety issues, more regulations. I'd like to say something from a farmer's standpoint: we live where we work, and we look after things with a vested interest. We care about preserving our environment. We want the farm to do well, and we want to be able to pass it on to our children." Toward that end, they actively participate in hop growers' organizations and seek to make regulators, legislators and the general public aware of their work and concerns.

However, she is also quick to point out some of the joys and satisfaction that come from hop growing and farming in general: "To some extent, you're your own boss, you have your hands on the wheel, you get to guide where you go. We're proud of what we do. I urge everyone to support your local farmers."

Hops may be the least efficient agricultural product on earth. (Farmers must grow a 20 foot (6.1 m) vine to produce a bunch of tiny lupulin glands.) But, for beer lovers everywhere, it's worth it. For homebrewers who wish to grow hops at home, see the March-Apil 2005 issue.

Bill Pierce writes the Advanced Homebrew column in every issue.



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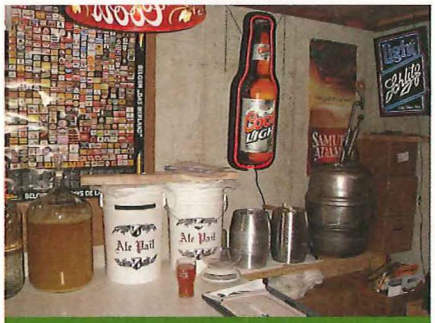
Last Call

Gluten-Free Brewery

A homebrewer beats his wheat allergy

by Harold Rothwell • Hopkinton, New Hampshire

I have been homebrewing for about one year and have been following *BYO*'s articles for about the same time. My first encounter with homebrewing was in graduate school, 30 years ago, when I sampled some brew that a friend had made. When we opened the bottles the brew literally exploded from the top — clearly much too much carbonation. However, what was left was pretty good. In any event only within the last year have I taken up homebrewing and the motivation for this is that I have a wheat allergy, generally referred to as Celiac. Basically I cannot eat any foods made with gluten — the protein found in many grains, including wheat and barley. Many good articles on Celiac disease and even some recipes for gluten-free beer can be found on the Internet.



Harold Rothwell found homebrewing to be the perfect solution to his wheat allergy.

While my initial motivation to enter into homebrewing was my condition, I have since discovered a real enjoyment in designing and brewing my own beer. It is with this enthusiasm that I want to share my experiences with the readers of *BYO*.

My system has evolved from many brewing sessions. I started as many with a kit consisting of several plastic buckets, a hydrometer and an airlock. My first batch of gluten-free (GF) beer was yeasty and I soon learned that a second stage fermentation was a must — therefore a carboy was purchased. The mashing and boiling steps were initially done in the kitchen, which was okay except that nothing else could be done in the kitchen when I was brewing. My wife was okay about the situation, but I suspect she was happy when I relocated.

My current brewing station is located in the basement, which is where I had been fermenting and aging my beer all along. The setup is housed inside a small room formed in a corner of the basement. The major elements consist of a mash pot, which is a converted electric turkey fryer. To the right and slightly lower is the boiling pot and a propane burner. Directly below the mash pot is a converted Igloo water bucket, which supplies water to the copper coiled wort cooler. A small pump is used to cycle the water.

I need to make an important point about using propane burners — one of the byproducts of the combustion is carbon monoxide, which has to be vented if you are inside. Directly above the boiling pot is a forced air vent that is ducted outside. Also a carbon monoxide detector is located nearby as a precaution. With these safe guards the system is quite safe. (I should note that I live in New Hampshire, which does not lend itself to brewing outside all year around.)

My fermenting bucket, carboy, and bottling equipment are located on an adjacent table. I have several plastic buckets for the primary fermentation and a carboy for the second stage. A plastic bucket sitting on a milk crate is used to transfer beer into bottles.

One of the interesting features of my brewing is the use of grains that are not commonly found in beer. The grains that are gluten-free include buckwheat, quinoa, millet, sorghum and amaranth. I have tried brews with the first three of these grains. Unfortunately malt extracts for these grains are not readily available, so I make my own malt. The procedure that I use for malting is actually very similar to malting barley, except that I am malting a very small amount.

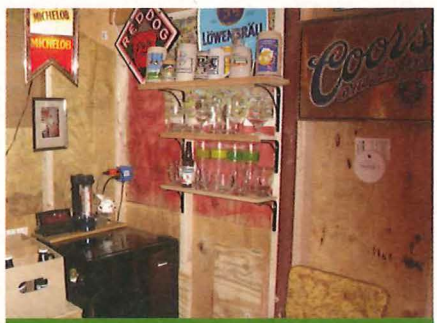
I start with about 2 pounds of hulled grain, i.e. raw grain, and soak the grain in fresh water for about two days. I replace the water every day. After the grain has softened and the oily substance covering the grain has dissolved, I put it in a straining bag and place the bag on a big cookie sheet. I then cover the bag with a clean towel and leave it alone.

Every day I rinse the grain bag by spraying water on it and let the excess water drain off. After several days the grain will start to sprout roots, which is the beginning of germination. Germination is the process, which converts the stored starch into sugars. When many of the grains have formed roots I remove the grain from the bag and spread the grain out onto several cookie sheets so that the depth of the bed is less than an inch.

The cookie sheets are then placed into an oven for over three hours at 200 °F (93 °C). The grain will darken slightly and feel dry and crisp to the touch when fully cooked. The last step is to grind up the grain. Originally I used a coffee grinder on the coarse setting, but usually a mixture of particle sizes resulted. The smallest size, which is the consistency of powder, is not desirable. A roller mill is much better for breaking up the grain.

I have made several types of brews with these grains, including:

- Gluten-free buckwheat
- Gluten-free buckwheat quinoa
- Gluten-free multigrain (containing buckwheat, quinoa and millet)
- Gluten-free honey buckwheat
- Gluten-free orange buckwheat
- Gluten-free pumpkin buckwheat



Harold keeps his brewery and beers gluten-free and roasts his own grain.

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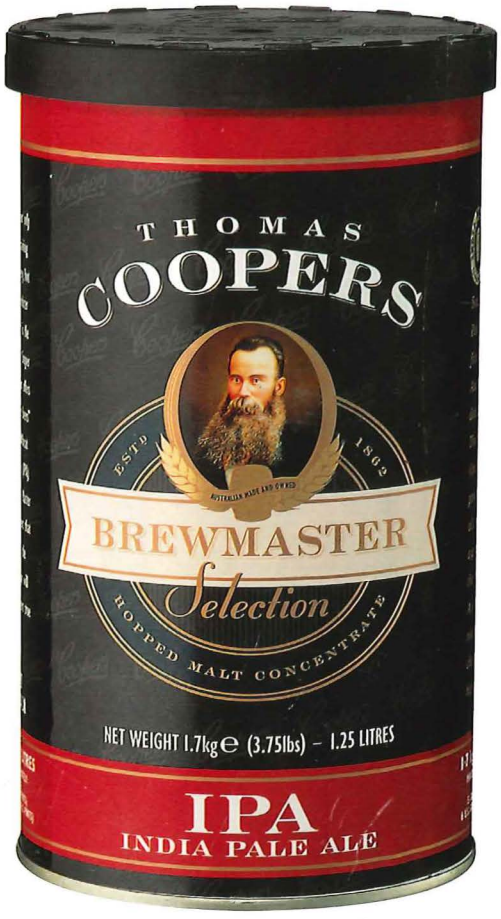
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