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SEPTEMBER 2006, VOL.12, NO.5

THE HOW-TO HOMEBREW BEER MAGAZIN

Sam I Am:

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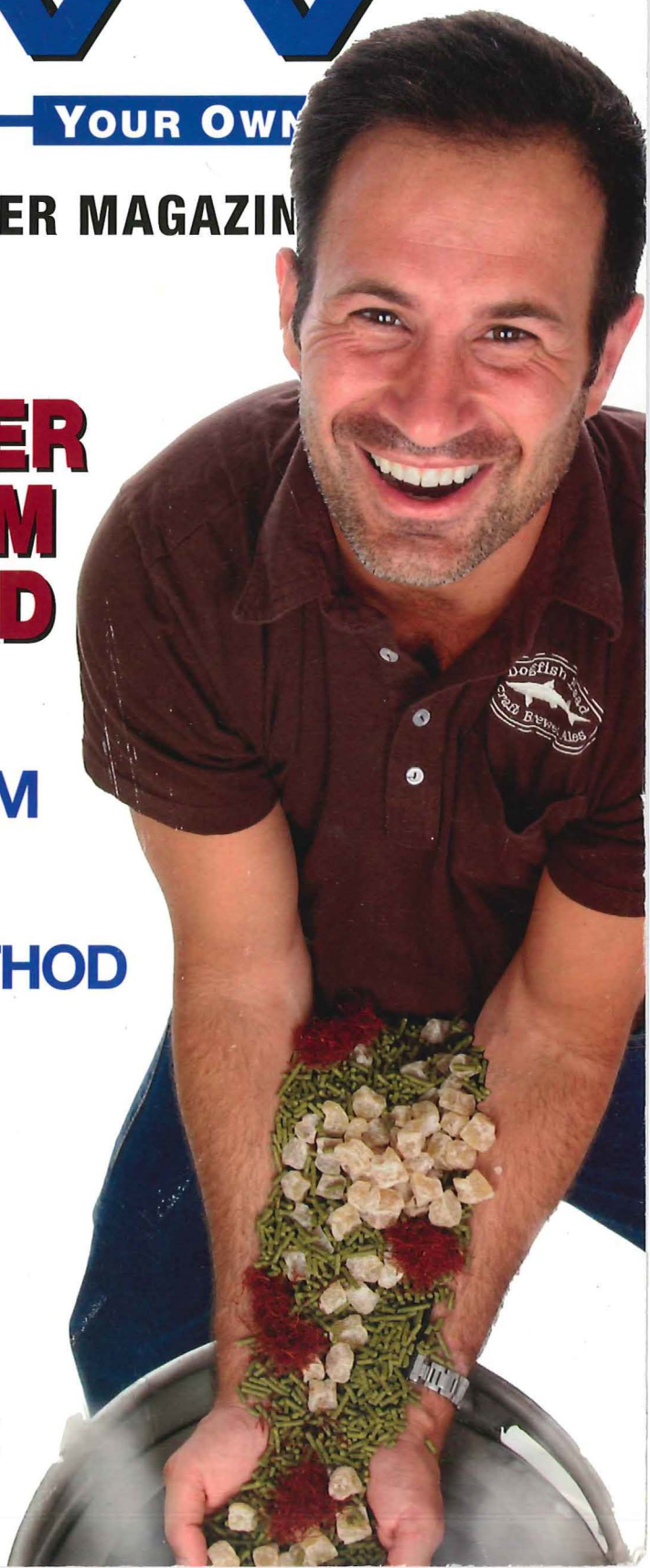
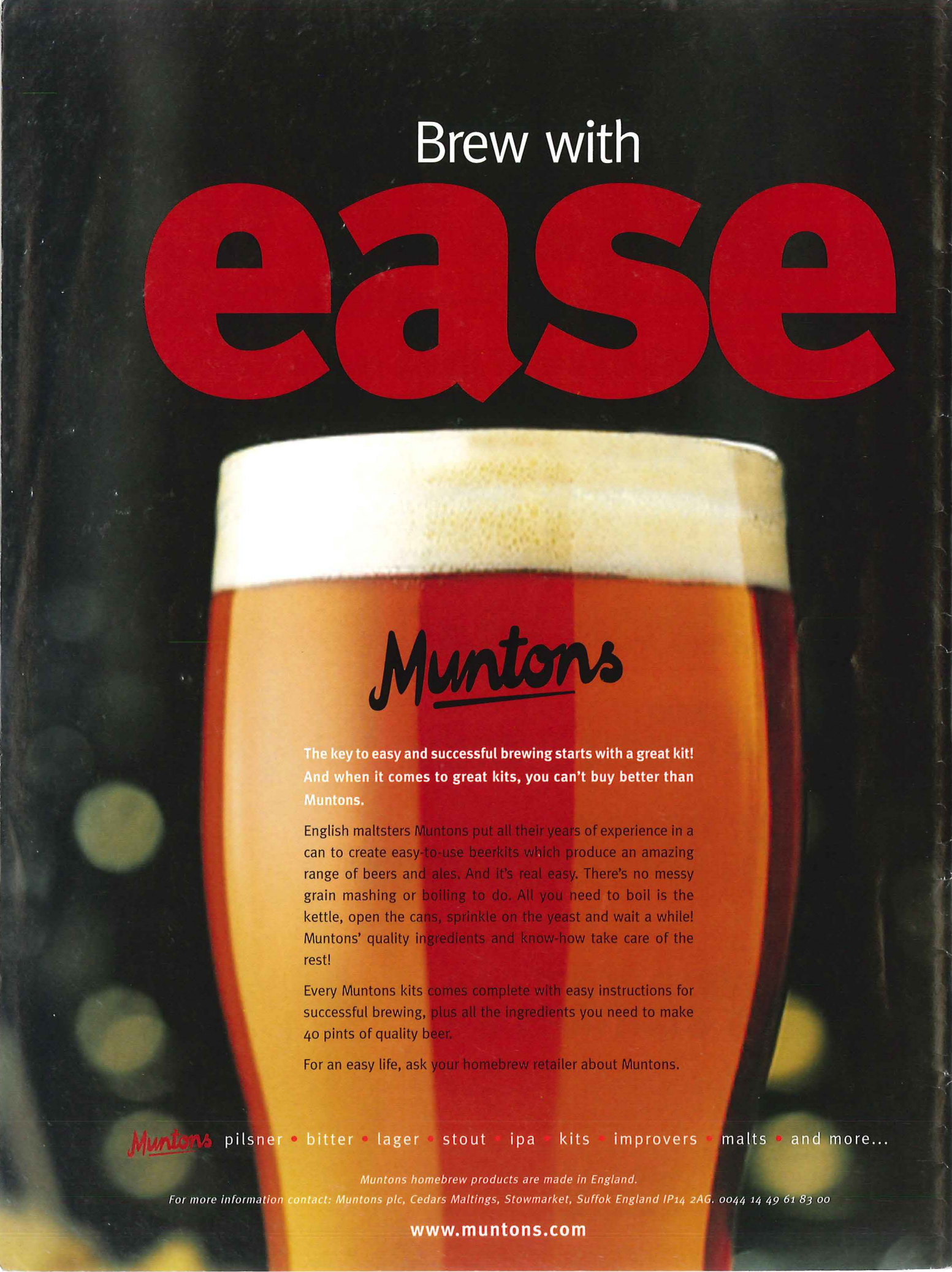


Sam Calagione of Dogfish Head Craft Brewery in Delaware gets back to his homebrewing roots in an extreme way.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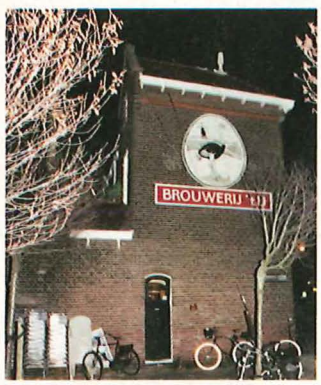

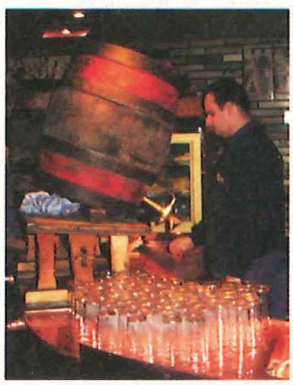

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COVER PHOTO: KEVIN FLEMING

BREW YOUR OWN®
THE HOW-TO HOMEBREW BEER MAGAZINE

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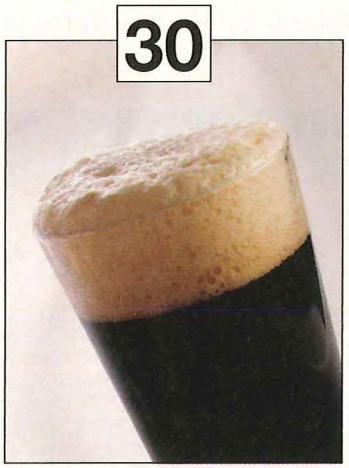

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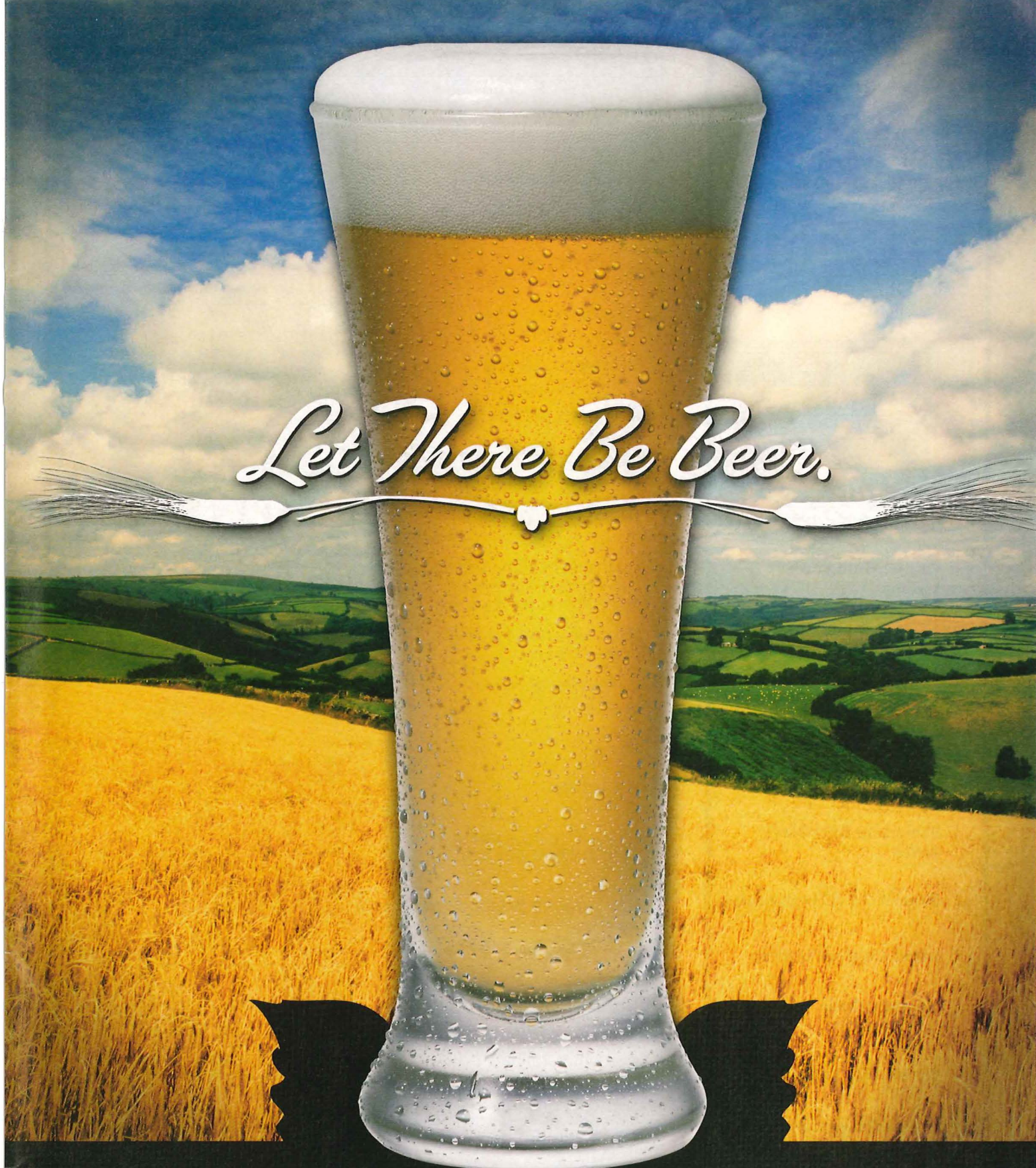

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An Enlightening Question

I am really puzzled about this open fermentation concept discussed in your July-August issue.

For years I brewed in poly pails, distilled water flagons or whatever and ignored the effect of light during fermentation. Then, in an "ah! ha!" moment, I found out a basic mistake I was making was not keeping things in the dark during fermentation.

Now, I am viewing the picture on page 41 of your issue, the shallow open fermenter at Ommegang in a well lit room. Now, I am reading your interesting article on open fermenter construction (page 51), and not a breath about how this 2x3x2 foot box — pretty big box, don't think it will fit in a used refrigerator, which is a common way for home brewers to keep things in the dark — will be kept in the dark while the fermentation is going on!

Help me with this. Open fermentation — does that mean open to light as well?

Roger L. Bessey
San Antonio, Texas

Another Enlightening Question

I have recently moved to Europe and have found that the homebrewing scene is quite different from that of the states. About the only raw material that I can reliably find is yeast from bottle conditioned beers. My problem: I have found a great beer shop, but am worried that their storage techniques are not the best as the beer is exposed to light on the shelves. Can lightstruck beer cause any off-flavors, or stunted performance in the cultured yeast? Thanks for your time.

Dan Rudy
via email

Brew Your Own *Editor Chris Colby responds: "Light, especially certain wavelengths of light, can have a detrimental effect on beer or yeast. However, you need to consider the type of lighting, its intensity and the amount of time the beer is exposed to the light.*

"It's well-known that light striking beer causes it to smell like a skunk. Skunking occurs when light in the 350-

550 nm range — in the UV part of the spectrum — strikes iso-alpha acids and cleaves them, producing 3-methyl-2-butene-1-thiol, a molecule similar to that found in the anal sacs of skunks and other mustelids. (Now aren't you glad you asked?)

"Sunlight, which gives off UV rays, as well as fluorescent lighting, can cause this to happen. Most incandescent lights give off little UV radiation and generally don't cause problems. Halogen lights, which are a type of incandescent lighting, give off quite a bit of UV. However, their bulbs are usually shielded, in part to block these wavelengths. Beer bottled in brown bottles is far less susceptible to skunking as the brown glass blocks most of the light at the problem wavelengths.

"It's less well known that UV radiation can cause mutations in yeast. Yeast cells are translucent and most light passes right through them. Different wavelengths absorb differently, but most UV radiation will pass through yeast cells and can potentially damage their DNA. Oddly enough, as an undergraduate, I worked on a project where I intentionally caused mutations in fungi by shining light of different wavelengths on it. (I was working on the smut fungus Ustilago violacea, *not* Saccharomyces cerevisiae.*) I'm not sure if the effect of UV light on brewers yeast has been studied specifically, but the mutagenic effect of UV light on laboratory strains of* S. cerevisiae *is well-known to yeast geneticists and I don't see why brewing strains would differ in this regard.*

"I spoke to Randy Thiel, Brewmaster at Ommegang, about light and the open fermentations he carries out. He says their fermentation rooms are lit by incandescent lights and the lights remain on almost all of the day. However, the thick layer of yeast and kräusen on top of the fermenting beer protects it and they've had no problems with skunking.

"For the homebrewer, keeping your beer out of direct sunlight is a must. Likewise, even a fairly short amount of exposure to fluorescent lighting can cause problems. However, exposure to moderate amounts of incandescent lighting should not hurt. If the sides of your fermenter (open or closed) are clear, it would probably be best to keep them covered, except when you want to take a peek. As for yeast harvested from bottles, you will probably be OK if the bottle was brown and not sitting in the sun or directly under fluorescent tubes for days and days. If the beer doesn't taste skunked, then I wouldn't worry about the yeast being harmed by the light.

"It's pretty easy to shield your beer (and yeast starters) from all light most of the time and this is a good general practice. Better to be safe than sorry. However, there are some times in the brewing process when your beer is going to have some light fall on it. I do what I can to minimize the amount of time my beer is exposed to light and keep it away from any intense lighting, but don't freak out about it. I have, for example, bottled beer in my kitchen, with the bottling bucket open right under the fluorescent lights, and not had a problem."

An Open Question

In the July-August issue, many of the articles mentioned open fermentation, but I couldn't find anywhere in the magazine that explained how to do an open fermentation. Do I just leave the lid off my bucket or is there more to it than that? Also, everything else I have read about homebrewing advises that I do everything I can to avoid contaminating my wort —

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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.

isn't open fermentation a huge risk?

Dan Ringer
Provo, Utah

Open fermentation seems scary to a lot of homebrewers, but actually works very well almost all of the time. To perform an open fermentation, transfer your chilled wort to an open fermenter, aerate the wort and pitch your yeast. A regular fermentation bucket works fine as an open fermenter and so do plastic storage bins.

It's best to place a lid loosely on the fermenter until the first signs of fermentation show. Once a little kräusen has built up, take the lid off and let the beer ferment. The kräusen will shield the beer from airborne contaminants. (This presumes the fermenter will reside in a reasonably clean room away from children or pets.) Once fermentation slows and the kräusen starts to fall into the beer, rack to a closed fermenter. You don't need to do this the second that beer is exposed, but don't delay for more than a day or so. If you open ferment using a modified chest freezer as your fermentation chamber, you should wipe down the insides of the freezer with a little sanitizing solution before you place your fermenter in it. This will get rid of any mold that may be clinging to the sides. You may want to prop the lid open a few inches to let air flow into the freezer.

Fermenter Facts

The open fermenter described in the July-August installment of Projects had bottom dimensions of 3' X 2'. When filled with 5 gallons (19 L) of wort, the depth of the liquid would be only 1.3 inches (3.3 cm) deep.

Although the volume enclosed by the fermenter is large, only shallow fermentations of "normal" homebrew volumes — 5 to 10 gallons (19–38 L) — should be attempted in it as the sides are not braced to hold against the pressure larger volumes of wort would exert.

Note also that the full 3' X 2' X 2' fermenter described in the text would enclose 12 cubic feet (as mentioned). However, this translates to 0.34 cubic meters, not the 30 cubic centimeters as stated in the article.

Rib Recipe?

I enjoyed your article on beer and food pairing (in the July-August issue) , but wish it had included a recipe or two with a beer pairing suggestion. The picture of grilled ribs sent me on a bee line to find the recipe, but no luck. Otherwise, great article.

Stuart Henry
Napa, California

Sorry to get you salivating, then not come through with a recipe. Check out our May–June 2004 BYO for the ribs recipe featured in that photograph as well as some other tasty beer and barbeque recipes.

Creamed Recipe

I have a recipe for American Cream Ale that uses 1 lb. of flaked corn (maize), 5 lbs. of light dry malt extract and 1 oz. of Cluster hops. My question is, I have the recipe, but no directions for it, and I was wondering how I do the maize for brewing. I also want to know how much maize can I add when I use other grains, and do I add it to the steeping process and how long do I steep it?

Richard Widder
via email

Flaked maize needs to be mashed with some grains that will supply the enzymes to convert the starch in it. If you steep it, you will just add starch to your beer. This will cause haze and leave your beer prone to the growth of contaminating microorganisms. Replace the flaked maize with ⅔ lb. (0.30 kg) of corn sugar, added in the boil.

Back to Basics

Every time I get ready to share my homebrew batch with friends, there is a brown film at the bottom of the bottles. Is this brown film bad? I have yet to notice a defect in the beers taste.

Jeffery Gardner
Terre Haute, Indiana

The brown film is just yeast that has sedimented out of the beer after consuming the the bottling sugar. All bottle conditioned beer have it. Just pour the beer into a glass before you serve it.

Forrest Whitesides brewed his first batch of homebrew with his dad in the summer of 1995 at the tender age of 18.

In the decade or so since that first batch — an English brown ale — he has developed an unhealthy obsession with Belgian-style brews of all shapes and sizes.

Forrest is a journalist and editor for the publications division of a non-profit organization in New York City and is a graduate of North Carolina State University. He resides in Hopatcong, New Jersey, with his wife, Meaghan, and their two cats.

In this issue is his first contribution to *Brew Your Own*, and also his first published article on brewing. On page 53, in the "Projects" department, he describes how to build a homebrew version of a very English piece of brewing equipment, a Burton Union.

Sam Calagione is the man behind Dogfish Head Craft Brewery, brewers of Midas Touch, Indian Brown Ale, Raison D'Etre, World Wide Stout, Aprihop and, of course, the "minute" series of IPAs — 60 Minute IPA, 90 Minute IPA and 120 Minute IPA.

He's also the guy who brought us Randall the Enamel Animal, an "organoleptic hops transducer" that sits in line between the keg and tap and infuses beer with fresh hop flavor and aroma. (See the September 2004 issue of *BYO* to learn how to build a homebrew version and also a clone of Sam's 90 Minute IPA.)

Here at *BYO*, we're extremely happy to present an excerpt from his new book, "Extreme Brewing" (2006, Rockport Publishers), to be released in November. In the article, Sam describes how to brew five extreme beers and answers questions about extreme brewing.

Jon Stika is a native of Milwaukee, Wisconsin and grew up within sight of the neon sign on top of the Miller brewery. He and his wife Eve currently reside in Dickinson, North Dakota where he is the president of the Heart River Home Brewers club. The club recently compiled a collective library and enjoyed a club picnic complete with barbequed buffalo and homebrew. Jon works as an agronomist and soil quality intructor and has been homebrewing since 1992, starting because quality beers were hard to find in "America's Outback." Jon makes his own malt, something he wrote about in the May-June 2002 issue of *BYO*, and grows his own hops, which we featured in the Homebrew Nation department of our September 2004 issue.

On page 42, he describes how to preserve small quantities of wort for use in making a yeast starter.

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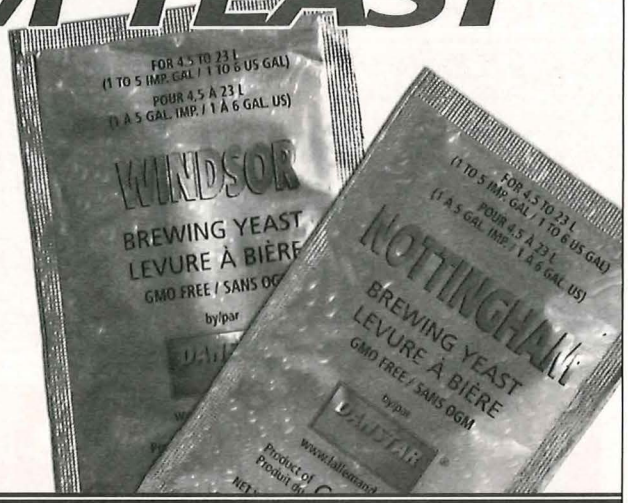

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Dixie Cup • Houston, Texas

The Dixie Cup, celebrating its 23rd year this October 20–21, is one of the nation's oldest and largest single-site beer competitions. Averaging 1,100 entries the last few years, the Dixie Cup offers an avenue to put beer into competition against those made by some of the best homebrewers in the country.

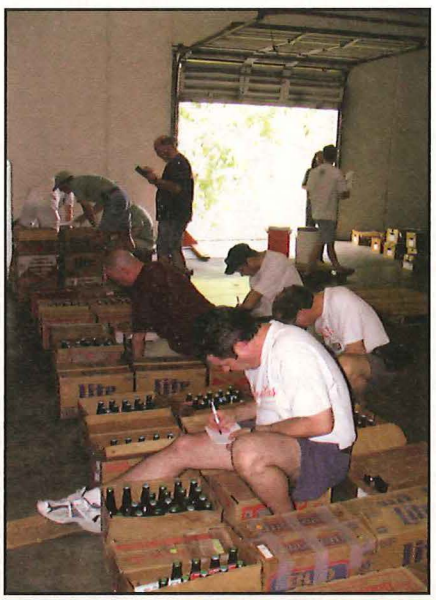
Each year there is a special theme-based category, this year's is 80/80 (1.080 OG with 80 IBU), in honor of beer writer Fred Eckhardt's 80th birthday. Far from just a beer competition, the Dixie Cup has other events that brewers and beer lovers enjoy. A Thursday night reception gives brewers and guests time to get to know each other, renew acquaintances and meet the speakers. Friday and Saturday judging is where the serious business of the Dixie Cup is done; however, there is plenty for participants to do including a pub crawl, speed raffle and the famous Fred Tasting (this year – Around the World in 80 Years) featuring America's original beer author, Fred Eckhardt.

Saturday morning, starting promptly at 8 a.m., one can imbibe in a barleywine tasting. What started a few years ago on a dare with a couple of bottles has blossomed into an event where both commercial and homebrewed barleywines, old ales and anything with a kick is served to bleary-eyed participants — many still in their bunny slippers.

After the tasting and before judging resumes, the mini-conference begins. This year's speakers at the Dixie Club include Ralph Olson, owner and general manager of Hopunion, Bill Covaleski, co-founder and co-brewmaster at Victory Brewing Company and Ashton Lewis, master brewer at the Springfield Brewing Company and "Mr. Wizard" of *BYO* magazine.

For more information about the Dixie Cup visit www.foamrangers.com/dixiecup.

(Right:) It's not all fun and games, someone has to organize all the entries. (Below:) Judges gather at St. Arnold's Brewery to taste the 1,100 entries.



homebrew CALENDAR

September 15
FOAM Cup
Tulsa, Oklahoma

Entries for this years's FOAM Cup must be received by September 15. This competition is one of the qualifying rounds for High Plains Brewer of the Year. For more information, visit the Website at www.alemakers.com, call (918) 906-7964 or email philospher@alemakers.com.

September 28–30
2006 Great American Beer Festival
Denver, Colorado

The 2006 Great American Beer Festival will be held from September 28–30 at the Colorado Convention Center (at 14th Street and Stout Street) in Denver, Colorado. The 2006 edition will be the 25th installment of the nation's annual celebration. The festival will feature 1,600 of the nation's best beers from over 370 American breweries.

Dixie Cup
October 6
Houston, Texas

Deadline for the 2006 Dixie Cup is October 6. For full details visit www.foamrangers.com/dixiecup or just look to your left!

we want you

Do you have a system or a gadget that will make our readers drool? How about a killer recipe or tip? Email a description and photos to **edit@byo.com** and you too may have a claim to fame in your brewing circle!

If we publish your article, recipe, photos, club news or tip in Homebrew Nation, you'll get a cool t-shirt (courtesy of White Labs) and a *BYO* Euro sticker.

brewer PROJECT

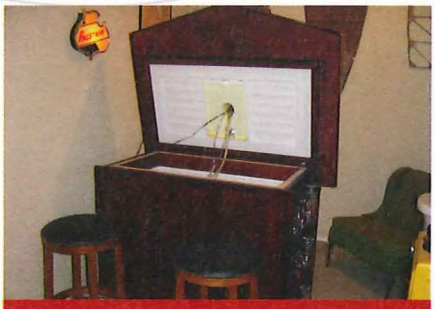
Kegerator Bar

Lonnie McAllister • Houston, Texas

This is my all-in-one dining room table/beer-serving/storing/utopia machine. The kegerator bar! There were many important factors for me that came to mind and drove me to this idea, the main being personal environment. I didn't want a simple serving area; I have been seeking a total environment, a place not only to get beer, but also to sit and enjoy the fruits of our homebrew labor. I think we have accomplished this task in very short order; though several items need attending to when one considers permanently wrapping a deep freezer in wood. For our purposes, 10 cubic feet serves nicely. Our unit will hold six 5-gallon (19-L) kegs, one 3-gallon keg (11.4 L) and a 15 lb. CO_2 tank to push the goods. The service end need only be limited to how many beers you care to keep on tap. We opted for a four-tap draught tower. This allows a bit of lager, or carbonating room inside the freezer with only four of the seven beers on tap at any one time.

This beautiful bar houses a kegerator and chest freezer that holds seven kegs.

Cautionary note: Any enclosed design should incorporate proper external ventilation. I have incorporated a ventilation system that removes external heat and exhausts it to the rear by way of a ventilation fan controlled by the same temperature controller that controls the freezer cycle. More details can be found at our website including a detail parts spreadsheet at www.alelago.com.



With a tip of the lid, the bar lifts up giving easy access to kegs, taps and CO_2.

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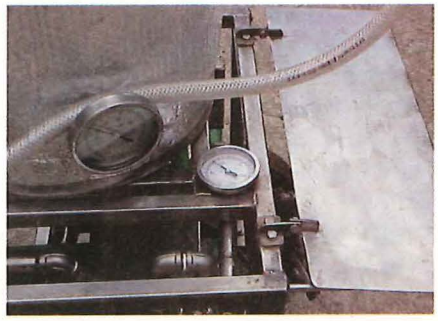
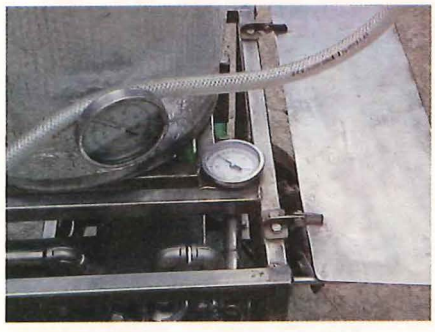
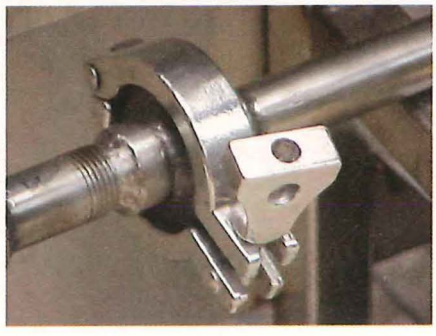
Martin Ammon • Kansas City, Kansas







After building several systems for friends I thought it was time to build a new system for myself. I had to go one better and build a system out of stainless steel, including the frame amd piping. The tri-clovers on the keg are made from the neck of kegs, with a gasket and clamp. The tri-clovers in the piping are made from two end caps that are bored and a half coupler tig welded onto the cap. Add a gasket and clamp and you have an inline tri-clover at a cost of about $20.00 compared to one half of a purchased fitting of $55.00.

The system can be broken down into parts of no longer than 24 inches for cleaning. The Mash tun has an adjustable return ring so you can set it for mash height. The coil in the HLT is copper because of heat transfer. The coil has a bypass valve so you can avoid the coil and maintain temperature. The temperature is monitored by a gauge coming out of the coil at the sight glass, which is also homemade. At present the boil pot and HLT are gas fired but an electric HLT tank is being built and may replace the present tank.

Brewer's dictionary

Y is for . . .

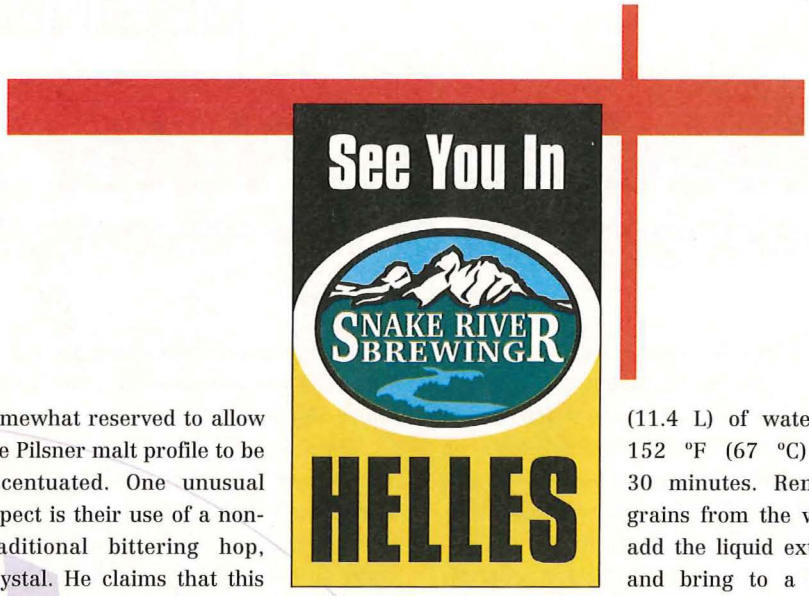
yard of ale: a long neck glass that measures 3 feet (i.e. 1 yard) and holds about a quart of beer. *BYO* staff drink out of nothing else.

yeast: A single-celled organism of the genus *Saccharomyces*. During fermentation, yeast convert sugar into alcohol and carbon dioxide.

yeast nutrients: These are elements that can be added to a fermentation to promote yeast health and vitality. Homebrew supply shops sell pre-measured packages of yeast nutrients for small batches.

replicator

by **Marc Martin**



Dear Replicator,

My wife and I recently made a trip through several western states. Being an experienced homebrewer, we attempted to seek out good beer and brewpubs each day. One night, after a long drive through Wyoming, we arrived in the resort area of Jackson Hole. Not expecting to find much in Wyoming, you can imagine our surprise to stumble upon Snake River Brewing Co. in the town of Jackson. Good beer and fantastic views! They were serving an excellent German Helles that I would love to duplicate. I am hoping you can get the details of this recipe for me.

Tim McCormick
Downers Grove, Ill.

My regular job allows me to travel a fair amount and shortly after receiving your letter, my employer sent me to Wyoming. I took your advice and drove the extra miles over to Snake River Brewing. You were correct! Not only is the setting, at the base of the Teton mountains, beautiful, but these folks brew excellent beers. I also found their Helles to be a truly classic example.

I met with Rob Denton who is their assistant brewer. Like many of us, he began as an avid homebrewer and worked his way up. He informed me that their brewery was named small brewery of the year in 2000 and 2001 at the Great American Beer Festival (GABF). This recipe was created by their Siebel-educated, head brewer Mark Spilker, who has produced several other gold medal beers during his six years at the brewery. Rob describes their Helles as a traditional German style lager. They strive to make this beer crisp and clean with a nicely balanced finish. Hop levels are somewhat reserved to allow the Pilsner malt profile to be accentuated. One unusual aspect is their use of a non-traditional bittering hop, Crystal. He claims that this makes their beer unique and creates a slight spiciness.

Rob reports that their version of this style has been very well received in Wyoming. Its straw color and mild flavor make it a perfect transition beer to convert those mega-lite beer drinkers. I would definitely agree and it seems you picked the perfect style for the coming dog days of September.

For more information about the brewery or their other fine beers you can access Snake River's company Website at www.snakeriverbrewing.com. Or, get them on the phone at (307) 739-2337.

Snake River Brewing Company See You In Helles German Lager

(5 Gallons/19 L, extract with grains)

OG = 1.048 FG = 1.010

IBU = 19 SRM = 3–4 ABV = 4.9 %

Ingredients

6.6 lbs. (3 kg) Briess unhopped light Pilsen extract
1 lb. (0.45 kg) Pilsner malt grain
½ tsp. yeast nutrient (15 min.)
5 AAU Crystal hop pellets (60 min.) (1 oz./28 g of 5.0% alpha acid)
1 AAU Tettnanger hop pellets (15 min.) (0.25 oz /7 g of 4.0% alpha acid)
White Labs WLP 830 (German Lager) or Wyeast 2124 (Bohemian Lager) yeast
0.75 cup (150 g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 3 gallons (11.4 L) of water at 152 °F (67 °C) for 30 minutes. Remove grains from the wort, add the liquid extract and bring to a boil. Add the first addition of Crystal hops and boil for 60 minutes. During the boil, use this time to thoroughly sanitize a fermenter. Add the second addition of Tettnanger hops and yeast nutrient for the last 15 minutes of the boil. Now add the wort to 2 gallons (7.6 L) of cold water in a sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool over the next few hours to 65 °F (18 °C). When evidence of fermentation is apparent, drop the temperature to 52 °F (11 °C) and allow to ferment for 10 days. Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Condition for 2 weeks at 42 °F (5 °C) and then bottle or keg. Allow to carbonate for 4 weeks and enjoy!

Note: For tips on cooling your fermentation refer to the article "summertime blues" in the July–August 2006 issue.

All-grain option:

This is a single step infusion mash. Replace the malt syrup with 10 lbs. (4.5 kg) Pilsner malt. Mix the crushed grain with 3.2 gallons (12 L) of 168 °F (76 ° C) water to stabilize at 152 °F (67 °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 hops to 3.75 AAU (0.75 oz./21 g) due to the higher utilization factor for a full wort boil. The remainder of this recipe is the same as the extract recipe.

Reading a Water Analysis

Making sense of the neverending numbers

by Garrett Heaney

Luckily, there is a federal law in the United States that requires every public water department to regularly conduct tests on community drinking water and furnish the results to anyone who requests it (yes, even homebrewers). The results are formatted into official "water analysis reports" that contain detailed information about the chemical and mineral makeup of a water supply.

Upon first glance, a typical water analysis report is enough to make your head spin. "Hmm . . . ok my water has 1.800 parts per billion xylenes. Good to know."

To be perfectly honest, I don't have any better an idea what a radionuclide is than you do, but I also know that I really don't need to. Out of all the numbers on a water report, there are only a handful that are of most importance to homebrewers: hardness (in forms of calcium and magnesium), carbonate, sulfate, chloride and pH.

Hardness

Your water analysis will give you a measurement of hardness in parts per million. Hardness is an indicator of your water supply's calcium and magnesium content. Calcium and magnesium lower mash pH by reacting with phosphate and amino acids from malt. The more of these minerals that are present in your water, the "harder" it is. They are measured in milligrams per liter and fall in a scale between 0 and 500 ppm. Water with 0–100 ppm is very soft to soft, 100–200 ppm is considered soft to medium, 200-300 ppm is medium to moderately-hard, 300–400 ppm is moderately hard to hard and 400–500 is hard to very hard.

Soft water is good for lagers and Pilsners because the low mineral content lends a neutral flavor profile with a delicate malt character that is permissive to subtle hop notes. Many famous lagers and Pilsners are brewed with water under 50 ppm in hardness.

Hard water is better suited to more aggressively hopped ales such as an IPA. Burton-on-Trent in England is home to perhaps the most famous hard brewing water in the world. All the Burton-style ales are brewed with water that is no less than 250 ppm in hardness.

As mentioned in the following "Tips from the Pros" article, you can treat your water to scale down the hardness, or increase it. Boiling and filtering are both fairly effective methods for the removal of minerals (and the consequent decrease in hardness). To increase hardness, you can always add minerals in controlled measurements to emulate the water used in the styles that you are brewing.

Carbonate

Carbonates are found in many water supplies, especially those from areas rich in limestone, and tend to drive mash pH up by neutralizing acid. Carbonates are used in consumer products, like Tums and Rolaids, for neutralizing acid in the body. Dark beers, like stouts and porters, work well with carbonate water because carbonates help balance the acidity of darker malts. When brewing pale beers with carbonate water, the addition of calcium sulfate or calcium chloride helps to offset carbonates. Many brewers prefer water low in carbonates and use a variety of methods to remove carbonates from their water prior to use.

pH — a measurement of acidity

pH is a scaled measurement of a water supply's acidic strength. The scale ranges from 1 to 14, 1 representing a strong acidity, 14 representing a strong alkalinity. For brewing, coming in as close to neutral (7) is preferable. One thing to note is that the pH of your local water can vary with the season and time of year. Rainfall (especially acid rain) can affect your municipal water supply's pH, regardless of the source. pH is an easy measurement to adjust, using various acid treatments (such as the additions of lactic or phosphoric acid) to achieve the proper mash pH.

Sulfate and chloride levels

Sulfate and chloride are ions that are both important to observe when it comes to brewing water. Both are listed in your water analysis report in parts per million. Sulfate sharpens hop bitterness and most brewers prefer to keep sulfate levels below 150 ppm. If you are shooting for an ESB or a beer that accentuates bitterness, you can add sulfate in order to promote this flavor.

Please note that you cannot add a straight ion to brewing water, it is scientifically impossible. You have to find a compound or mineral that contains a certain ion and add that to your water. In the case of sulfate, that compound is calcium sulfate (aka gypsum).

Chloride helps mellow and round out a beer's flavor profile. Most beers contain no more than 100 ppm of chloride, but rich, maltier beers with strong flavor, such as a doppelbocks, imperials or Scotch ales can benefit from as much as 250 ppm chloride. Also, mild ales and beers that are meant to be gentle on the palate appreciate this ion in amounts of 200 ppm or more. Chloride is typically added in one of two forms, calcium chloride or sodium chloride.

Now that you have an idea of what to look for on your water report and the basic treatments, you should be able to better pair your brewing liquor (a fancy term for brewing water) with your beer styles. Keep the beer flowing!

Brewing Water

Most H_20 is more than a couple Hs and an O

by Garrett Heaney

There is more to most water than two molecules of hydrogen and a molecule of oxygen. In most municipal water supplies, whether from aquifer or reservoir, you will have both natural minerals and manmade chemicals that are added to protect consumers from bacteria. Some brewers, such as Greg Noonan, find the local water supply unsatisfactory for their beer styles and feel the need to treat it. Others, like Scott Schwartz, take a more "hands-off" approach to his water.

Greg Noonan is the owner of Vermont Pub and Brewery in Burlington. In his book, *New Brewing Lager Beer* (Brewers Publications, 1996) he dedicates an entire 40-page chapter to water treatment.

At Vermont Pub and Brewery we employ an activated carbon "taste and odor" filter to remove the chlorine. It isn't the most necessary of steps, since, as most homebrewers know, heating the water in preparation for brewing drives off chlorine. The mineral makeup is another story. The mineral makeup of most surface water supplies changes seasonally. Once we have a great recipe we are particularly concerned about replicating it accurately. The mineral content of the water affects that, so we monitor and treat the water according to its seasonal character.

Moreover, when we began brewing at Vermont Pub and Brewery 18 years ago, our water was very soft. However, in the intervening time our own "great lake" Champlain has been invaded by zebra mussels. When the little suckers die, their shells disintegrate into calcium carbonate. Our water supply has become much more carbonate, and therefor more alkaline. As Jim Koch of Sam Adams pointed out to me years ago, alkalinity produces dull-flavored beers.

Depending on the beer, we overcome the alkalinity by adding food-grade lactic acid or making up a partial sour-mash and adding that to the mash tun. Otherwise our water has a pretty low mineral content, so we generally add mineral salts to suit the beer style that we are brewing that day. We test our water at least monthly for alkalinity, hardness and calcium. We then plug those numbers into a spreadsheet that we developed to accurately and consistently turn water into the brewing liquor that we feel suits the particular beer we're brewing (a copy of my spreadsheet can be found at byo.com.)

At Vermont Pub & Brewery we are conscious of beer styles, so we do treat our brewing liquor to suit each style that we brew. We want to emphasize the mineral character that complements a particular style. As an example, the only appreciable difference between a Dortmunder lager and a Bohemian lager is the mineral character of the Dortmunder — so in particular instances liquor character is essential to the beer style.

All brewing minerals add a mineral or salty flavor to beer, but each has a different flavor effect. The general rule in brewing to add gypsum (calcium sulfate) to British-style beers is a good one, especially if the beer is heavily hopped. Hoppy beers sometimes have an unpleasant soapy flavor. Calcium sulfate eliminates soapy flavors and accentuates a clean, piquant hop bitterness.

Magnesium sulfate is also common in English water sources, and has a similar effect in brewing. However, I don't recommend using it because the salt is "diuretic." That means it is dehydrating. So unless, for some bizarre reason, you like to pee a lot and wake up desiccated the next day, avoid or at least take it easy on the epsom salts (magnesum sulfate).

Chlorides generally don't complement bitter beers. In moderation, sodium chloride does accentuate caramel flavors in malty beer, although we prefer to add calcium chloride because the sodium ion is harsher and in excess can harm the yeast.

We don't add minerals for most lagers, Dortmunders being the notable exception. The Dortmund style requires moderate calcium sulphate and sodium chloride contributions to achieve its distinctive mineral character. We add calcium sulfate to bring the brewing liquor for our IPA up to 750 mg/L of hardness, and most other English ales up to 350–500 mg/L. For Irish and Scottish ales our hardness target is lower, with more emphasis on the chloride content.

My feeling is that if you only have really hard water available to you, then brew hoppy English style ales or Dortmund-like lagers. Otherwise, your only real option is to buy purified water for brewing malty beers. On the other hand, if you are blessed with a soft water supply, your options are wide open. You can brew lagers and malty beers with the soft water and add gypsum for English and hoppy ales.

Inexpensive freshwater test kits are readily available from aquarium supply shops for measuring the mineral content of water, so it isn't a very difficult regimen for any homebrewer to replicate. You only need pH papers and hardness and alkalinity test kits. The calculations required to use that information in replicating classic brewing water profiles aren't rocket science, although using a spreadsheet or other calculator greatly simplifies things. Homebrewers shouldn't be intimidated by the process.

If you are unhappy with your current brewing liquor, water treatment can be a pretty easy way to improve your beer's character.

BYO.COM bonus:
Greg Noonan's brewing water treatment spreadsheet.

Scott Schwartz is the Head Brewer at Nimbus Brewing Company in Tucson, Arizona. He monitors all aspects of the brewing process, and has garnered multiple awards for Nimbus Brewing Company, including Best Local Brew and Best Beer on Tap in the Best of Tucson competition for five consecutive years. He has a bit of a "hands-off" approach when it comes to the water supply in Tucson.

Nimbus Brewing is somewhat fortunate in relation to the local water supply. The water supply in the area of Nimbus contains the following values: sodium 31 mg/L, pH 7.7, hardness 109 mg/L, mineral content 236 mg/L and chlorine 0.73 mg/L. Currently all of our water is charcoal filtered. The water used for mashing is boiled the day before and allowed to sit overnight to assist in driving off any extra chlorine character. This also aids in the removal of bicarbonate ions by precipitation. Additionally, food grade phosphoric acid is used in lower pH to 5.2–5.4.

Nimbus doesn't really focus on ions. Whereas calcium, sodium, chloride and sulfate add to a proper mash and finished product, as luck would have it we are fortunate to have a more than suitable profile for ales. The mineral ion content in Tucson is similar to Burton-On-Trent. All of the Nimbus ales benefit from the hard water supply, especially our pale ale and our oatmeal stout. We currently do not brew lagers so we do not have the need for soft water.

> "You can certainly blend municipal water with softer purchased water for achieving a profile more suited to lagers."

Most major cities will provide a brewer with a general water profile. If a brewer is focusing on any specific style, I would suggest buying water from a water supply store that can offer a detailed profile. You can certainly blend municipal water with softer purchased water for achieving a profile more suited to lagers.

I would also highly recommend reading "Designing Great Beers" by Ray Daniels and "The Brewers Companion" By Randy Mosher. Both books offer vast insights to both water chemistry and excellent style backgrounds. Brewers should research a style before brewing and sampling styles of the beer you want to brew is part of the joy of brewing!

Garrett Heaney is the Associate Editor of Brew Your Own *and writes "Beginner's Block" and "Tips from the Pros" in each issue.*

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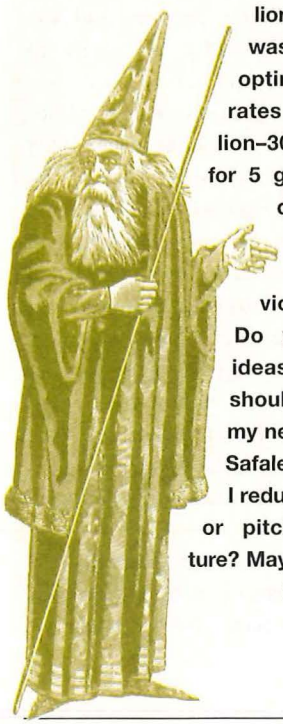
Dry Yeast Dilemmas

Hungry, hungry hoppings and the wonders of welding

Dry yeast, wet floor

I've been brewing all-grain for 15 years and using liquid yeasts exclusively. I recently decided to give dry yeast a try. I made a 10-gallon (38-L) batch of IPA at 1.070 OG and racked it into two 5-gallon (19-L) glass carboys, cooled to 72 °F (22 °C) and oxygenated with an aquarium pump. I then pitched one, rehydrated 11.5-gram package of Safale S-04 dry yeast into each carboy. The carboys began showing signs of fermentation within 4 hours. By the next morning, the fermentation was violent and I was losing a substantial amount of brew out of the blow-off tubes. After three days the fermentation had all but flat-lined and I was left with only about 3 gallons (11.4 L) of beer in each carboy. Safale directions say to sprinkle (no mention of rehydration) 1 package for 20–30 quarts (~20–30 L) or approximately 5.5 to 7.5 gallons (20.9–28.5 L) with temperature range of 59–75 °F (15–24 °C). Since the beer that I did get was still good but the flavor was a little different than brewing the same recipe with White Labs WLP 001, I would like to try dry yeast again but am hesitant due to this last experience. The *BYO* article states that a dry yeast package contains approximately 110 billion cells. Since I was actually below optimal pitching rates of 200 billion–300 billion cells for 5 gallons (19 L), I don't understand why I had such a violent reaction. Do you have any ideas on how I should proceed for my next attempt with Safale yeast? Should I reduce pitching rate or pitching temperature? Maybe re-hydrate?

Tim Reasonover
Yuma, Arizona



For starters, many of the guidelines about pitching rates are rules of thumb. Most commercial brewers I know do shoot for about 1 million cells per °Plato/mL of wort. However, there are many references to ale breweries across the pond that use about half of this general rule. I don't think pitching rate caused your geyser, I just thought it worth noting that lower pitching rates are indeed successfully used. I also don't think rehydration was the problem. Hydrating dried yeast in water before pitching is recommended because it allows the cell wall and internals to establish their normal size and transport functions before the yeast is tossed into wort. I have used dried yeast many, many times without rehydrating and made good beer, but the microbiology folk who understand what's going on at the cellular level do suggest rehydrating for the benefit of the yeast.

The "problem" is that you are accustomed to yeast strains that don't form such a large kräusen volume. Not all yeasts behave the same and some strains require a considerable amount of headspace in the top of the fermenter if mega blow-off is to be avoided. A "standard" beer fermenter, if such a thing exists, has about 25% headspace in the top of the tank. When sizing cylindroconical tanks I calculate the beer level for a given tank geometrically, typically a 2.5:1 height to diameter ratio, and then make sure there is 25% additional length in the straight side of the tank. There are different ways of calculating headspace, but this is how I do it.

Most yeast strains perform just fine in a tank with 25% headspace. We use White Labs WLP 001 California Ale yeast for our house ales and have never had any blow-off when tanks are normally filled. Our seasonal beer in the summer is hefe-weizen. Over the years we have used a few different strains but for the last 3 or 4 years White Labs Weizen IV has been the one that gives the flavor that suits our tastes. All the weizen yeast strains used to make a huge mess in the fermentation cellar. Foam comes pouring out of the line leading to the top of the fermenter and froths out of the airlock making a big mess on the side of the tank and on the floor as well as depositing a thick, clean yeast cake in the bottom of the airlock (ours is pretty big and looks like a stainless steel bucket suspended from the blow-off line).

As you point out, losses can be considerable when mega blow-off occurs. Besides losing beer, hop components are lost when the kräusen is skimmed. The loss of hop bitterness can be a bummer if unexpected and your finished beer may be different than that envisioned when formulated. However, some of what you're losing may not be such a bad thing.

If you have ever tasted the foam on the top of fermenting beer you will know that it is very bitter and that hop compounds become concentrated in beer foam. Cold break trub that forms upon wort chilling is also carried up into the yeast and head and German brewers call this stuff *braun hefe* or brown yeast. *Braun hefe* does not taste very good and traditional brewers using open fermenters skim this stuff off the top. Some traditional fermentation techniques such as Burton Unions and Yorkshire Squares are "self-skimming" by their very design and this yeast is separated from the beer (See our Burton Union "Projects" article on page 53). More than one large American brewer uses fermenters specifically designed to remove *braun hefe* during fermentation to make a cleaner tasting brew.

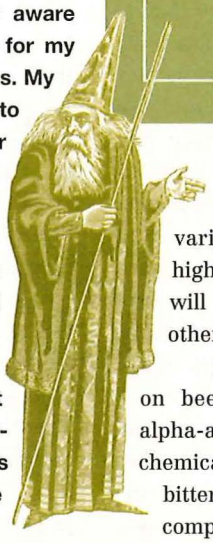
As *BYO* Editor Chris Colby pointed out in his January–February 2006 article about dry yeast, there are definite advantages to having this type of yeast in your brewing toolbox. I would give this experiment another go. This time around use way more headspace than you think is required, something like 40%. Once you get an idea of how a particular strain

behaves you can then adjust the fill height in your fermenter accordingly. You may decide that a little blow-off is a good thing and end up filling in order to achieve a controlled amount of self-skimming.

Hop flopping

I have become increasingly aware that I am not getting the "bang for my buck" that I should out of my hops. My IPAs and double IPAs come out to be just pale ales — with little or none of the expected hop profile. I have used pellets, plugs and leaf hops, depending on what's available. I use them in bags although my intuition is that I would get more efficient hop utilization if they could be suspended in the boiling wort. I tried that once with one of those "e-z-masher"-style screens over my kettle's outlet and it was a disaster. The screen clogged and the wort barely dripped out. I finally had to lift the whole kettle and pour the wort out — trub and all. So what's the answer? A false bottom in the kettle? That still wouldn't do any good with pellets. Could I use bigger bags? Any thoughts you could offer would be appreciated.

Bill Winter
Colesville, Maryland



I will do my best to give some helpful information related to your hopping blues. I am not exactly sure what you mean by "not getting the bang for your buck" from your hops. Many of the IPAs and double IPAs brewed by craft brewers are, in my opinion, out-of-balance hop bombs with assertive bitterness and astringency from the hops and tremendous hop aroma. For the sake of answering your question I will assume that you want to brew a hop monster!

One of the most important considerations about hopping is the hop. When it comes to brewing styles that are high in bitterness units I think it helps to use high alpha hop varieties for the first hop addition. You can use low alpha varieties, but then you have to use more hops — and the separation of wort from hops can become challenging (I will get to that later). I personally subscribe to the low-cohumulone school of hopping and I avoid high cohumulone varieties. My favorite all-around high alpha variety is Nugget, but I will leave varietal discussions to other pundits.

> "Aggressively rubbing small samples of hops between the palms of your hands warms the hops and releases their aromas for sniffing."

Hop age has a profound effect on beer bitterness since hops lose alpha-acids with age and with this chemical change comes a decline in the bitterness contributed by hops. To complicate aging, not all varieties deteriorate at that same rate and packaging method and storage temperature have a huge impact on stability. Like most small breweries we buy our hops directly from a hop supplier. The supplier works with the hop farmers and processes the hops immediately after harvest into compressed whole hop cones, pellets or extracts and then stores the hop bales and vacuum bagged pallets in cold warehouses before shipment to the brewery. We then store the hops cold until use. I prefer using hops that are less than one year old and use older hops only if forced to do so by availability of certain varieties.

One of the challenges of homebrewing is that some of the information available to the commercial brewer is lost when ingredients get sold through distribution channels. When hops are bought directly from a hop supplier the box has the crop year, alpha acid content (always taken at the time of harvest) and the lot number. Most packs of hops I have seen in homebrew stores do not give the harvest date. This is not the end of the world and sensory evaluation is a tried and true method used to judge the freshness of hops.

Although visual inspection gives some information if you know what you are looking for, the best and easiest thing is to give the hops a good rub. This method of aggressively rubbing small samples of hops between the palms of your hands warms the hops and releases their aromas for sniffing. Aromas associated with aged hops are usually described as cheesy or wet sock and are due to the release of short-chain fatty acids when hops deteriorate. The other thing you can observe when rubbing are the lupulin glands in cone hops — in both pellet and cone hops you can get a feel for the type of aromas associated with the oils. I like the piney, citrus and resin-like aromas to come through in a big and assertive beer.

This is a very small introduction to a really broad topic and my point is that hop selection is quite important since nothing we do in using hops can transform bad to good. Good hops in hand, it is now time to touch on brewing tips. My advice is to add hops directly to the kettle and not to use a bag if at all possible. If you use pellets, the best way to separate hops from wort is to use the whirlpool method. If you have a flat bottom brew kettle, all you have to do after the boil is to give the wort a good solid stir to get it moving and then let it rest until movement completely stops. This simple technique corrals all of the little bits of hop and trub into the center of the brew kettle and makes racking or decanting the wort from a valve installed in the lower side of the kettle very easy. Hop pellets will clog fine screens and the experience you describe can easily be solved by whirlpooling.

If you use whole hop cones (either from compressed bales or in the plug form) you really need to make sure the hops are loosened up before adding them to the boil. I am not suggesting tossing them into a blender, but sorting through the hops and gently breaking up compressed bits will help. I have seen bags used for dry hopping with dry spots after weeks in the fermenter and have heard the same from other brewers. At home it's easy enough to avoid this problem . . . if the hops ain't wet you haven't gotten all of 'em.

In our brewery we have a whirlpool and have no way of using whole hops without a hop bag, which means we

rarely use whole hops in the kettle. At home you can easily use whole hops either by putting a screen in the bottom of your kettle or building a simple hop strainer large enough to hold all of the swollen hop cones used in the boil.

I prefer using a screen in the bottom of the kettle because it is simple and effective. This requires installing a valve in your kettle, which makes things easy and safe for all types of brews and, in my opinion, is more of a requirement and less of a luxury if you brew frequently. Whole hops should not clog the screen, but can plug an outlet valve if the screen does not fit into the bottom of the kettle properly. Most commercial brewers using whole hops use a whirlpool following hop removal to separate trub.

So far I have given some preliminary background information to help prepare for the battle. Now that we have selected the hop variety of choice, have given the hops the thumbs up after a cursory evaluation and have tweaked our brewing setup so that hops can be used and removed without confining them to a bag (which can reduce yield if the bag is too small) it's time to formulate our hop monster.

Hopping techniques are a matter of art and empirical evidence will help shape your brewing method. My "standard" way of approaching hopping is to get about 80% of the bitterness from the first hop addition added, and these hops are boiled for 60 minutes. The second addition comes midway through the boil and amounts to about 15% of the total bitterness. Finally, the late hops are added right at the end of the boil and account for just 5% of the bitterness, but most of the hop aroma. This is where homebrewing and commercial brewing differ considerably.

Wort transfer from the kettle to the whirlpool typically takes 20 minutes in a commercial operation, the whirlpool rest takes about 20 minutes and transfer through the cooler and into the fermenter requires another 30–45 minutes. This means that total exposure time between those late hops and hot wort is at least 20 minutes for breweries using hop cones and a hop separator (after the kettle) and well over one hour for pellet users. During this time some isomerization occurs, albeit very little, and (more importantly) the hop oils have plenty of time to be extracted in the wort. Some of the oils are lost during this time, but the surface to volume ratio is in the favor of brewers with bigger pots — as kettle size increases this ratio decreases and the retention of volatile oils increases.

In my quest for big aroma my go-to method is dry hopping. I have tried all sorts of strategies in the brewhouse to get the big fragrant punch desired in certain styles and have personally determined, like so many before me, that dry hopping delivers the one-two punch and definitely delivers the hop bang! I have used both pellet and whole cones and prefer the aroma of the whole cones as well as the ease of use. We wait until fermentation is complete and rack the beer into a clean fermenter containing the bag of hops. It is important to add a stainless steel weight to the bag or some how tie the bag to the bottom of the fermenter (if you have a racking port you can tie off to it) as a floating bag does not deliver the whole enchilada. Two weeks of dry hopping is long enough to get the good stuff out yet not too long to give you that grassy, freshly baled hay aroma found in some dry-hopped beers.

I have detected an ever-so-slight oxidized aroma in dry hopped beers and recently borrowed a technique used by some winemakers to purge tanks of air. Since whole hop cones are like little sponges they contain air (that's why they float) and I figure that this could be a bad thing when added to beer. We toss dry ice into the bottom of the fermenter before adding the hop bag and allow the dry ice to completely sublime before racking the beer onto the hops. This method slowly pushes the air out of the fermenter and probably displaces much of the air from the hop cones. One mole of carbon dioxide (44 grams or about 1.5 ounces) expands into about 22 quarts (~ 22 L) at atmospheric pressure and a little goes a long way. This has become a standard method at our brewery when we dry hop. If you do this do not seal off the fermenter, as it will build pressure! Fit with an airlock and wait until bubbling ceases before racking your brew.

Full tank of unwelded please

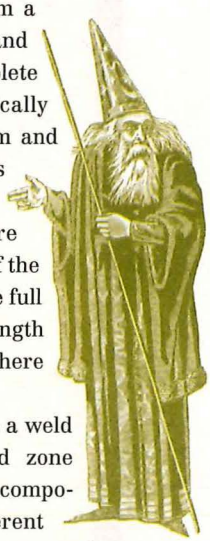
I am an extract plus grain brewer and kit winemaker who is thinking of stepping up to a stainless steel conical fermenter. I notice that most are listed as seamless with no welds, but some brag about being welded. What is the difference and which is "better?" Is there any place to find honest reviews on brewing equipment to help me decide?

Brent Starr
Knoxville, Tennessee

I have answered some stainless steel questions in the past and at the time Mr. Wizard was still cloaked by the wispy clouds of anonymity. Now that I have been unveiled I can write with a bit more authority on this topic. I am employed by one of the largest stainless steel equipment fabricators in the United States, Paul Mueller Company.

Mueller chose to build a brewery in 1997 to showcase its products and that's how I ended up working for a stainless company. Weld quality is a very big deal as stainless steel corrosion and the ability to be cleaned are both affected by weld quality. I want to give a little background on welding because both welded and seamless kettles can be excellent pieces of gear.

As a general rule, welds are only used when required. When big vessels are made, weld seams are required because stainless steel coils come in a standard width of 48 inches (122 cm). To build big tanks, weld seams are required to join the material. The standard method used to build tanks is to form a "tube" and attach bottom and top heads to the tube to complete the tank. Fermenters typically have a cylindroconical bottom and dished top head. The heads and tube all have weld seams and the welds are ground flush on the interior of the vessel. A good weld must have full penetration to provide strength and to eliminate crevices where micro-organisms grow.



Excessive heat applied to a weld leaves a large heat-affected zone around a weld and the alloy composition around this area is different than stainless steel that is not exposed to the heat of welding. Corrosion is more likely to occur in the heat-affected zone,

especially when the welds are made using too much heat, and various testing methods, such as radiography, are used to evaluate welds. Tube or pipe welds can be really problematic if the tube or pipe is not properly purged before welding. Improper purging causes "sugaring" inside of the tube and this black, granular oxide is a veritable breeding ground for bacteria.

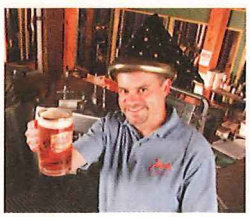
Most long pipe runs are "fit up" with very small tack welds and the joints taped with a stainless steel tape. The line is then purged with an inert gas, usually argon or a blend of argon and nitrogen, before the welds are made.

A good pipe weld, like that used to attach a valve or ferrule into a line, is fully penetrated, has only one start and stop, is smooth (often having the appearance of a stack of dimes slid off into an even and overlapping row) and has very little discoloration. Pipe and tube welds often cannot be ground on the interior and boroscopes are used to visually inspect the weld for penetration, starts and stops and color.

If welding can be avoided it is because of all the associated concerns. One way to build a "pot" without welding is through metal forming. Stainless steel has very good mechanical properties and can be stretched and formed without tearing the material. Although stainless does not look elastic it is really like a sheet of dough and can be formed into a variety of smooth shapes with the proper forming tools.

Spinning dyes can be used to stretch and form the steel into the shape of a bowl or pot, for example, and most stainless steel cookware is made using such methods. "Knuckles" can be added to a dish shaped head using special dyes to add strength to the head. These methods do not require welding and the potential problems associated with welds are avoided.

Here is the take home message: Excellent equipment can be purchased with or without weld seams. The key is to know how to properly inspect equipment before purchasing. All beer contact surfaces should be smooth. Polished surfaces should not be scratched or pitted. Welds should be uniform and free of crevices and discoloration. Once you pick out your gear, you then want to maintain it in this condition. Do not use abrasive scrubbing pads to clean stainless steel and be very careful of the metal tips many scrub brushes have as these things can quickly scar a perfectly smooth stainless surface.



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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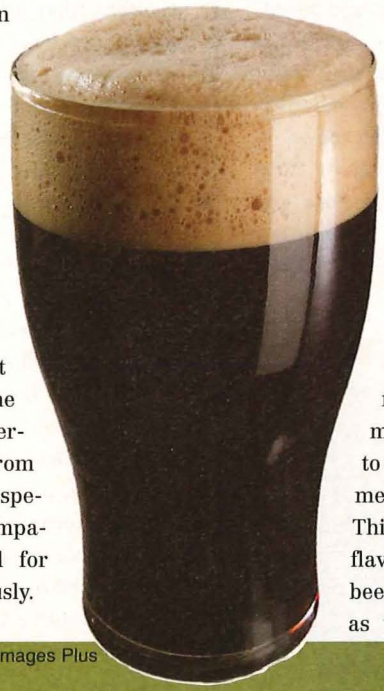
Robust Porter

An opulent Victorian brew

by Horst Dornbusch

Those who are familiar with the history of porter know that the brew started sometime in the early 1700s as a workman's drink in London. It was first served in the pubs of the public markets, where green grocers and fishmongers used to hawk their wares. As a beer style, porter conjures up images of jovial, brawny roughnecks, assembled in dark ale houses after a day of heavy toil, downing a few pints . . . and then some.

By some accounts, this brew was originally mixed on the premises from perhaps three casks, or "threads," of ale. There is no agreement as to which ales made up this common pub blend, but pale ale, stock or old ale and stale or sour ale are usually listed among the likely contenders. It must have been a cumbersome process for the pub's g'vernor to fill each pint from three separate taps, especially when droves of impatient patrons clamored for their drinks simultaneously.



Photos by Charles A. Parker/Images Plus

The birth of porter a tall tale?

As the three-thread draft gained in popularity, the brewers themselves decided to do their own mixing in the mash tun rather than leaving the blending to the publican behind the bar. Legend has it that the first person to brew a "pre-fab" three-thread was Ralph Harwood, owner of the Bell Brewhouse in Shoreditch, East London, in 1722. Allegedly, Mr. Harwood's brew was first served in the Blue Last, an ale house on Shoreditch's Great Eastern Street. There, it was referred to as an "entire" or "entire butt," because it bundled the flavors of several threads into a single "entire" ale, which also made for a quicker pour. Because hard-working porters were among the Blue Last's best customers, so the tale goes, the new beer was named after them. The name "porter" for the "entire" apparently came into general use only a few decades after Mr. Harwood's alleged invention, in the mid-1700s. Regardless of how the three threads in one cask really started or how it got its name, the new brew was made mostly from dark brown to amber malts and fermented in a single gyle. This made for an opaque, flavorful and hefty ale— a beer style we now refer to as the brown or standard porter. In Ireland this beer became known as a plain porter, a brew that continued to be made there by Guinness until 1974.

Robust Porter by the numbers

OG	1.045–1.060 (11–14.7 °P)
FG	1.010–1.015 (2.5–3.8 °P)
SRM	30–60
IBU	25–45
ABV	4.5–6.5%

The brew of the industrial age

The emergence of porter coincided with the spread of industrialization on the British Isles, and, as brewing raw materials and brewing techniques evolved especially during the 19th Century, so did the porter. Great advances in brewing and malting technology gave brewers many more malt choices than were available when the London porter got its start, and

RECIPE

Tod's Boisterous Porter

(5 gallons/19 L, all-grain)

OG = 1.058 FG = 1.014

IBU = 32 SRM = 51 ABV = 5.8%

Ingredients

9.5 lbs. (4.3 kg) Muntons pale ale malt (5.5 °L)

0.2 lb. (0.9 kg) Muntons chocolate malt (380 °L)

0.8 lb. (0.36 kg) Dingemans Special B malt (100 °L)

0.9 lb. (0.4 kg) Muntons light crystal malt (56 °L)

0.8 lb. (0.36 kg) Hugh Baird Carastan malt (15 °L)

7.11 AAU Magnum hops (bittering) (0.55 oz./16 g of 13% alpha acid)

0.5 oz. (14 g) Santiam hops (flavor)

0.5 oz. (14 g) Glacier hops (flavor)

White Labs WLP051 (California Ale V), Wyeast 1098 (Whitbread British) or White Labs WLP002 (English Ale) yeast

1 cup light dried malt extract (for priming)

Step by Step

Assuming a milled dry grain temperature of 68 °F (20 °C) and a desired liquor-to-grist ratio of 3:1 by weight, heat about 4.25 gallons (16 L) of water to a temperature of roughly 166 °F (74 °C). Infuse the mash with this liquor until you reach the mash target temperature of 155 °F (68 °C). Hold that temperature for about 45 minutes for proper grain hydration and enzymatic conversion. Meanwhile, heat plenty of sparge water to a temperature of 175 °F (79 °C), which should be sufficient to raise the grain bed temperature during the sparge to the mash-out temperature of 167 °F (75 °C). Recirculate the initial runnings until the wort

recipe continued on page 20

recipe continued from page 19

runs clear. Sparge very slowly for about 45 minutes until the kettle gravity is about 1.050 (12.4 °P).

Boil the wort for 75 minutes. Add the bittering hops 15 minutes into the boil and the flavor hops 55 minutes into the boil. After shut-down, take a gravity reading. If necessary, liquor the wort down to the target OG of 1.058 (14.26 °P). Then add the aroma hops and whirlpool for about half an hour. Heat-exchange the wort to about 70 °F (21 °C), pitch the yeast, and aerate thoroughly. Primary fermentation should last about a week. Allow the lees to settle for two days after primary fermentation and rack the brew into a clean container. Let the brew mature without pressure for another two or three weeks. Rack again and add the priming agent. Now bottle or keep in a closed Cornelius keg for conditioning. Omit the priming agent, if you use bottled CO_2 and a keg. After a week, the porter should be ready for serving.

Tod's Boisterous Porter

(5 gallons/19 L, extract plus grains)
OG = 1.058 FG = 1.014
IBU = 32 SRM = 51 ABV = 5.8%

Ingredients

7.0 lbs. (3.2 kg) pale ale liquid malt extract (such as Coopers, John Bull, or Muntons)
0.2 lb. (0.9 kg) Muntons chocolate malt (380 °L)
0.8 lb. (0.36 kg) Dingemans Special B malt (100 °L)
0.9 lb. (0.4 kg) Muntons light crystal malt (56 °L)
0.8 lb. (0.36 kg) Hugh Baird Carastan malt (15 °L)
7.11 AAU Magnum hops (bittering) (0.55 oz./16 g of 13% alpha acid)
0.5 oz. (14 g) Santiam hops (flavor)
0.5 oz. (14 g) Glacier hops (flavor)
White Labs WLP051 (California Ale V), Wyeast 1098 (Whitbread British) or White Labs WLP002 (English Ale) yeast
1 cup light dried malt extract (for priming)

Step by Step

Mill or coarsely crack the specialty malts. Mix them well and apportion them into two muslin bags. Steep the bags in about 1 gallon (~4 liters) of water at roughly 170 °F (77 °C). Hydrate the grain for about an hour, while periodically giving the steeping pot a boost of heat to maintain the proper temperature. Lift each bag separately out of the steeping liquid and rinse it with 2 cups of cold water. Allow the bags to drip dry. Do not squeeze them. Add about 3 gallons (11.4 L) of brewing liquor to the steeping liquor and bring to a boil. Turn off the heat and stir in the malt extract. Bring the wort to a boil and add the bittering hops. Boil for 1 hour. Add the flavor hops 20 minutes before shut down. At shut-down, take a gravity measurement and liquor the wort down to the required original gravity of 1.058 (12.37 °P). Add the aroma hops and whirlpool for 30 minutes. Then follow the equivalent instructions for the all-

many of the original brown malts were being replaced by mash mixes of pale malt and heavier-colored malts, including the new black patent malts. In general, such mashes gave brewers better control over beer colors and flavors. Because of the higher enzymatic strength of pale compared to brown base malts, these mixed-grist mashes also improved extract efficiency in the brew house (and thus the profits per capital invested). The use of darker or even black malts in the mashes of some porters gave these beers a slightly more roasted, acrid flavor than was common in the standard brown porters of earlier days. Some porters became chocolate-like, some toffee-sweet, some dry, some lighter, some heavier . . . and some porters became downright "stout." It is thought that the most full-bodied of porters were the genesis of stout as a separate beer style.

One characteristic of all newer porters made with slightly to heavily roasted malts was their need for more hops, both for bittering and for flavor and aroma, so that they would taste balanced. While the old entire butt porters and their variations may have been hopped to an IBU-range in the mid-20s (nobody knows for sure), the later derivations of porter tended to be bittered at least in the 30s. Also, late aroma hopping or even dry hopping became more customary for the darker, heavier porters than might have been the practice for the lighter-colored brown-malt versions of yore.

Porter brewing reached its peak production volume in London in the 1820s, by which time it had become arguably the first mass-produced commercial beer. There was no brewery of note that didn't depend on porter sales for its prosperity. Ironically, brown or standard porter reached its zenith at just about the same time when a newly-patented indirect-heat kilning technology made the reliable production of very pale, as well as very dark, malts possible, thus hastening the phase-out of the traditional, floor-malted brown malts. As brown-malt mashes fell out of favor in the brew houses of London, so did brown-malt based porters in the city's pubs. Eventually, near the end of Queen Victoria's long reign, the once-dominant standard porter "represented only one quarter of London's beer consumption,"

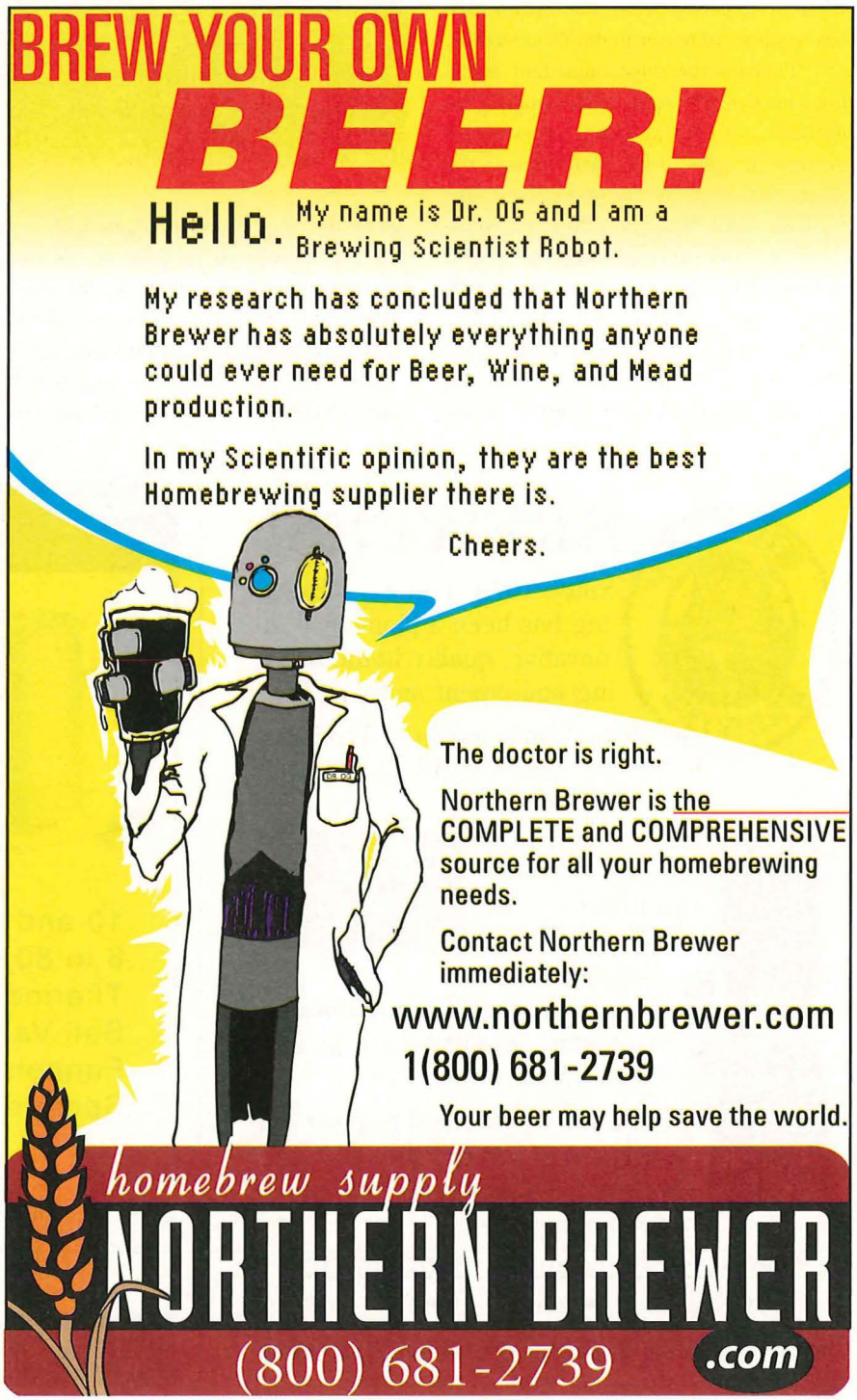
according to porter expert Terry Foster (see his book *Porter*, Brewers Publication 1992). It was during this technology-induced beer transformation of the standard porter that the robust porter — not unlike the stout in earlier times — split off from the fading original porter.

Diversification of the porter style into various sub-styles in the 19th century, however, could not save the brew. In the early 20th century, as beer drinkers switched more and more to pale ales, porters — robust or not — disappeared almost entirely from the beer menu. Only near the end of the 20th century did the erstwhile gruff porter make a comeback, especially in North America, where it is now a respectable, almost gentrified, craft brew style. On its home turf in England, too, porter has experienced a small renaissance. Today, perhaps the best-known and most easily available imported porters are Samuel Smith's Taddy Porter from Tadcaster in Yorkshire and Fuller's London Porter from London. Though not labeled a robust, the Taddy is fairly dark and comes with pronounced roasted notes, like a robust. Only the dry finish is a reminder of this brew's "standard" lineage. The Fuller's, too, is fairly robust. It is rich and coffee-accented with less of a dry finish than the designation "London" would suggest. But, of course, we cannot really know for sure what a robust porter from the Victorian days tasted like. Among the imports, perhaps the 5.1% abv St. Peter's Old-Style Porter from the St. Peter's Brewery in Bungay, Suffolk, comes closest to the original robust porter. The St. Peter's is very black and complex, and explodes with strong, long-lingering notes of chocolate. Unfortunately, this brand is only sparsely distributed in the New World, and when you do find a bottle amidst an "art gallery" of pretty labels on a warm shelf, there is a chance that it is past its prime.

From standard to robust — brew-technically speaking

To learn more about the differences between a robust porter and its allegedly tamer antecedents, I interviewed Tod Mott from the Portsmouth Brewery, a brewpub in Portsmouth, New Hampshire. Tod knows a thing or two about robust porter, because he has been perfecting a recipe for this style for well over a decade. In 1997, his interpretation of robust porter even won him a silver medal at the Real Ale Festival in Chicago. Our recipe on pages 19 and 20 is a scaled-down adaptation of Tod's commercial brew.

"All sub-styles of porter, such as robust, Baltic or imperial," explains Tod, "are later evolutions of the brown or standard porter of the 18th century. These sub-styles differ dramatically in color, texture and flavor from the original porter, however, they do not differ all that much from each other. To me, a robust porter, a Baltic porter, an imperial porter and even some of the stouts are so similar that, in a blind taste test, I am sure, even an expert might have difficulty keeping them apart. While the original porter of two centuries ago was obviously a workers' session beer, to me, a robust



porter has become primarily a sipping beer. As a full-bodied brew, it is intended for the connoisseur among beer drinkers, not for guzzlers. Compared to many modern easy-drinking porters and to most commercial stouts, a robust porter is much richer. Though it resembles most modern stouts and porters in color, the robust porter is definitely higher in alcohol."

Mott derives his brewing rules for the robust porter principally from the historical evolution that this brew experienced when it departed from the brown-malt based standard porter in the Victorian era.

"Perhaps the most important brewing consideration for a robust porter," he explains, "is the avoidance of excessive dryness. In spite of the dark malts in the mash, this beer should never finish like an Irish stout. A single infusion is sufficient, but the saccharification rest temperature should be closer to 155 °F (68 °C) than, say, to the 148–152 °F (64–67 °C) range, at which most British ales are mashed. For additional smoothness, maltiness and depth, as well as for the proper mouthfeel and body, you can add measured portions of caramel, chocolate and crystal malts to the mash. The relative proportions of these specialty grains, however, are essentially left up to the individual brewer — and it is in the selection and quantity of specialty malts that you will find the greatest variation in today's craft-brewed and imported porters."

"The finished beer should have an alcohol level of about 5.8% by volume, which is in line with the drinking habits of 19th Century Londoners."

There also seems to be no definite rule about the upper color limit of a robust porter, except that it is darker than the original brown-malt based porter from London. Anything above 30 SRM appears to be acceptable. Because of the generous portions of darkish specialty malts in Tod's grain bill, the Portsmouth Brewery interpretation of the robust porter ends up on the darker side of the porter spectrum, with an SRM-value of about 51.

In a brew system with a nominal extract efficiency of about 65%, a robust porter with an OG of 1.058 (14.26 °P) requires about 12 lbs. (5.4 kg) of grain. The brew should finish at a FG of roughly 1.014 (3.6 °P). The finished beer should have an alcohol level of about 5.8% by volume, which is in line with the drinking habits of 19th Century Londoners. For extract-plus-grain brewers, the equivalent amount of liquid malt

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extract (LME) is about 8 lbs. (3.62 kg), based on an 80% sugar content in the extract, and assuming no contribution to gravity from the steeped specialty grains.

Tod recommends a boil length of 75 minutes. For bittering, he uses a high-alpha Magnum (~13% AA) instead of traditional, lower-alpha English hop varieties. For flavor, he uses U.S.-grown Santiam, which he adds about 20 minutes before shut-down. Because Santiam is a Tettnanger-like hop that adds a slight note of citrus to the brew, it can be replaced with Tettnanger or Fuggles. For aroma, he uses U.S.-grown Glacier in the whirlpool. If this hop is difficult to find, you can replace it with Fuggles, Styrian Goldings or Willamette.

As far as yeast, Tod uses his White Labs WLP051 California Ale V house yeast, but you can also use the more traditional Wyeast 1098 Whitbread British or the White Labs WLP002 English Ale yeasts.

Horst Dornbusch writes "Style Profile" in each issue of BYO.

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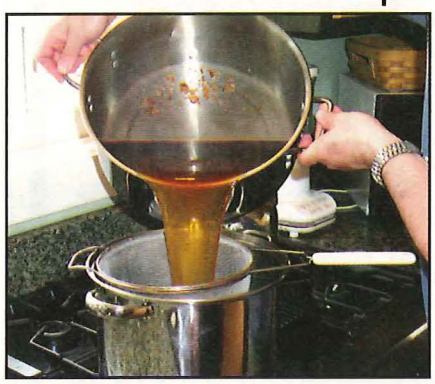
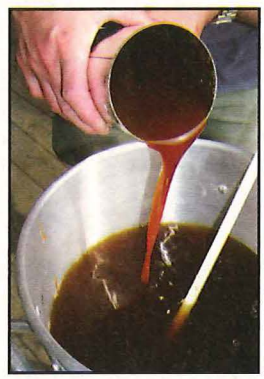




There are many ways to make beer from malt extract. Some are quick and convenient. Others are more involved, but allow extract brewers to tackle a wider variety of beer styles.

In this article, we present a collection of homebrew recipes that show each method at its best so you can choose the method of brewing that best fits your tastes and available time. If you are an extract brewer, you'd be mad not to consider all your method options.

Ask ten different homebrewers how to make an extract beer and you will get ten different answers. When brewing an extract beer, it pays to think about which procedures will give you the best shot at success. In this article, I'll give a quick description of some of the most popular extract methods, followed by six recipes designed to show off the strong points of the various methods. (Another five bonus recipes can be found at byo.com.)

NO-BOIL BREWING

Many canned extract kits give a no-boil procedure. You simply heat a couple gallons of water, stir in some hopped malt extract and let it steep for awhile to sanitize the wort. The steeping time is often as short as 15 minutes. Then you cool the wort, add water to make 5 gallons (19 L) and proceed as normal.

The main benefit of the no-boil procedure is that it is quick. Another is, because the malt extract is not heated much, you can make very light-colored beers. Many of the key characteristics of the beer, including the specialty malt character and level of bitterness, have been determined by the kit maker so there isn't a need to worry about these variables. And, because you don't boil the wort, you can cool it quicker than if you had boiled it.

Although homebrewers can use more involved brewing methods, a no-boil extract beer made from hopped wheat extract can make a fine base for a fruit beer. Likewise, a no-boil beer made from unhopped wheat extract or light extract can serve as the base for a sour beer. (See our no-boil recipe at byo.com.). Of course, some homebrewers enjoy their no-boil kit beers (and extra free time to drink homebrew) without any further additions.

CONCENTRATED BOIL METHOD

For many years, the most popular method of extract beer production was the concentrated boil method. In these beers, the brewer steeped the specialty malts he (or she) wanted then boiled his own hops in the malt extract, dissolved in a couple gallons of water. Any sugar in the recipe was usually replaced with malt extract. After the boil, the concentrated wort was diluted with water to working strength.

However, with these two steps forward came one step back; boiling a concentrated, all-malt wort led to excessive darkening of that wort. Still, the concentrated boil method can be used to make good beer, provided the beer meets a few criteria. First, you can only brew beers that are amber or darker. Second, because it gets harder to extract hop bitterness the "thicker" your wort is, you can only brew beers with a low level of hop bitterness. Finally, since the extent of wort darkening and the degree of depression of hop utilization increase with the beer's gravity, it's best to stick with low-gravity beers.

In the recipe section, two recipes are given that take advantage of the benefits of the method, but aren't held back by its limitations. A third recipe can be found on our website.

EXTRACT LATE METHOD

The extract late method can be seen as a way to split the differences between the previous two methods. As with the

by Chris Colby

concentrated boil method, the brewer can steep his own specialty grains and boil his own hops in some dissolved malt extract. However, in the extract late method, half or more of the malt extract is withheld until at or near the end of the boil. Either the late extract is boiled for the final 15 minutes of the boil or steeped in hot wort for 15 minutes after the boil. Because less heat is applied to the malt extract over the course of the brewing session, the wort produced is lighter in color than that made by the concentrated method. Also, because the gravity of boiled wort is lower, hop utilization is improved. In short, you can brew lighter-colored beers that exhibit more hop bitterness (or the same amount of bitterness from fewer hops) compared to beer made with the concentrated boil method. (See the October 2004 issue of *BYO* for experimental proof.)

In the recipe collection, recipes for three light-colored or hoppy beers are given that showcase the best the extract late method has to offer. Another two recipes are online.

TEXAS TWO-STEP

Although the extract late method allows for hoppier beers than the concentrated boil method, you still end up diluting your wort (and the bitterness it contains) before fermentation. If you want to brew truly bitter, hoppy extract beers, you need to perform a full-wort boil. However, for most stovetop brewers, both the size of their brewpot and the output of their stove preclude vigorously boiling all their wort at once.

The Texas Two-Step method is a workaround that allows stovetop brewers to boil their entire wort, albeit in shifts. The basic idea is to boil two 2.5-gallon (9.5 L) worts and combine them. Although this method allows for the lightest-colored, hoppiest stovetop beer, it does have one drawback: you need two consecutive brew days for every brew — one to boil the first half of the wort and the other to boil the second half.

The recipe collection features two recipes for decidedly hoppy beers — one on page 28 and one at byo.com. These recipes require more effort, but are well worth it for the confirmed hophead.

WHICH METHOD IS BEST?

The method you choose for your extract beers should depend on the beer you are brewing and the amount of time you are willing to spend on the project. The best way to become familiar with the strengths and weaknesses of the different methods is to try them yourself. The recipe collection here will allow you to see and try the best that each method has to offer.

CONCENTRATED BOIL RECIPES

The Brothers Reid Scottish ale

(5 gallons/19 L, extract with grains)

OG = 1.040 FG = 1.010

IBU = 18 SRM = 11+ ABV = 3.9%

A malty beer to walk 500 miles for . . . and 500 more, if necessary.

Ingredients

3 lb. 6 oz. (1.5 kg) Briess Light dried malt extract
1 lb. 10 oz. (0.74 kg) pale ale malt
0.25 lb. (0.11 kg) crystal malt (30 °L)
2.0 oz. (56 g) roasted barley (300 °L)
5.5 AAU Kent Goldings hops (60 mins) (1.1 oz./31 g of 5% alpha acids)
1 tsp. Irish moss
Wyeast 1728 (Scottish Ale) or White Labs WLP028 (Edinburgh Ale) yeast (0.75 qt./~0.75 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step

Place crushed grains in a nylon steeping bag. In a large kitchen pot, heat 3.0 qts. (2.8 L) of water to 173 °F (79 °C). Submerge grain bag in water and let steep at 162 °F (72 °C) for 15 minutes. (The temperature will drop a bit during the steep, but this won't hurt.) While grains are steeping, heat 1.5 qts. (~1.5 L) of water to 170 °F (77 °C) in a sauce pan. Also, begin heating 2 gallons (7.6 L) of water to a boil in your brewpot. When steeping is done, place a colander over your brewpot and lift the grain bag into it. Pour the "grain tea" through the bag (which will strain out most of the grain bits), then rinse the bag with the 1.5 qts. (~1.5 L) of 170 °F (77 °C) water.

Heat the (roughly) 3 gallons (11 L) of wort in your brewpot to a boil, then stir in dried malt extract. (It will foam a bit, so don't pour all the extract in at once.) Bring the wort back to a boil, add the hops and boil for 60 minutes. Add Irish moss with 15 minutes left in boil. After the boil, put a lid on your brewpot and cool the wort (either in a cold-water bath in your sink or with a wort chiller). Cool until the side of the brewpot no longer feels warm. Transfer wort to your fermenter and top up to 5 gallons (19 L) with cool water. Aerate the wort and pitch your yeast. Ferment at 65 °F (18 °F). When beer falls clear, bottle with corn sugar (or keg). (In other words, skip "secondary fermentation.")

Clifford Brown Ale

(5 gallons/19 L, extract with grains)

OG = 1.048 FG = 1.014

IBU = 23 SRM = 29+ ABV = 4.4%

Like the best jazz from the hard bop era, this beer is complex but not boggling.

Ingredients

4 lb. 6 oz. (2.0 kg) Muntons Light dried malt extract
12 oz. (0.34 kg) dark Munich malt (20 °L)
3 oz. (85 g) biscuit malt
8 oz. (0.23 kg) crystal malt (60 °L)
3 oz. (85 g) crystal malt (120-150 °L)
5 oz. (142 g) chocolate malt
6 AAU Northern Brewer bittering hops (60 mins) (0.66 oz./19 g of 9% alpha acids)
1.5 AAU First Gold hops (15 mins) (0.3 oz./8.5 g of 5% alpha acids)
1.0 AAU Fuggles hops (15 mins) (0.2 oz./5.6 g of 5% alpha acids)
0.75 oz (21 g) First Gold hops (0 mins)
1 tsp. Irish moss
Wyeast 1272 (American ale II), White Labs WLP051 (California V) or US56 dried yeast (1.5 qt./~1.5 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

Place crushed grains in a nylon steeping bag. In a large kitchen pot, heat 3.0 qts. (2.8 L) of water to 166 °F (74 °C). Submerge grain bag in water and let steep at 155 °F (68 °C) for 30 minutes. (The temperature will drop a bit during the steep, but this won't hurt.) While grains are steeping, heat 1.5 qts. (~1.5 L) of water to 170 °F (77 °C) in a sauce pan. Also, begin heating 2 gallons (7.6 L) of water to a boil in your brewpot. When steeping is done, place a colander over your brewpot and lift the grain bag into it. Pour the "grain tea" through the bag (which will strain out most of the grain

bits), then rinse the bag with the 1.5 qts. (~1.5 L) of 170 °F (77 °C) water. Heat the (roughly) 3 gallons (11 L) of wort in your brewpot to a boil, then stir in dried malt extract. (It will foam a bit, so don't pour all the dried extract in at once.) Bring the wort back to a boil, add the first charge hops and boil for 60 minutes. Add Irish moss and two flavor hops with 15 minutes left in boil. Add aroma hops at the end of the boil.

After the boil, put a lid on your brewpot and cool the wort (either in a cold-water bath in your sink or with a wort chiller). Cool until the side of the brewpot no longer feels warm. Transfer wort to your fermenter and top up to 5 gallons (19 L) with cool water. Aerate the wort and pitch your yeast. Ferment at 68 °F (20 °F). When fermentation slows to a halt, rack to secondary. Bottle with corn sugar (or keg) one week later.

EXTRACT LATE RECIPES

Bergman's Notorious Blonde Ale

(5 gallons/19 L, extract with grains)

OG = 1.052 FG = 1.012

IBU = 25 SRM = 7 ABV = 5.2%

A golden blonde ale with just a hint of raciness in the hops. Follow the instructions closely and this will come off without a hitch.

Ingredients

1 lb. 11 oz. (0.76 kg) Briess Light dried malt extract
3.3 lbs. (1.5 kg) Briess Light liquid malt extract (late addition)
0.75 lbs. (0.34 kg) corn sugar (15 mins)
1.0 lb. (0.45 kg) Pilsner malt
0.75 lb. (0.34 kg) Vienna malt
0.25 lb. (113 g) crystal malt (20 °L)
5.5 AAU Centennial hops (60 mins) (0.45 oz./13 g of 12% alpha acids)
2.5 AAU Willamette hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
0.66 oz. (19 g) Mt. Hood hops (0 mins)
1 tsp. Irish moss
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or US-56 dried yeast (1.5 qt./~1.5 L yeast starter)
1.0 cup corn sugar (for priming)

Step by Step

Place crushed grains in a nylon steeping bag. In a large kitchen pot, heat 3.0 qts. (2.8 L) of water to 163 °F (73 °C). Submerge grain bag in water and let steep at 152 °F (67 °C) for 45 minutes. (If temperature drops below 148 °F (64 °C), heat to 152 °F (67 °C) again.) While grains are steeping, heat 1.5 qts. (~1.5 L) of water to 170 °F (77 °C) in a sauce pan. Also, begin heating 2 gallons (7.6 L) of water to a boil in your brewpot. When steeping is done, place a colander over your brewpot and lift the grain bag into it. Pour the "grain tea" through the bag (which will strain out most of the grain bits), then rinse the bag with the 1.5 qts. (~1.5 L) of 170 °F (77 °C) water.

Heat the (roughly) 3 gallons (11 L) of wort in your brewpot to a boil, then stir in dried malt extract. (It will foam a bit, so don't pour all the extract in at once.) Bring the wort back to a boil, add the first charge of hops and boil for 60 minutes. Add liquid malt extract, Irish moss and flavor hops with 15 minutes left in boil. Add aroma hops at the end of the boil.

After the boil, put a lid on your brewpot and cool the wort (in your sink or with a wort chiller). Cool until the side of the brewpot no longer feels warm. Transfer wort to your fermenter and top up to 5 gallons (19 L) with cool water. Aerate the wort and pitch your yeast. Ferment at 68 °F (20 °F). When fermentation slows to halt, rack to secondary. Bottle with corn sugar (or keg) one week later.

Creature of the Wheel Kölsch

(5 gallons/19 L, extract with grains)

OG = 1.046 FG = 1.012

IBU = 23 SRM = 5 ABV = 4.5%

The wheat malt is a nod to the past, but this recipe uses every modern technological advantage to produce a clean, crisp, light-colored Kölsch. If the family has never enjoyed any of your homebrews before, this may bring them into the light.

Ingredients

1 lb. 2 oz. (0.51 kg) Coopers Light dried malt extract
4.0 lbs. (1.8 kg) Weyermann Bavarian Pilsner liquid malt extract (late addition)
1 lb. 2 oz. (0.51 kg) Pilsner malt
8.0 oz. (0.23 kg) wheat malt
6.0 oz. (170 g) Weyermann acidulated malt
1 tsp. Irish moss
3.3 AAU Tettnang hops (60 mins) (0.94 oz./27 g of 3.5% alpha acids)
3.0 AAU Hallertau hops (60 mins) (0.75 oz./21 g of 4% alpha acids)
Wyeast 2565 (Kölsch) or White Labs WLP029 (German Ale/Kölsch) yeast (1.5 qt./~1.5 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

Place crushed grains in a nylon steeping bag. In a large kitchen pot, heat 3.0 qts. (2.8 L) of water to 165 °F (74 °C). Submerge grain bag in water and let steep at 154 °F (68 °C) for 45 minutes. (If the temperature drops below 150 °F (66 °C), heat to 154 °F (68 °C) again.) While grains are steeping, heat 1.5 qts. (~1.5 L) of water to 170 °F (77 °C) in a sauce pan. Also, begin heating 2 gallons (7.6 L) of water to a boil in your brewpot. When steeping is done, place a colander over your brewpot and lift the grain bag into it. Pour the "grain tea" through the bag (which will strain out most of the grain bits), then rinse the bag with the 1.5 qts. (~1.5 L) of 170 °F (77 °C) water.

Heat the (roughly) 3 gallons (11 L) of wort in your brewpot to a boil, then stir in dried malt extract. (It will foam a bit, so don't pour all the extract in at once.) Bring the wort back to a boil, add the two hops and boil for 60 minutes. Add Irish moss with 15 minutes left in boil. Add liquid malt extract at the end of the boil, put a lid on the brewpot and let the wort steep for 15 minutes before cooling.

After the steep, cool the wort (either in a cold-water bath in your sink or with a wort chiller). Cool until the side of the brewpot feels cool to the touch. Transfer wort to your fermenter and top up to 5 gallons (19 L) with cool water. Aerate the wort and pitch your yeast. Ferment at 65 °F (18 °F). When fermentation slows to halt, rack to secondary. Bottle with corn sugar (or keg) one week later. If possible, store beer cold (around 40 °F/4.4 °C) for 2 weeks after it carbonates.

Big Belly Belgian Blonde

(5 gallons/19 L, extract with grains)

OG = 1.060 FG = 1.011

IBU = 26 SRM = 5 ABV = 6.3%

Austin Powers claimed that "Danger"

was his middle name. After seeing our procedures, you may think we should have named this beer after him. However, once you get your first taste of it, you'll be yelling one of Fat Bastard's most memorable lines — "Get in my belly!"

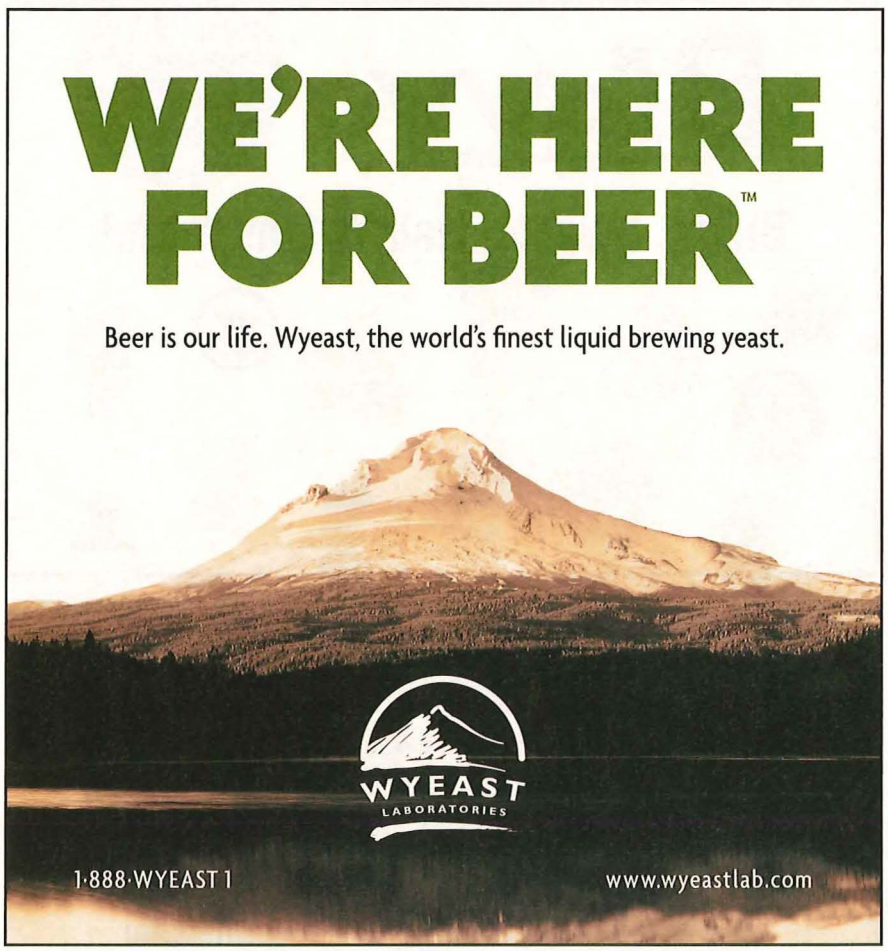
Ingredients

3.25 lbs. (1.5 kg) Coopers Light dried malt extract
14 oz. (0.40 kg) Coopers Light liquid malt extract (late addition)
2.0 lbs. (0.91 kg) corn sugar (late addition)
1 lb. 13 oz. (0.82 kg) Belgian Pilsner malt
3.0 oz. (85 g) Belgian aromatic malt
6 AAU Cluster hops (60 mins) (0.86 oz./24 g of 7% alpha acids)
1.3 AAU Styrian Golding hops (20 mins) (0.26 oz./7.3 g of 5% alpha acids)
1.3 AAU Styrian Golding hops (10 mins) (0.26 oz./7.3 g of 5% alpha acids)
0.25 oz. (7.1 g) Styrian Golding hops (2 mins)
Wyeast 1388 (Belgian Strong Ale) or White Labs WLP570 (Belgian Golden Ale) yeast (no starter)
1.25 cups corn sugar (for priming)

Step by Step

Place crushed grains in a nylon steeping bag. In a large kitchen pot, heat 3.0 qts. (2.8 L) of water to 163 °F (73 °C). Submerge grain bag in water and let steep at 152 °F (67 °C) for 45 minutes. (When temperature drops below 148 °F (64 °C), heat to 152 °F (67 °C) again.) While grains are steeping, heat 1.5 qts. (~1.5 L) of water to 170 °F (77 °C) in a sauce pan. Also, begin heating 2 gallons (7.6 L) of water to a boil in your brewpot. When steeping is done, place a colander over your brewpot and lift the grain bag into it. Pour the "grain tea" through the bag (which will strain out most of the grain bits), then rinse the bag with the 1.5 qts. (~1.5 L) of 170 °F (77 °C) water.

Heat the (roughly) 3 gallons (11 L) of wort in your brewpot to a boil, then stir in dried malt extract. (It will foam a bit, so don't pour all the extract in at once.) Bring the wort back to a boil, add the bittering hops and boil for 60 minutes. Add first charge of Styrian Goldings with 20 minutes left in boil. Add Irish moss, liquid malt extract and corn sugar with 15 minutes left in boil. Add remaining charges of



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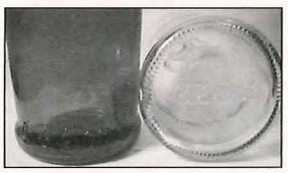

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hops with 10 minutes and 2 minutes left in the boil.

After the boil, cool the wort (either in a cold-water bath in your sink or with a wort chiller). Cool until the side of the brewpot feels cool to the touch. Transfer wort to your fermenter and top up to 5 gallons (19 L) with cool water. Aerate the wort and pitch your yeast — straight from the package (no starter) — at 65 °F (18 °F). (Expect a lag time of a day or more.) Put your fermenter somewhere where the ambient temperature is around 72 °F (22 °C) and let the fermentation temperature rise — up to 80 °F (27 °C) is fine — during fermentation. When fermentation stops, wait a day or two, then rack to secondary. Bottle with corn sugar (or keg) a few days later. If possible, store beer cold (around 40 °F/4.4 °C) after bottle conditioning for a week or so.

TEXAS TWO-STEP RECIPES

Bierce's Bitter (IPA)

(5 gallons/19 L, extract with grains)

OG = 1.072 FG = 1.018

IBU = 68 SRM = 13 ABV = 7.0%

India Pale Ale, n. A style of beer inaccessible to stovetop homebrewers — unless you use the Texas Two-Step method.

Ingredients

Step One

3.0 lbs (1.4 kg) Briess Light dried malt extract
0.75 lbs. (0.34 kg) Munich malt (10 °L)
0.75 lbs. (0.34 kg) crystal malt (40 °L)
0.50 lbs. (0.23 kg) crystal malt (60 °L)
7.2 AAU Magnum hops (60 mins)
(0.45 oz./13 g of 16% alpha acids)
5 AAU Centennial hops (15 mins)
(0.42 oz./12 g of 12% alpha acids)
0.5 oz. (14 g) Cascade hops (0 mins)
1 tsp. Irish moss (15 mins)
Wyeast 1272 (American II) or White Labs WLP051 (American V) yeast
(0.5 qt./~0.5 L yeast starter)

Step Two

4.0 lbs (1.8 kg) dried malt extract
8 AAU Simcoe hops (60 mins)
(0.62 oz./17 g of 13% alpha acids)
4 AAU Ahtanum hops (15 mins)
(0.66 oz./19 g of 6% alpha acids)

0.25 oz. (7.1 g) Amarillo hops (0 mins)
1 tsp Irish moss (15 mins)
0.5 oz. (14 g) Cascade hops (dry hops)
0.25 oz. (7.1 g) Amarillo hops (dry hops)
⅞ cup corn sugar (for priming)

Step by Step

Step One: Place crushed grains in a nylon steeping bag. In a large kitchen pot, heat 3.0 qts. (2.8 L) of water to 167 °F (75 °C). Submerge grain bag in water and steep at 156 °F (69 °C) for 45 minutes. (If temperature drops below 152 °F (67 °C), heat to 156 °F (69 °C) again.) While grains are steeping, heat 1.5 qts. (~1.5 L) of water to 170 °F (77 °C) in a sauce pan. Also, begin heating 2 gallons (7.6 L) of water to a boil in your brewpot. When steeping is done, place a colander over your brewpot and lift the grain bag into it. Pour the "grain tea" through the bag (which will strain out most of the grain bits), then rinse the bag with the 170 °F (77 °C) water.

Heat the (roughly) 3 gallons (11 L) of wort in your brewpot to a boil, then stir in dried malt extract. (It will foam a bit, so don't pour all the extract in at once.) Bring the wort back to a boil, adding hops and Irish moss at times indicated in ingredient list. Total boil time is 60 minutes.

After the boil, put a lid on your brewpot and cool the wort (either in a cold-water bath in your sink or with a wort chiller). Cool the wort to 68 °F (20 °C). Transfer the post-boil wort — which should be around 2.5 gallons (9.5 L) — to your fermenter, aerate the wort and pitch your yeast.

Step Two (16–24 hours after Step One): Bring 3 gallons (11 L) of water to a boil, add dried malt extract and return to a boil. Add hops and Irish moss at times indicated. Cool wort to 68 °F (20 °F) and rack cooled wort into fermenting beer from Step One. (If beer is not fermenting aerate combined wort.) Add water to make 5 gallons (19 L), if needed.

Ferment IPA at 68 °F (20 °F). When fermentation slows to halt, rack to secondary, add dry hops and let beer condition for 5 days. Bottle beer with corn sugar or keg.

BYO.COM bonus:
Five more recipes sorted by extract method.

HOW TO BREW

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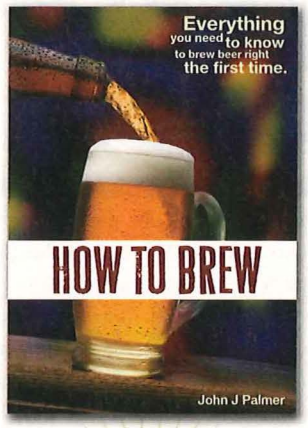

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when STOUT was STOUT

by **Terry Foster**

first appeared on the British brewing scene towards the end of the Eighteenth Century. It was created by brewers in order that they could charge more for a beer that was already in production. Stout was nothing more than the strongest porter produced by a brewer. If you like, it was "premium porter."

The term "stout" had been used in England to designate a strong beer for a hundred years or more before the Eighteenth Century. William Ellis, in "The London and Country Brewer," famous for publishing the first porter recipe, also mentions a "Stout Beer" in 1742. My calculations suggest this beer, made from all brown malt, might have had an original gravity as high as 1.136!

But two things happened in the eighteenth century — the "invention" of porter, and the Industrial Revolution. To condense a long story, these events resulted in a rapid increase in size of the London Porter breweries. They went from being small operations run by one man with a few employees, to major companies run by skilled managers and staff. By the end of the century, some were turning out up to 200,000 barrels of beer annually. To do this they had to be efficient and quite highly mechanized and several London brewers had installed steam engines in the 1780s and 1790s.

They had learned quite a bit about brewing in the process of this growth. Use of the thermometer in brewing had become fairly widespread, but for a long time they lacked a method for determining the strength of their beer. This changed in 1784 when John Richardson published a book on the use of the hydrometer in brewing.

The introduction of this simple instrument was a major advance in brewing technology. Brewers now knew just what the strength of their beers was, so they knew which was their "best" porter, and which was the second-rate, or common porter. Armed with this new knowledge, some searched around for a new way to describe the stronger beer, and called it things like "stout porter," "brown stout," "brown stout porter" and even "Imperial Brown Stout." Not too soon after came single, double and triple stout.

Secondly, up to that time porter brewers had relied solely on brown malt, which was cheaper than pale malt. With the hydrometer, they found out that brown malt gave a lower yield of fermentables than pale malt, and that it was actually more expensive in terms of cost per yield of extract. It was actually a double whammy, for malt was sold on a volume basis, and the weight of a quarter of brown malt was only around two-thirds that of a quarter of pale malt.

The obvious remedy to this problem was to use pale malt as the source of extract, and to rely on other malts to produce the popular porter flavor. At the time, however, there were fewer other malts available. So many brewers still stuck to only brown malt, while others used a proportion of pale with brown, or a mix of pale, brown and amber. Yet others were more unscrupulous, and resorted to adulteration to obtain the "true" porter flavor.

A partial solution to this difficulty, came in 1817 when Daniel Wheeler patented a roasting process to produce black malt (still sometimes known as patent malt today). Adding a small proportion of this to a pale malt mash would give the color and something of the flavor of brown malt porters. However, this did not mean the disappearance of brown malt, as most brewers continued to use at least a proportion of this in their stouts and porter right up to the end of the Nineteenth Century. In that sense, many stouts were still really the brewer's strongest porter, rather than a truly separate style.

Indeed, the key to stout developing as a style on its own, was the elimination of brown malt in the stout grist in favor of a

a PEEK into the FIRST HUNDRED YEARS of STOUT

Before stout was black, it was brown. Learn how to brew this historical beer style.

photos by charles a. parker/images plus

black malt and pale malt combination (with perhaps some amber malt as well). The black and pale only approach represented a significant taste difference in the product. That was because the use of brown malt gave a relatively high proportion of unfermentables, resulting in a lower attenuation by the yeast and a higher finishing gravity than in a normal wort made from only pale malt. This meant that porters and stouts had a full, sweetish flavor as compared to ales of a similar original gravity. In contrast, the black and pale combination would give a wort capable of higher attenuation, resulting in a beer with a drier flavor. In other words, it would be what we would call a dry stout today.

One of the earliest users of the black and pale combination for stout was, not surprisingly Guinness. Only a couple of years after Wheeler's invention, a malt roasting house had been set up in Dublin, literally outside the walls of Guinness' brewery. Apparently, the first brew of Guinness' Extra Stout Porter was made in 1821. Ironically, the Irish brewers had almost been run out of business by the English porter brewers in the Eighteenth Century, but by the 1840's Guinness was exporting significant amounts of stout and porter into England. It was of course to become the dominant brewer in the English stout market going into the Twentieth Century.

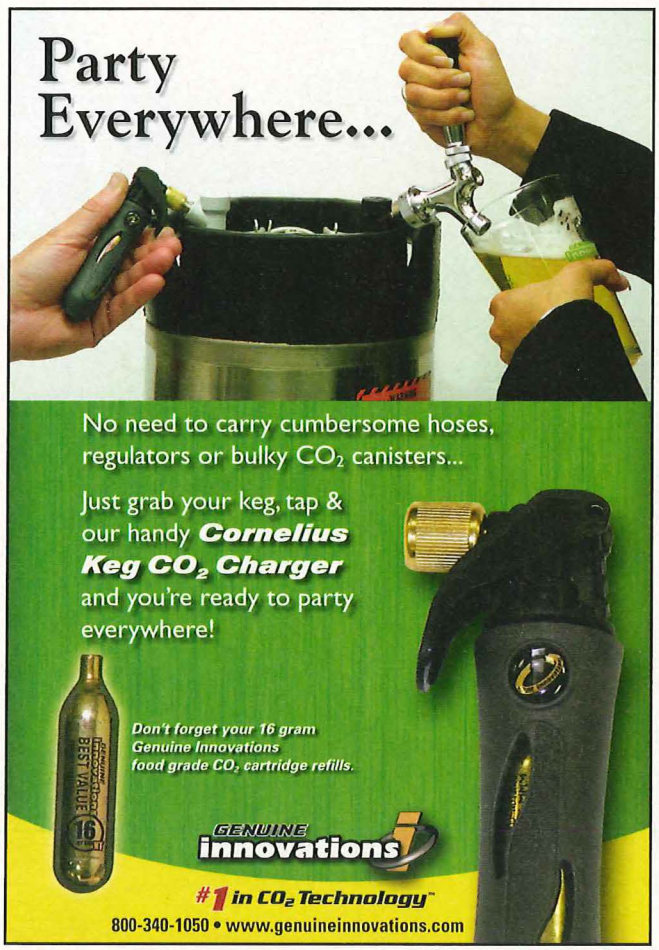
It is not clear when they first began to use black and pale malt only in their stout. However, G. Amsinck, writing in 1868, records just such a brew as "Dublin Stout," in his "A Series of Fifty Brewings." Amsinck states that it was brewed in his brewery, for his instruction, by John Guinness Jr., so the recipe appears to be authentic. Amsinck's Dublin Stout had an OG of 1.092, 77 IBU (calculated) and fermented down to 1.019. This finishing gravity was significantly lower than that for his treble stout, made from pale, brown and black malts, which started at 1.096 and finished at only 1.031. Interestingly, Amsinck also made a double stout (1.079–1.086), as well as a single stout (1.069–1.072), both again using pale, brown and black malts.

Of course, Guinness later began to use roasted barley instead. I do not know exactly when this occurred, but one writer, in 1889, states that "cheap black malts are frequently made from roasting barley and other cereals, but these cheap substitutes are nearly always disappointing and not unfrequently lead to disaster." This tends to suggest that the use of roasted barley was probably not widespread among mainstream brewers at that time.

So that's my story for the first hundred years or so of stout's history. Later, of course, it diverged into a whole range of styles, including Irish dry stouts, sweet stouts, oatmeal stouts and others.

BROWN STOUT by the numbers:

OG .....1.070–1.078 (17.1–18.9 °P)
FG .....1.022–1.026 (5.6–6.6 °P)
ABV .....6.3–6.8 %
IBU 35–50
SRM .....40+?



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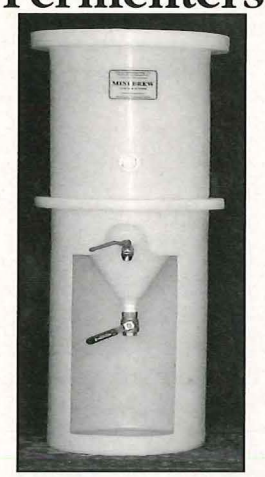
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The SRM values for color in the "by the numbers" box are a guess, based on what we know of the color of modern stouts. No such measurements were made in those days. Similarly, we do not know the alpha-acid levels of the hops. These were probably much lower than for modern hops, especially as refrigerated storage was not then available. I have calculated them from actual hop usage, based on alpha-acid at 2%. These averages include figures given in 1820 by a Mr. Foster, a brewer at Meux in London!

MALTS

Brown stout requires the use of a considerable amount of brown malt, about 50:50 with pale malt. Go for Maris Otter and, of course, English brown malt. If you want to experiment, there are a number of other recipes that use a 1:1:1 mixture of pale, brown and amber malts. However, neither brown nor amber malts contain any enzymes, and there is likely insufficient enzymes from this amount of pale malt to get good conversion.

When it comes to making an extract version, we have to resort to some inauthentic trickery to come up with a broad approximation of the original. We are limited to a partial mash recipe, as there is no way to do it with extract only. The partial mash recipe is done with a 50:50 mix of brown and pale malts, plus a good proportion of very dark (140 °L) crystal malt, and the wort from this is mixed with a pale malt extract.

HOPS

English hops are obviously as authentic as you can get. Goldings hops were around at this time, but it seems unlikely that they were used in stouts. Contemporary writings indicate the use of "coarse" or "earthy" hops and I think UK Fuggles are the way to go.

YEAST

A good English ale yeast is the best choice and a Whitbread strain would be particularly appropriate. I used White Labs WLP005, and Wyeast 1098 would also work well. You should prepare a 2–3 quart (~2–3 L) starter wort.

Terry Foster wrote "Chancellor Ale" in the May-June 2006 issue of BYO.

1820 Brown Stout
(5 gallons/19 L, all-grain)
OG = 1.070 FG = 1.022
IBU = 38 SRM = 40+ ABV = 6.3%

Ingredients
7 lb. 15 oz. (3.6 kg) 2-row pale malt (Maris Otter)
7 lb. 15 oz. (3.6 kg) brown malt
10 AAU Fuggles hops (90 mins) (2.0 oz/57 g at 5% alpha acids)
Wyeast 1098 (Whitbread Ale) or White Labs WLP005 (British Ale) yeast
1/2 cup dried malt extract (for priming)

Step by step
Use a single-step infusion mash at 150–152 °F (65.6–66.7 °C) for 1–1.5 hours. Sparge one hour, with water no hotter than 175 °F (80 °C), until run-off reaches SG 1.010–1.012. Boil 90 minutes, with hops added at the start. Strain, or siphon off from the hops, and adjust wort volume with cold water, and cool to about 70 °F (21 °C). Pitch with yeast starter, and allow to ferment. By 5–7 days, final gravity should have been reached; rack into a glass fermenter. One week later, rack again, prime with dried malt extract, and rack into keg or bottles. Mature the beer for 3–6 months for best results.

To ensure good fermentation, it is best to make a 2–3 quart (~2–3 L) starter of the original yeast culture, and to oxygenate the wort at pitching.

1820 Brown Stout
(5 gallons/19 L, partial mash)
OG = 1.070 FG = 1.020
IBU = 38 SRM = 40+ ABV = 6.6%

Ingredients
5 lb. 5 oz. (2.4 kg) pale dried malt extract
1 lb. 11 oz. (0.77 kg) 2-row pale ale malt
1 lb. 11 oz. (0.77 kg) brown malt
1 lb. 11 oz. (0.77 kg) crystal malt (140 °L)
10 AAU Fuggles hops (90 mins) (2.0 oz/57 g at 5% alpha acids)
Wyeast 1098 (Whitbread Ale) or White Labs WLP005 (British Ale) yeast
1/2 cup dried malt extract (for priming)

Step by Step
Place all the milled grains in a muslin bag, add to 2 gallons (7.6 L) of water at 165 °F (74 °C), and keep at 150–155 °F (66–68 °C) for 30 minutes to 1 hour. Remove the bag, rinse with hot water, and combine this water with that from the partial mash. Add the malt extract, stirring well to ensure it is properly dissolved, then bring to a boil. Add hops and boil 90 minutes. Turn off heat, adjust wort volume with cold water, and cool to about 70 °F (21 °C). Pitch with 2–3 qt. (~2–3 L) yeast starter, oxygenate the wort if possible, and allow to ferment.

By 5–7 days, the final gravity should have been reached. At this point, rack into a glass fermenter. One to two weeks later, rack again, prime with dried malt extract or corn sugar, and rack into keg or bottles. Condition for two to three months.

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5 EXTREME BEER RECIPES

by **SAM CALAGIONE**

While there isn't a single quality that is the alpha-aspect of a great brewer's profile, there are a number of qualities that all great extreme brewers share, to a degree. By extreme brewers I mean those making beers that are not made in the image of the dominant style of the day (i.e., light, homogenous lagers). Extreme beers are beers made with extreme amounts of traditional ingredients or beers made extremely well with non-traditional ingredients. The people who make these kinds of beers, both professionally and at home, share a curiosity for how things work, and a passion for breaking free from the crowd (in this case boring, watery beer), a desire to put their own thumbprint on the world, and a propensity for risk. But, homebrewers are also disciplined. They understand that they must first have a strong grasp of the traditional brewing process before heading off on their own tangent to subvert and influence that tradition. If you recognize these qualities in yourself then you are well on your way to becoming an accomplished homebrewer.

Breaking Away From the Norm

From the day I opened Dogfish Head Craft Brewery in 1995 our motto has been "Off-centered ales for off-centered people." This perspective influences everything we do and everything we make at our company; it implies that we do not brew beers that maintain the status quo. We never will. While we have focused on making strong exotic brews since our inception, in no way would we want to pretend that Dogfish Head invented extreme brewing. The tradition began well before Dogfish Head was around. Sierra Nevada, Hair of the Dog, and Anchor Brewing are but some of the earlier American practitioners of extreme brewing though the method certainly didn't originate here. I don't think any beer enthusiast would argue with me when I say that extreme brewing is rooted in the brewing traditions of Belgium—a country surrounded by some of the most storied grape-growing regions of the world that capitalized on the assets of its own climate and indigenous crops to brew the most interesting, food-friendly beers the world has seen. This story celebrates the Belgian extreme brewing tradition and explores a few ways in which Belgian ingredients and methods can be incorporated into various recipes.

Some of our first recipes at Dogfish Head were for beers made with maple syrup, roasted chicory, organic Mexican coffee, juniper berries, apricots, pumpkins, and brown sugar. Our beers were nothing like the ones found in cans and thirty-packs on the shelves of liquor stores in the mid-nineties. We had some challenging years before the beer community grew and became as self-educated and exploratory as it is today. There weren't many takers for the thirteen-dollar six-packs of oak-aged, maple syrup-fermented beers we were selling in 1996. But we never discounted the value of our hard work and quality ingredients by dropping our prices. Like a homebrewer, we brew first for ourselves and second for our friends, loved ones, and hardcore beer enthusiasts. Thankfully, the community of friends and beer enthusiasts has continued to expand as our company has grown up. Today, Dogfish Head is one of the fastest growing breweries in the country. I'm proud of that but I'm even more proud of the fact that we have achieved this heady growth while always focusing on making the kinds of beers that are honest reflections of our own idiosyncratic, envelope-pushing selves, not the "me too" beers that the world already has too many examples of. That being said, more and more people are discovering the full-flavored diverse beers being made today by American craft breweries, import breweries, and homebrewers. It's comforting to see so many brewers helping to stretch the boundaries of the definition of good beer alongside us.

ROUND THE WORLD TRIPEL

Tripel Round can best be described as a traditionally strong pale Belgian-style ale on an exotic road trip. In most instances, the barley sugars in Belgian tripel ales are augmented with white, brown, or candi sugar. For this version you will venture to the Far East (or at least an Asian grocery store) for Chinese rock sugar. Usually used to braise meats, this sugar is a mixture of refined sugar, brown sugar, and honey that has a subtle pleasant spiciness.

For a finishing touch add a bit of dried chamomile to give a fruity finish that will complement the estery profile of the Belgian yeast. A vigorous yeast strain will be needed to ferment this strong brew.

PROCESS

1. Fill a grain bag with the crushed Cara-pils barley. Tie off the top and place the bag in your brewpot filled with 4½ gallons (17 L) of cool water. Add the gypsum. Heat the pot and stir the water and grain bag every 5 minutes.

2. When the water reaches 170°F (77°C), pull out the grain bag using a large stirring spoon. Hold the bag above the brewpot for a minute allowing most of the liquid to drain into the pot. Do not squeeze the grain bag.

3. As the water begins to boil, remove from heat. Add all the malt extract. Stir to prevent clumping and scorching on the bottom of the pot. Return the brewpot to the heat.

4. Allow the wort to come to a boil. After pre-boiling for 5 minutes add the Saaz hop pellets for bittering and stir. Start timing the 1-hour boil at the point that you make this hop addition.

5. 30 minutes before the end of the boil add 1 of the 2 pounds (455 g) of Chinese rock sugar and stir for a minute.

6. 20 minutes before the end of the boil add the East Kent Golding hop pellets and the Irish moss and stir for 1 minute.

7. 10 minutes before the end of the boil, add the aroma Saaz hop pellets and stir for 1 minute.

8. Five minutes before the end of the boil add the last pound (455 g) of Chinese rock sugar and stir for 1 minute.

9. At the 60-minute mark, add the dried chamomile. Stir for 1 minute and turn off heat source. Stir wort clockwise for 2 minutes as you build up a whirlpool effect. Stop stirring and allow wort to sit for 10 minutes.

10. Chill wort in cold-water bath to a temperature of 70°F–75°F (21°C–24°C).

11. Transfer wort with the chamomile into the carboy. Aerate for 1 minute.

12. Top up carboy with cool water to the 5 gallon mark.

13. Pitch yeast into carboy and aerate for another minute. See yeast starter info in yeast resource area.

14. After fermentation takes off (1 or 2 days) bring 2 cups (470 ml) of water to a boil and add the brown sugar. When dissolved, add to the fermenting beer in the carboy.

15. In about 10 days your beer should be ready to package.

16. Before bottling, clean and sanitize bottles and caps and create a priming solution of 1 cup (235 ml) boiling water and priming sugar. Siphon beer into a sterilized bottling bucket, add the water-diluted priming solution, and gently stir. Bottle and cap beer.

17. Allow the beer to bottle condition for another 2 weeks and it should then be ready to drink.

INGREDIENTS

Pre-boil tea

4½ gallons (17 L) cool water
1 pound (455 g) crushed Cara-pils barley
Grain bag
2 teaspoons (10 g) gypsum

Boil

9.9 pounds (4.5 kg) light liquid malt extract plus 1 pound (455 g) light dry malt extract; or 9 pounds (4 kg) light dry malt extract *(65 minutes)*
1 ounce (28 g) Saaz hop pellets (bittering) *(60 minutes)*
1 pound (455 g) Chinese rock sugar *(30 minutes)*
1 teaspoon (5 g) Irish moss *(20 minutes)*
1 ounce (28 g) East Kent Golding hop pellets (flavor) *(20 minutes)*
½ ounce (15 g) Saaz hop pellets (aroma) *(10 minutes)*
1 pound (455 g) Chinese rock sugar *(5 minutes)*
1½ (43 g) ounces dried chamomile *(End of boil)*

In carboy

Cool water to the 5 gallon mark

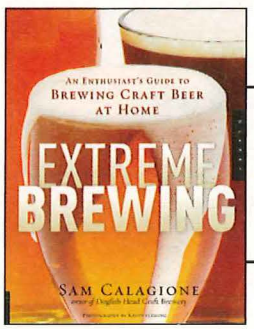
Fermentation

YEAST: Wyeast 1762 Belgian Abbey Yeast or 3787 Trappist High Gravity; or White Labs WLP530 or WLP575
1 pound (455) light brown sugar *(Day 2)*

Bottling

5 ounces (125 g) priming sugar

STARTING GRAVITY: 1.090
FINISH GRAVITY: 1.018
FINAL TARGET ABV: 9%



This story and five recipes are excerpted from the upcoming book *Extreme Brewing* by Sam Calagione, copyright (c) Rockport Publishers 2006. *Extreme Brewing* will be released this November and is packed with recipes and tips for brewing craft beer at home. It will be available at better homebrew supply stores and bookstores. In addition copies can be reserved pre-publication at amazon.com.

KIWIT

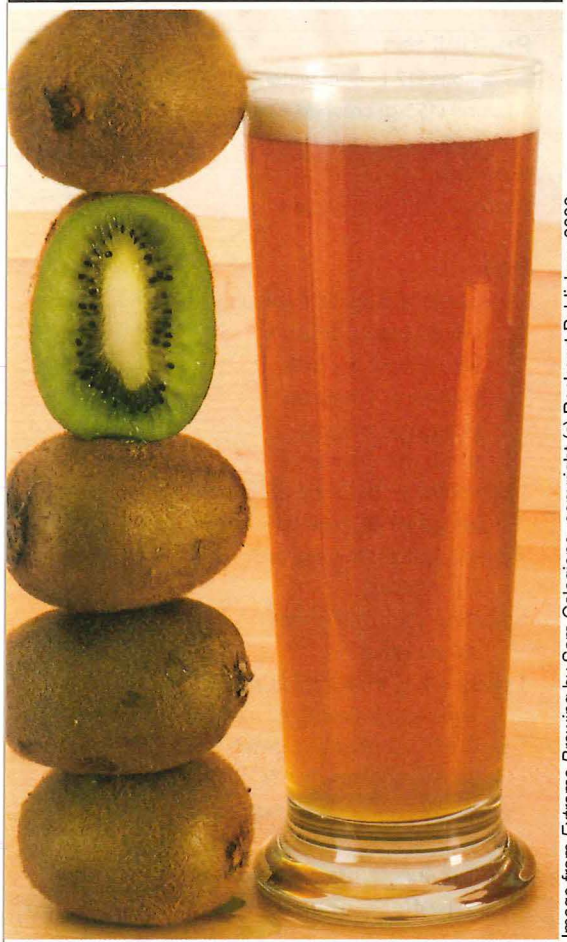


Image from *Extreme Brewing* by Sam Calagione, copyright (c) Rockport Publishers 2006

Wit or white beers are traditional Belgian beers made with wheat and a variety of spices. They are relatively light in body and alcohol and are very refreshing. The style dates back to before hops were domestically grown and brewers were forced to spice or bitter their beer with whatever ingredients were handy. Modern wit beers are usually spiced with Curaçao orange peel and crushed coriander. Since Kiwi is such a refreshing tropical fruit, it works well with a wit style beer; in this recipe the coriander will remain but Kiwi will replace the orange peel. Make sure the fresh kiwis you find for this beer are nice and firm and not mushy and browning. Soak them in hot water for a few minutes and it should be easier to peel the skin off of them.

PROCESS

1. Mix the grains together before filling a grain bag with the crushed 6 row pale malt and the crushed Torrified wheat. Torrified grains are heated to make the grain pop similar to puffed rice or wheat to explode the cell walls. It makes the interior of the grain more usable for the brewing process. Tie off the top and place the bag in the brewpot filled with 4 ½ gallons (17 L) of cool water. Add the gypsum to the water. Heat the pot and stir the water and grain bag every few minutes.

2. When the water reaches 170°F (77°C), pull out the grain bag using a large stirring spoon. Hold the bag above the brewpot for a minute allowing most of the liquid to drain into the pot. Do not squeeze the grain bag.

3. As the water begins to boil, remove from heat. Add the liquid wheat-barley malt extract. Stir to prevent clumping and scorching on the bottom of the pot. Return pot to heat.

4. Allow the wort to come up to a boil. After pre-boiling for 5 minutes add the Tettnanger bittering hop pellets and stir. Start timing the 1-hour boil at the point that you make this hop addition.

5. 10 minutes before the end of the boil add the Willamette hop pellets, coriander and Irish moss and stir for 1 minute.

6. At the 60-minute mark in the boil, add the cubed kiwi fruit and shut off the heat source. Stir wort clockwise for 2 minutes as you build up a whirlpool effect. Stop stirring and allow wort to sit for 20 minutes.

7. Chill wort in cold water bath to a temperature of 70°F–75°F (21°C–24°C). Transfer wort and fruit into carboy, aerate for 1 minute.

8. Pitch yeast into carboy and aerate for another minute. Top up carboy with cool water to the 5 gallon mark.

9. Primary fermentation will take a little longer than usual (this beer should be done fermenting in 15 to 20 days). When the kiwis rise to the top of the carboy and are almost white in color this will signify that they have been successfully stripped of their flavors and sugars.

10. Before bottling, clean and sanitize bottles and caps and create a priming solution of 1 cup (235 ml) boiling water and priming sugar. Siphon beer into a sterilized bottling bucket, add the water-diluted priming solution, and gently stir. Bottle and cap beer.

11. After bottling, allow the beer to bottle condition for another 10 days; it should then be ready to drink.

INGREDIENTS

Pre-boil tea

4½ gallons (17 L) cool water

½ pound (225 g) Torrified wheat grain

½ pound (225 g) 6 row pale malt

Grain bag

2 teaspoons (10 g) gypsum

Boil

6.6 pounds (3 kg) wheat-barley liquid malt extract *(65 minutes)*

1 ounce (28 g) Tettnanger hop pellets *(60 minutes)*

½ ounce (15 g) Willamette hop pellets *(10 minutes)*

½ ounce (15 g) crushed coriander *(10 minutes)*

1 teaspoon (5 g) Irish moss (10 minutes)

4 pounds (1.8 kg) fresh kiwi fruit peeled and cubed (½ inch [1.27 cm] cubes)

(End of boil)

In carboy

Cool water to 5 gallon (19L) mark

Fermentation

Yeast: White Labs WLP400 Belgian Wit Ale or WLP410 Belgian Wit II; or Wyeast 3944 Belgian Wit or 3463 Forbidden Fruit

Bottling

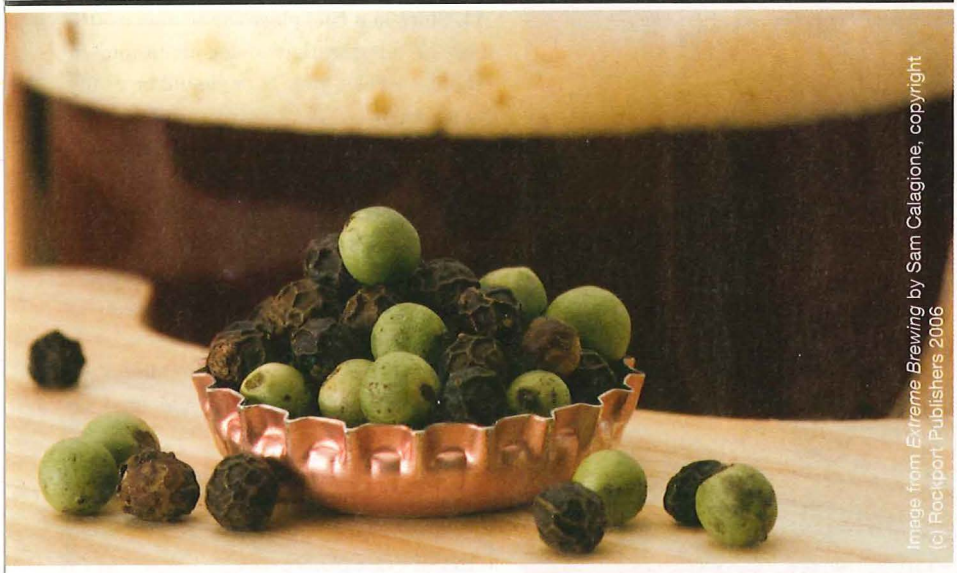
5 ounces (125 g) priming sugar

STARTING GRAVITY: 1.052

FINAL GRAVITY: 1.014

FINAL TARGET ABV: 5%

PEPPERCORN RYE-BOCK



The bock beer style has been made in Northern Germany and Austria for centuries. The Dutch version of a bock beer is usually a bit darker in color than those from other countries and there is evidence that the Dutch used rye in making some versions of their bock beers. Bock beers tend to lean more on the barley than the hops for their signature character. The rye that will be used in this recipe will give the beer a nice spicy, woody edge to cut the sweetness of the barley. Black and green peppercorns will be added to further accentuate the spicy notes in this beer.

PROCESS

1. Fill a single grain bag with the flaked rye and Munich barley. Tie off the top and place the bag in your brewpot filled with 4½ gallons (17 L) of cool water. Heat the pot and stir the water and grain bag every 5 minutes.

2. As the water reaches 170°F (77°C), pull out the grain bag using a large stirring spoon. Hold the bag above the brewpot for a minute allowing most of the liquid to drain into the pot. Do not squeeze the grain bag.

3. As the water begins to boil, remove from heat. Add all the malt extract. Stir to prevent clumping and scorching on the bottom of the pot. Return to heat.

4. Allow the wort to come up to a boil. After pre-boiling for 5 minutes add the Cluster hop pellets and stir. Start timing the 1-hour boil at the point that you make this hop addition.

5. 10 minutes before the end of the 1-hour boil, add the Hallertau hop pellets and the Irish moss and stir for 1 minute.

6. At the 60-minute mark, add the black and green peppercorns and turn off the heat source. Stir wort clockwise for 2 minutes as you build up a whirlpool effect. Stop stirring and allow wort to sit for 10 minutes.

7. Chill wort in cold water bath to a temperature of under 55°F (13°C).

8. Transfer wort into carboy, aerate for 1 minute.

9. Pitch yeast into carboy and aerate for another minute. Top up with water to 5 gallons (19 L).

10. Store in a cool place (at or under 50°F [10°C]) for duration of fermentation.

11. After primary fermentation is complete (about 2 to 3 weeks), transfer wort into sanitized bottling bucket and then sanitize your now-empty carboy before transferring the beer back into it.

12. In about 2 more weeks your beer should be ready to package.

13. Before bottling, clean and sanitize bottles and caps and create a priming solution of 1 cup (235 ml) boiling water and priming sugar. Siphon beer into a sterilized bottling bucket, add the water-diluted priming solution, and gently stir. Bottle and cap beer.

14. Allow the beer to bottle condition for another 2 weeks and it should then be ready to drink.

INGREDIENTS

Pre-boil tea

4½ gallons (17 L) cool water
1 pound (455 g) flaked rye
½ pound (225 g) crushed Munich barley
Grain bag

Boil

6.6 pounds (3 kg) Pilsner or light liquid malt extract *(65 minutes)*
1 pound (455 g) light dry malt extract *(65 minutes)*
1 ounce (28 g) Cluster hop pellets *(60 minutes)*
1 ounce (28 g) Hallertau hop pellets *(10 minutes)*
1 teaspoon (5 g) Irish Moss *(10 minutes)*
1 teaspoon (2 g) milled black peppercorns *(End of boil)*
1 teaspoon (2 g) milled green peppercorns *(End of boil)*

In carboy

Cold water to the 5 gallon (19L) mark

Fermentation

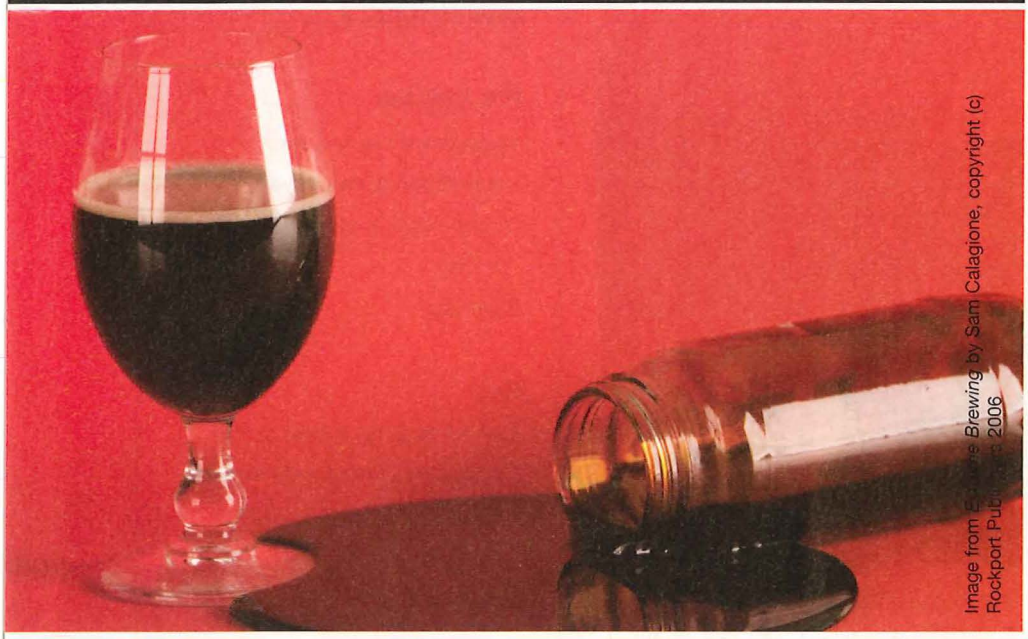
YEAST: Wyeast 2308 Munich or 2206 Bavarian Lager; or White Labs WLP838 Southern German Lager yeast

Bottling

5 ounces (125 g) priming sugar

STARTING GRAVITY: 1.063
FINAL GRAVITY: 1.014
FINAL TARGET ABV: 5.5%

MOLASSES MÄRZEN



Märzen beers are German in heritage, have a relatively sweet malt character, and tend to have a reddish hue. Traditionally Märzen beers were brewed in the spring to lager through the warm summer months. This method was the result of brewing these beers in the days before modern refrigeration. After fermentation, the beers were transferred into barrels and rolled deep into caves and cellars where they were packed with ice to age over the summer. The extended lagering time gives Märzen their smooth but crisp malt character. This Märzen will be a bit stronger than the standard 5 to 6% ABV continental version. To bump up the ABV to 8.5%, this recipe will use molasses. Brewing with molasses is a tradition that is actually more prevalent in Britain than in Germany but allowing the worlds to collide can be a fun way to make an ordinary beer a bit more extreme. Be sure to use high-grade, light molasses, which is about 90% fermentable. In addition to sugars, molasses contains aromatics that will contribute to the flavor and complexity of this beer.

PROCESS

1. Fill a grain bag with the crushed 60 °L crystal malt. Tie off the top and place the bag in your brewpot filled with 4½ (17 L) gallons of cool water. Heat the pot and stir the water and grain bag every 5 minutes.

2. As the water reaches 170° F (77°C), pull out the grain bag using a large stirring spoon. Hold the bag above the brewpot for a minute allowing the last of liquids to drain into the pot. Do not squeeze the grain bag.

3. As the water begins to boil, remove from heat. Add the light liquid malt extract and brown sugar. Stir to prevent clumping and scorching on the bottom of the pot. Return to heat.

4. Allow the wort to come up to a boil. After pre-boiling for 5 minutes add the Chinook hop pellets and stir. Start timing the 1-hour boil at the point that you make this hop addition.

5. 20 minutes before the end of your boil add the light molasses; stir to prevent clumping.

6. 10 minutes before the end of your 1-hour boil add the Saaz hop pellets and the Irish moss and stir for 1 minute.

7. At the 60-minute mark, turn off your heat source. Stir wort clockwise for two minutes as you buildup a whirlpool effect. Stop stirring and allow wort to sit for 10 minutes.

8. Chill wort in cold water bath to just below 55°F (13°C).

9. Transfer wort into carboy, aerate for 1 minute.

10. Pitch yeast into carboy and aerate for another minute. Top up with water to 5 gallons (19 L).

11. Store in a cool place (at or under 50°F [10°C]) for duration of fermentation. In about 4 weeks, your beer should be ready to package.

12. On bottling day, boil 6 ounces (175 ml) of water and 1 cup (235 ml) of light molasses. Stir until the molasses is completely in solution. Pour it into bottling bucket and transferring the beer into it. Stir to mix well. The beer is now ready to bottle.

13. Allow the beer to bottle condition for another 2 weeks and it should then be ready to drink.

INGREDIENTS

Pre-boil tea

4½ gallons (17 L) cool water
1 pound (455 g) 60 L Crystal malt Grain bag
2 teaspoons (10 g) gypsum

Boil

6.6 pounds (3 kg) Pilsner or light liquid malt extract *(65 minutes)*
2 pounds (0.9 kg) light brown sugar *(65 minutes)*
1½ ounces (43 g) Chinook hop pellets *(60 minutes)*
1 pound (680 g) light molasses *(20 minutes)*
1 ounce (28 g) Saaz hops pellets *(10 minutes)*
1 teaspoon (5 g) Irish Moss *(10 minutes)*

In carboy

Cold water to the 5 gallon (19L) mark

Fermentation

Yeast: Wyeast 2042 Danish Lager yeast or Wyeast 3327 Euro Lager; or White Labs WLP850

Bottling

8 ounces (340 g) molasses for priming

STARTING GRAVITY: 1.080
FINAL GRAVITY: 1.016
FINAL TARGET ABV: 8%

BYO **Q&A** with **Sam Calagione**

Q. What distinguishes an extreme beer from a "regular" one?

A. It's either a beer that is made with an extreme amount of traditional ingredients — like a double IPA or barleywine — or it is brewed with non-traditional ingredients. Examples of each and hybrids exist and are becoming more commonplace in both commercial and homebrewing circles.

Q. When homebrewers try one of these recipes, what are the most important things they should keep in mind?

A. There is a difference between being experimental and being disorganized. Extreme brewing does not equate to extreme chaos. I used to be guilty of running all over the kitchen in our pub searching for raisins or coffee two-minutes before the addition of that ingredient was meant to be added to the beer; completely stressing me and everyone around me out. One time I went to transfer a beer from the kettle to a fermenter and forgot to put a valve on the end of the whirl-inlet. I tried to keep the near-boiling-temp beer in the kettle using my bare hand . . . that wasn't extreme brewing, it was extreme stupidity.

I learned that if I could plan ahead, line up my ingredients and equipment in sequential order, write out my recipe, it made for a much more peaceful and manageable brewday and allowed me to focus on the nuances of making a great beer as opposed to the nuances of staying out of the emergency room. Hopefully the book drives the importance of organization and preparedness home. That said, when it comes to tweaking, expanding or mutating a recipe in the book — don't be afraid to let your freak-flag fly and put the "mental" in "experimental".

Q. Is there craftsmanship involved in extreme brewing, or do the beers succeed simply due to having an overwhelming amount of ingredients?

A. I don't think you can place enough emphasis on the craftsmanship component. Brewing is as much an art form as sculpture and if some beret-wearing sculptor wants to disagree, I know hundreds of dedicated brewers ready to womp him upside the head with a 22-ounce bottle. How many of us have tried or brewed an IPA that was brewed with ham-fisted quantities of hops? Anyone can add too much hops — the challenge is approaching that threshold in a way that makes you the drinker say "Damn that's hoppy!" at the same time they are reflexively moving toward their second sip. Boldly approaching that threshold without overstepping it is where the craftsmanship in extreme brewing lies.

Q. When experimenting with an unusual ingredient, how do you decide when in the brewing process to add it?

A. Mostly trial and error — less error now than ten years ago. The suggestions for the usage and volumes of uncommon ingredients in this book come from dialing in our own recipes and experiments through the years. That said they are based on our own tastes and should be viewed as jumping off points for the reader. The appreciation of beer is subjective and that's a beautiful thing. Too much cinnamon for one person is not enough for another.

Q. You've had much success with your extreme beers. Are there any failures you'd care to relate?

A. Yup, a couple come directly to mind. High Alfa Wheat, which we made in the first year at our pub, was brewed with peppercorns and lavender buds. Way too many lavender buds. Drinking it was like tongue-kissing Laura Ashley. That said, it was 1996 and I bet it would find a wider audience today than it did then. I hope we brew it again some day. The other was a homebrew batch made with wormwood that I'd rather not elaborate further on . . . suffice to say it's possible to have Nam flashbacks without ever having been to Vietnam.

Q. What makes a good extreme beer?

A. At the end of the day I would think that the definition of any great extreme beer is centered upon some version of the ideal balance. All of the flavors of the beer should mesh perfectly with one another. That doesn't mean that the beer must taste familiar to be enjoyable. Experimental brewing, and the enjoyment of experimental beer is about expanding your palate but it's not about destroying your palate. The best extreme beers are the ones that you remember as being unlike anything out there long after you've finished drinking them but that you look forward to drinking again.

Q. When you first brew an extreme beer, how close do you get to the version of the beer "in your mind's eye?"

A. I'm pretty good at coming up with an idea for a beer and the general recipe and working through the test batch. The tweaking of recipes that is necessary as ingredient specs change over time is a collaborative process at our company.

Q. How do you approach extreme brewing — is it a seat-of-the-pants endeavor or carefully planned?

A. When we opened in 1995, it was definitely seat-of-the pants. I had a 15-gallon modified Sabco Brew-Magic system that I used for the first year. Our motto from even before we opened has been "Off-centered ales for off-centered people" and I was experimenting with non-traditional ingredients right out of the gates. Now our system of brewing is a little more methodical, but no less adventurous than it was the day we opened. I'm proud to say I'm the least skilled brewer of the eight brewers that work at Dogfish Head. But I still enjoy taking a beer from the concept to the pilot brew. We do the pilot brews on the 5 barrel system at our Rehoboth Beach Pub and if they turn out well, we scale up the recipe and make them on our 100 barrel production brewery in Milton. We never look at the existing market to determine what we want to brew next — we look to our own inspiration or some historical or artistic stepping off point that brings an idea for a beer to light.

Q. What are some good extreme-beer ingredients and are there any to avoid?

A. A few of my favorites include crystallized ginger, maple syrup, honey, we just made a beer with black tea. . . again it's a subjective process so anyone's personal favorites would be equally valid. Stay away from peanut butter — the oil is a bitch for head retention. Jelly is OK though.

Q. If a homebrewer has an idea for an extreme beer of his (or her) own, how should he (or she) approach the planning and first brewing of it?

A. Add a little more hops than your gut is telling you to add. Add a little less spice or herbs than your gut is telling you to add. Add about as much fruit as your gut is telling you to add. Usually works for me.

DEMA-GODDESS ALE

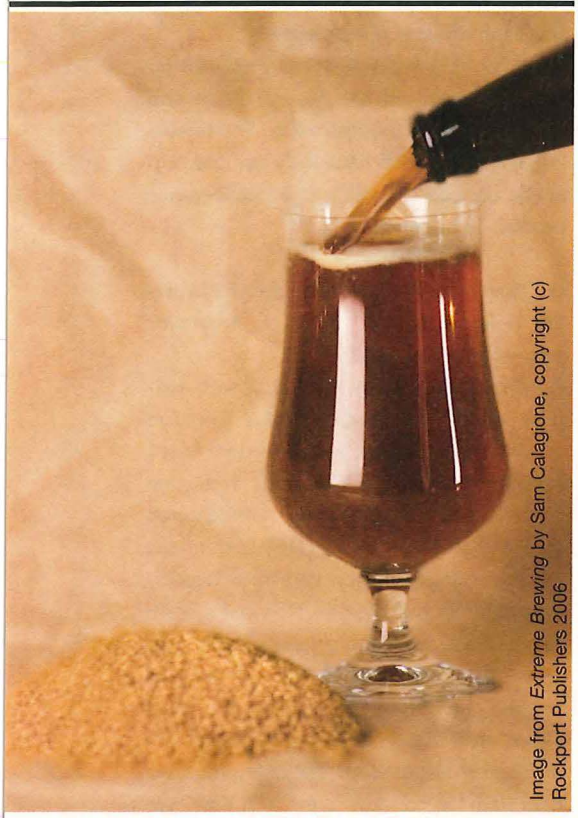


Image from *Extreme Brewing* by Sam Calagione, copyright (c) Rockport Publishers 2006

To make this particular recipe you will be conducting high gravity brewing. White or light beet sugars are more highly fermentable than barley sugars so dose in small amounts of sugar during fermentation. However, using too much of these sugars will make a beer overly dry, cidery, and "hot" (boozy with no body). To reduce this effect, high quality Demerara sugar will be added during the initial boil as well as intermittently during fermentation to keep the body of the beer up and the dryness down. With big beers, high volumes of hops need to be added just to counterbalance the sweetness that will inevitably be left via the unfermented sugars. To fully ferment this beer, two different yeast strains and a special aerating method will be used. The boiling process drives nearly all of the oxygen out of the beer as it's being made, but yeast works best in an oxygen-rich environment. Aerating your beer is therefore recommended at the start of fermentation. However, with strong beers, sometimes that isn't enough. For this beer, and all beers with a target alcohol by volume of over 12%, it's recommended to use an aquarium air pump, hose, and aerating stone to add high levels of oxygen just before pitching the primary yeast and just before adding the secondary yeast. This extreme aeration method can give your beer undesired, oxygenated, or "cardboard" flavors if done too late in the fermentation process. But huge beers require extended periods of time to properly ferment. For primary and secondary fermentation periods lasting six to eight weeks for the combined processes, I would not recommend this method of aeration beyond the third week of total fermentation. Since you will be adding sugar repeatedly during fermentation it will be difficult to gauge the initial and final specific gravity. However, it will be important to take hydrometer readings as you add sugars during fermentation, to make sure that the yeast is still performing optimally in the alcohol-rich environment.

PROCESS

1. Fill a grain bag with the crushed Cara-Munich barley and the crushed Special B Barley. Tie off the top and place the bag in your brewpot filled with 4 gallons (15 L) of cool water. Add the gypsum to the water. Heat the pot and stir the water and grain bag every 5 minutes.

2. As the water reaches 170°F (77°C), pull out the specialty grain bag using a large stirring spoon. Hold the bag above the brewpot for a minute allowing most of the liquid to drain into the pot. Do not squeeze the grain bag.

3. As the water begins to boil, remove from heat. Add the light malt extract. Stir to prevent clumping and scorching on the bottom of the pot. Return to heat.

4. Allow the wort to come up to a boil. After pre-boiling for 5 minutes, add the Tomahawk hop pellets and stir. Start timing the 1-hour boil at the point that you make this hop addition.

5. 20 minutes before the end of the boil add the Chinook hop pellets, ½ pound (225 g) of cane sugar and the Irish moss, stir for 1 minute.

6. 10 minutes before the end of the boil

INGREDIENTS

Pre-boil tea
4 gallons (15 L) cool water
½ pound (225 g) crushed Cara-Munich barley
½ pound (225 g) crushed Special B barley
Grain bag
2 teaspoons (10 g) gypsum

Boil
13.2 pounds (6 kg) light liquid malt extract or 11 pounds (5 kg) dry light malt extract *(65 min)*
2 ounces (55 g) Tomahawk hop pellets *(60 minutes)*
2 ounces (55 g) Chinook hop pellets *(20 minutes)*
½ pound (225 g) cane sugar *(20 minutes)*
2 teaspoon (10 g) Irish Moss *(20 minutes)*
½ pound (225 g) Demerara sugar *(10 minutes)*
5 teaspoons (25 g) yeast nutrient *(After cooling)*

In carboy
Water to the 5 gallon (19L) mark

Primary fermentation
YEAST: Wyeast 1214 Abbey Ale; or White Labs WLP570 Belgian Strong /Golden Ale
1 ounce (28 g) pure cane sugar *(Day 8)*
1 ounce (28 g) Demerara sugar *(Day 9)*
1 ounce (28 g) pure cane sugar *(Day 10)*
1 ounce (28 g) Demerara sugar *(Day 11)*
1 ounce (28 g) pure cane sugar *(Day 12)*
1 ounce (28 g) Cascade hop pellets *(Day 13)*
Distillers yeast (secondary) *(Day 13)*
1 ounce (28 g) pure cane sugar *(Day 13)*
1 ounce (28 g) Demerara sugar *(Day 14)*
1 ounce (28 g) pure cane sugar *(Day 15)*
1 ounce (28 g) Demerara sugar *(Day 16)*
1 ounce (28 g) pure cane sugar *(Day 17)*

Bottling
Champagne Yeast or Wyeast 3021
5 ounces (125 g) priming sugar
Extra Equipment: an aquarium pump/hose/aerating stone setup.

STARTING GRAVITY: 1.100 (at the start of primary fermentation)
FINAL GRAVITY: With this many small sugar additions and this big a beer, final gravity is anybody's guess!
FINAL TARGET ABV: 14 to16%

Note: *Day references in recipe above are approximations. The day that you actually begin your post primary fermentation sugar additions may vary depending on fermentation temperatures.*

add ½ pound (225 g) of Demerara sugar and stir for 1 minute.

7. At the 60-minute mark of the boil, turn off heat source. Stir wort clockwise for 2 minutes as you build up a whirlpool effect. Stop stirring and allow wort to sit for 10 minutes.

8. Chill wort in cold water bath to a temperature of 70°F–75°F (21°C–24°C).

9. Transfer wort into a carboy. Add the yeast nutrient.

10. Pitch primary strong ale yeast into carboy. Top up wort to 5-gallon mark with water. Set up the aquarium pump, hose and aeration stone and oxygenate beer for 1 hour.

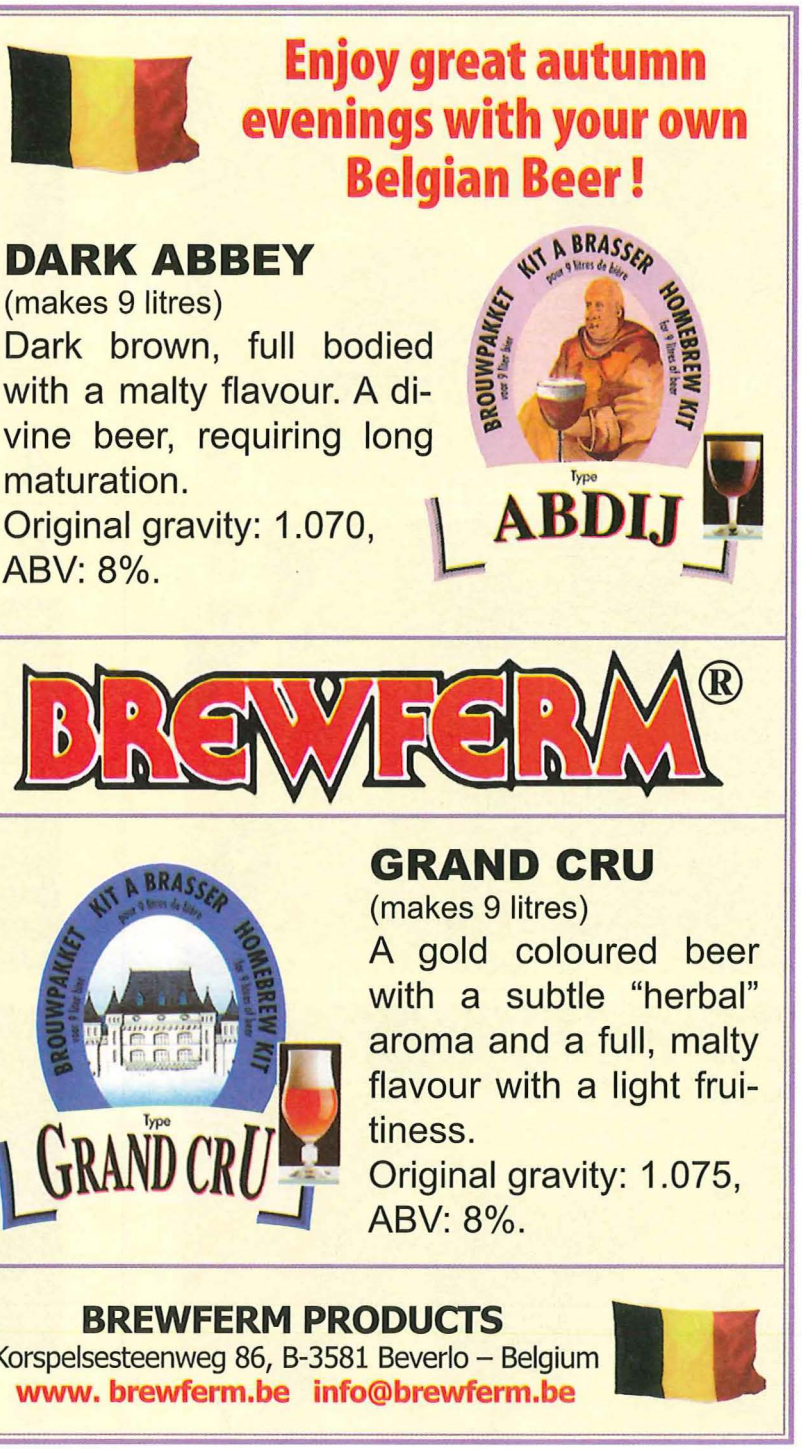
11. After the vigorous primary fermentation slows down (around 8 to 10 days) you will hear the air lock bubbling less frequently. Once this slowdown occurs, alternate between 1 ounce (28 g) pure cane sugar and 1 ounce (28 g) Demerara sugar additions to the carboy every day for 5 days straight.

12. A few days after the primary fermentation slows down, transfer your beer into the sterilized bottling bucket while you clean out the carboy. Many yeast cells have grown in this sugar rich environment, and you want to leave the layer of dead yeast cells that have dropped to the bottom of the carboy behind as you transfer to the bottling bucket.

13. Add the Cascade hop pellets to the empty, sterilized carboy. Transfer the beer back into your sterilized carboy and pitch your secondary super high gravity yeast (a yeast starter is a good idea. See reference area a rear of book for more info). Set up your aquarium pump/hose/aerating stone unit once again and aerate the beer for 1 full hour. Again, you will be adding 1 ounce (28 g) of pure cane sugar followed by 1 ounce (28 g) of Demerara sugar the next day for 5 straight days. The difference here is that you begin the sugar additions the day that you transfer and aerate the beer for secondary fermentation. Secondary fermentation should last 1 to 3 weeks. 2 weeks after all fermentation activity subsides your beer should be ready to package.

14. For this high gravity beer, you will be adding additional yeast at bottling to make sure that the beer has fresh yeast for the bottle conditioning. While transferring the beer to the bottling bucket, use a cup of the beer to dissolve the Champagne yeast. Add the Champagne yeast mixture to the bottling bucket and stir well. Now add the priming sugar dissolved in 1 cup (235 ml) boiling water to the bottling bucket and stir well before bottling.

15. In another 3 weeks your beer should be ready to drink. This is another long keeper and will mature well with age. It will be better after a year of aging, if you can wait that long.



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story & photos by **Jon Stika**

CAN IT!

canning your own yeast starters

A properly made yeast starter ensures that you have a large number of healthy yeast cells to pitch on brewing day. But, making a starter is fairly time consuming. If you ever wished that you could have starter wort on hand, ready to go at a moment's notice, you need to can it — the wort that is. By using the methods of home canning, you can make and store starter wort for use whenever you want. For those of you that never helped your Mom can fruits and vegetables, read on.

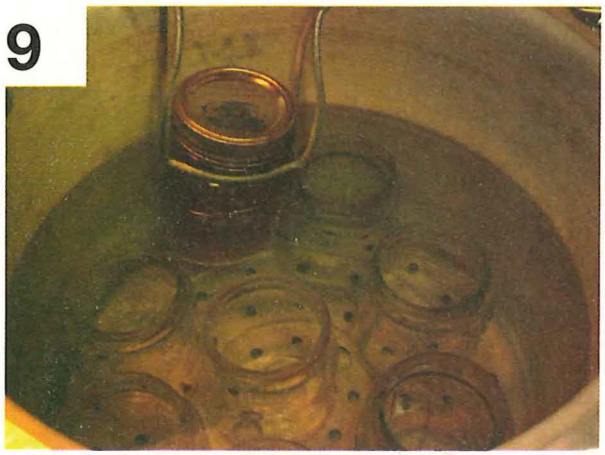
Home canning is a simple and effective process for preserving starter wort in handy, ready to use, quantities. Of course, you can just cook up a batch of starter and let it cool to bring your dormant yeast to life, but that's one more thing to remember to do in a busy brewing process. Also, canned wort is sterile and already at the correct temperature (if stored properly) for yeast propagation, so it is both safe and convenient.

The basic canning process is designed to sterilize and seal the contents of the canning vessel (typically a glass jar) for long-term storage. To accomplish this, clean jars, lids, and screw-on bands are held in boiling water while the starter wort is also at a slow boil. The boiling wort is then used to properly fill the empty jars, which are then each covered with a lid and secured with a band. The filled jar is then returned to the boiling water bath for "processing." "Processing" is simply holding the filled jars at 212 °F (100 °C) — in a boiling water bath — for at least a half hour to be sure everything is sterilized. When the jars are removed from the boiling water

Canned wort can be prepared ahead of time and stored in a cool, dry place, ready to be used **at a moment's notice.** Try this **convenient** method to **save time** making **yeast starters.**

PHOTO CAPTIONS

1. Boiling the jars, lids, bands and wort.
2. Sanitizing the empty jars in boiling water.
3. The lids and bands get sanitized as the wort boils.
4. All the miscellaneous equipment.
5. Clean dishtowels to set the jars on.
6. Ladeling wort into a jar.
7. Wiping off excess wort from the rim of the jar.
8. Placing the lid on the filled jar.
9. Submerging the filled jars in boiling water.
10. The jars under 2–3 inches (5–8 cm) of boiling water.
11. The jars slowly cooling under a clean dishtowel.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Have ready-to-use starter wort at your finger tips and get your brewing preparations off to a quick start.

bath and allowed to cool, the lid creates a secure seal and the contents remain sterile until the lid is removed.

Here's what you'll need to produce a gallon of starter wort:

Ingredients:
12 ounces (0.34 kg) dried malt extract
2 teaspoons yeast nutrient
1 gallon (3.8 L) water

Equipment:
8 pint-sized canning jars
8 bands to fit jars
8 lids to fit jars
Soup ladle
Canning jar funnel
Canning jar tongs
Kitchen tongs
Clean dishcloth
Clean dishtowels
Canning kettle (or large pot) with false bottom
Pot for wort
Saucepan for lids and bands

The original gravity of this starter wort will be around 1.034. At this gravity, the yeast will grow happily — assuming you aerate the wort well immediately prior to pitching the yeast to the starter — and they will not be stressed by a high-gravity fermentation. As an option, you may want to add a few hop pellets to the starter wort. If you do, keep the addition under a quarter ounce (7 g) of hops per gallon of wort. Another option would be to add a small amount of yeast nutrients to your starter wort. A quarter teaspoon per gallon (3.8 L) would work fine.

Sanitizing the Jars

Once you have all the ingredients and equipment rounded-up, the first order of business is to wash and rinse the jars to make sure they are clean and then place them in the canning kettle (or large pot), cover them with water and turn on the heat. It is important that you have some type of false bottom in the pot, and kettles sold for canning purposes come with a wire or perforated metal insert. This is so the jars are not sitting directly on the bottom of the pot where steam pockets could develop under them and bounce the jars around, possibly causing breakage.

Bring the pot with the jars to a gentle boil. At the same time place the screw-on bands with a lid inserted into each one in a saucepan, cover with water and also bring to a gentle boil.

Boiling the Wort

In a third pot, bring a gallon (3.8 L) of water to a boil, then turn off the heat and gradually add the dried malt extract and yeast nutrient, stirring constantly to be sure everything dissolves completely. Then bring the pot of starter wort back to a gentle boil, without letting it boil so vigorously that it boils over.

So now you should have a canning pot with eight pint jars at a low boil, eight bands with lids in another saucepan of water at a low boil and a pot with a gallon of wort at a low boil.

Filling The Jars

Next you will retrieve the jars from the canning pot, fill them with wort, secure a band and lid to each and return them to the canning pot for processing. You should do this by removing, filling, and replacing one jar at a time, not taking them all out then filling them in succession in a row.

Using the canning jar tongs, grasp a jar by the neck and empty the water back into the canning pot. Then place the jar on the counter. Place the funnel in the mouth of the jar and carefully ladle wort into the jar leaving about a half-inch (~1.3 cm) of head space, unfilled with starter wort.

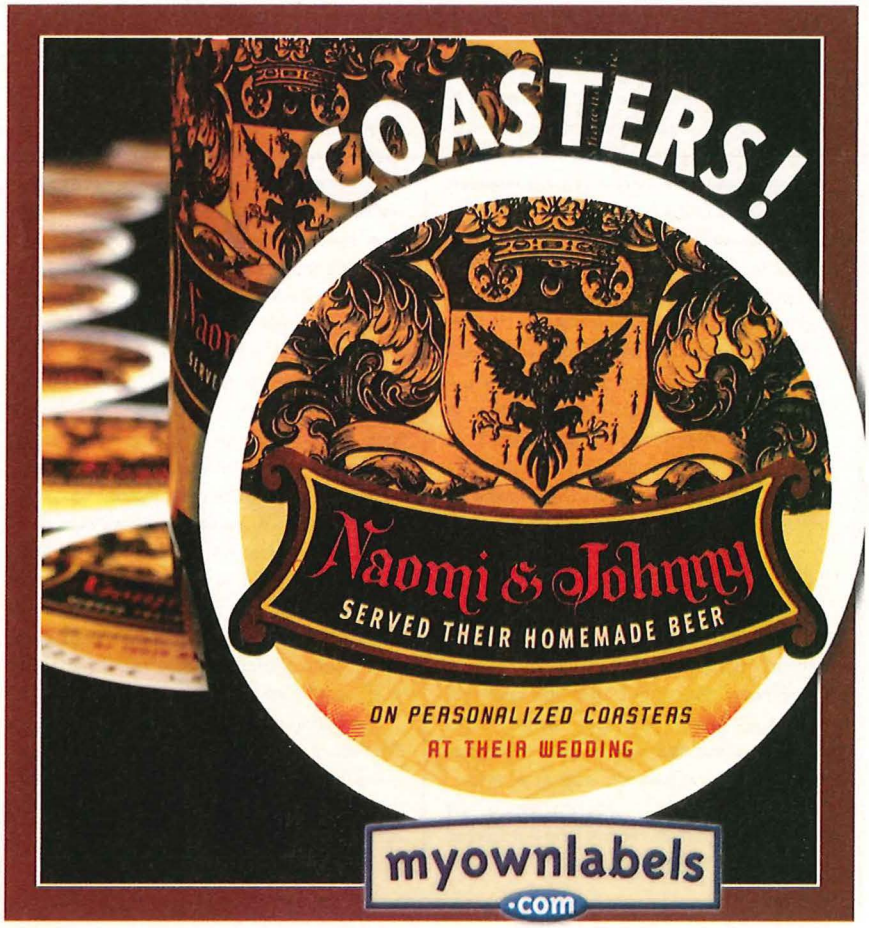
Wipe the rim of the jar with a clean dishcloth to remove any wort that would interfere with a good seal. Retrieve a band and lid from the saucepan, leaving the water behind, and place it on the mouth of the jar. Secure the band so that it is snug, but don't twist it on tightly. When the jars are heated in the boiling water bath, the expanding air in the headspace of the jar needs to be able to escape under the lid and band if necessary. Then immediately return each filled jar to the canning pot. Repeat the process with all eight of the jars until they are all properly filled and immediately returned to the canning pot.

As you fill the jars and return them to the canning pot, the filled jars will obviously displace more water than when they were open. When the water level in the pot rises more than a few inches (~7 cm) over the filled jars, you can empty the water from subsequent jars in the sink instead of back into the canning pot.

Sanitizing the Closed Jars

Once all the jars are filled, fitted with a lid and band and placed back in the canning pot covered with at least a couple inches of water, bring the water in the pot to a gentle boil if it is not there already. Let it continue boiling gently for at least a half an hour. During this processing-time, the jars and their contents will be sterilized from the heat.

If the water level looks like it will drop to the point that the jars are no longer submerged, add boiling water to the pot to restore a level of 2–3 inches (5–8 cm) above the jars.



BOTULISM WARNING

In home food preservation, foods are divided into "high-acid" foods, with a pH below 4.6, and "low-acid" foods, with a pH above 4.6. High-acid foods can be safely canned using the boiling water method. It is recommended that low acid foods be canned in a pressure cooker, where the increased pressure means that water boils at 240 °F (116 °C) or higher. The pH of boiled, unfermented wort is around 5.0–5.2, making it a low-acid liquid.

The reason for the high-acid/low-acid distinction is that spores of the bacterium *Clostridium botulinum* can survive in low-acid foods, even if they have been heated to 212 °F (100 °C). *Clostridium botulinum* produces 7 different classes of botulinum toxin, labeled A through G, and all are powerful neurotoxins. Botulinum type A, the most toxic, is 15,000 times more potent than VX nerve gas.

Botulinum toxins stop impulses in the nervous system from triggering muscular contractions. Symptoms of botulism usually arise 24–36 hours after exposure to the toxin and include dry mouth, weakness, double vision, vomiting, depressed breathing and a progressively intensifying paralysis leading to death.

The presence of *Clostridium* spores in raw honey is why doctors recommend not feeding it to infants or small children.

Although spores of the bacteria are found almost everywhere, cases of botulism are actually relatively rare. Most years, around 110 cases are reported in the US, with most occurring in infants or small children that have eaten honey or other affected foods. On average, less than 30 cases per year result from improper home canning.

In fermented wort (i.e. beer), the alcohol content, low pH (4.0–4.4) and anti-bacterial components in hops prevent *C. botulinum* from surviving. In preserved, unfermented, lightly-hopped wort, it is possible for the bacteria to grow. Although the bacteria will die if the wort is fermented, any toxins produced by the bacteria will not be neutralized.

To minimize the possibility of botulinum poisoning, can your starter wort using a pressure cooker or add acid — such as phosphoric or lactic acid — to your starter wort such that its pH is 4.6 or below if you are using the boiling water method. (High hopping levels alone are likely not enough.)

The boiling water method is presented here because it has been used successfully for many years, but it does allow for the possibility of botulinum poisoning. Although the probability of this is low, the consequences can be severe if it does occur.

Removing and Cooling the Jars

At the end of the processing time, carefully remove the jars from the boiling water bath with the jar tongs and place them on a clean dishtowel with at least a half-inch (2.3 cm) of space between the jars. Cover the jars with the rest of the (or another) dishtowel to prevent excessively rapid cooling.

At this point, you want the jars to cool gradually at room temperature. Don't place the jars by an open window or other source of rapid cooling or the jars may crack from too rapid of a temperature change. As the jars cool you may hear the characteristic "dink" sound as the lids are drawn downward as the wort and air in the jar headspace cools and contracts sealing the lid securely to the jar.

The Finished Product

Once the jars are cooled to room temperature, they can be moved to a cool, dry cupboard for long-term storage. If everything went as planned, the sterile wort should last almost indefinitely. If the wort

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becomes discolored or the lid begins to bulge upward, all is not well and any suspect wort should be dumped down the drain. However, I have been using this method for many years and have yet to have a failure.

Alternate Method

The method described here is what many home canners use for canning fruit or tomatoes or other "high-acid" foods. If "low acid" foods, such as meat or most vegetables, are to be preserved, a alternate method of canning is used in order to minimize the possibility of botulism (see sidebar on page 46).

The alternate method of canning is to use a pressure cooker instead of a pot of boiling water as your sterlizer. You follow the same basic procedure as described, except the jars are boiled inside the pressure cooker. The jars sit in 2–3 inches (5–8 cm) of water — instead of being submerged — and are boiled for 10 minutes in a closed, but not sealed, presure cooker. After 10 minutes, the pressure cooker is sealed and the jars are heated under pressure for 30 minutes.

The pressure cooker is then removed from the heat and left to slowly depressurize at room temperature. (Attempting to cool the pressure cooker or rapidly release the pressure will crack the jars.)

The jars are then removed and allowed to cool as in the previous method.

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Jon Stika wrote "Sweetgrass Ale" in the May 2003 issue of Brew Your Own.

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Troubleshooting

Fix your brewing problems fast

by Chris Colby

One of the nice things about homebrewing is that it is fairly forgiving. Most small errors do not usually result in disaster. Still, it does happen that a homebrewer will hit a stretch when his (or her) beers aren't turning out as they should. If you brew more than a couple bad beers in a row, after having brewed successfully before, this can be very discouraging. The good news is, if you brewed good beer before, you can do it again — you just need to identify and correct the problem. In this article, I'll tell you how to troubleshoot your brews and get your brewing mojo back.

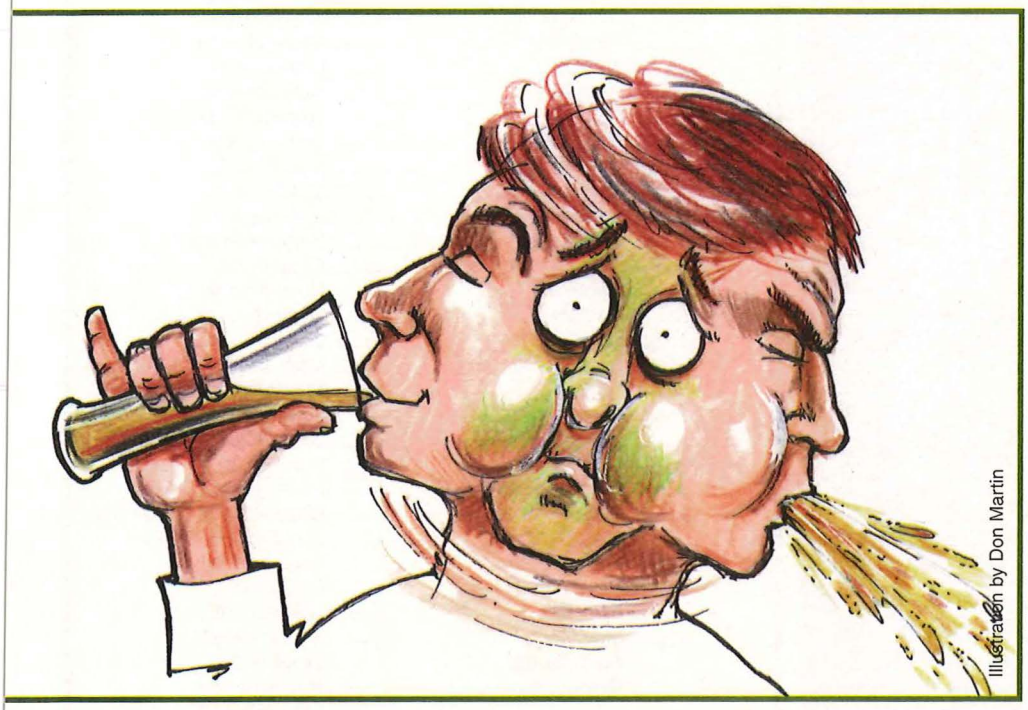

Illustration by Don Martin

What not to do

Before I get to steps you should take, let me review the things you should avoid. The first is getting discouraged. As I said, if you brewed good beer before, you can do it again. And, if you troubleshoot your way to the problem, you'll feel even better knowing that not only has your beer returned to form, but you've also identified the problem and can avoid it in the future.

The second thing to avoid is changing everything you can in your recipes or brewing procedures. If you hit a rough patch, it's understandable that you may consider completely revamping your brewing practices. With the wealth of information available from homebrew club members, online forums, books and magazines, you may consider trying out some new recipes or techniques — after all, your old ways quit working, right?

This is actually a bad idea for a few reasons. The first is, if you brewed good beer before, your old ways did work. You just need to find the new monkey wrench in the machine.

Secondly, if you try three or four new things in a batch of beer, your new procedures may cause you new unforeseen problems. Then you will have multiple problems to root out. Don't troubleshoot like Dick Cheney hunts, blasting away at everything that moves. Try to focus on a single target.

The one exception to this rule is if you were ignoring sound brewing fundamentals. If your old way of brewing involved, say, both underpitching and taking chances with sanitation, you should correct both of those things the next time you brew.

Finally, don't take the opposite approach, simply brewing and rebrewing your failed beers without changing anything. If your beers went from good to bad, there is a reason; and the odds that that reason will simply disappear are fairly low.

Looking for trouble

Troubleshooting is really just applied common sense. If something has gone wrong in a machine, you would simply test each part of the machine until you found the problem. In many cases, the problem itself may suggest which part to test first. (If you turn the ignition key on your car and nothing happens, you're more likely to find the problem if you check the battery rather than your tire pressure.) Most homebrew books have a troubleshooting table that lists common problems and their most likely causes. (There is also a table compiled to accompany this piece online at www.byo.com.) If your problem can be found on one of these charts, you can stand on the shoulders of giants — or slightly overweight middle-aged homebrewers (like myself) — and have the most likely cause of your problem pointed out to you. If this doesn't solve your problem, read on for the general approach to troubleshooting problems in your homebrew by yourself.

Attention newbies

The first thing to do whenever you suspect you have a bad batch of beer is to give it time. Never dump a batch because something smells, tastes or looks funny during fermentation or conditioning. Fermentation can generate a lot of

unpleasant smells and green beer often has an unpleasant taste. What looks like mold or contamination may just be what a certain strain of brewers yeast looks like. New brewers are often too quick to pull the plug on a batch when it is simply going through the normal progress of fermentation and conditioning.

If your beer has carbonated and has been in the fridge for a couple weeks and it still tastes bad — or is getting progressively worse — then it *is* time to figure out what the problem is.

Troubleshooting on your own

If you can't find your problem on any chart, you'll have to ferret it out yourself. The first step in doing this is to try to identify everything that was different between your bad batches of beer and previous good batches. Sometimes, the differences are obvious — maybe you just moved and you know your water is harder or softer than you were used to. Maybe you tried out a new procedure, ingredient or processing agent.

Sometimes, though, the differences may be harder to find. Maybe the city switched wells or its water treatment methods and your water changed without you knowing it. Maybe your homebrew shop started getting its extract from a new source. Maybe your thermometer suddenly went out of whack and you didn't catch it. I recall hearing a story several years ago about a brewpub brewer whose beers suddenly lost their head. He tried adding wheat malt to his recipes, altering his mash schedule and cleaning his tap lines, all to no avail. Finally, he tracked the problem down to the glassware — the restaurant manager had ordered a different kind of dishwashing detergent and it was leaving a residue that interfered with head retention.

Identifying the difference between one batch of beer versus another becomes much easier if you keep a detailed brewing notebook. In my notebook, I write down not only the recipe and tasting notes for each beer, but lots of "useless" stuff such as when I start using new tubing, when I change CO_2 or propane tanks, when I start a new bag of Irish moss, what the weather is like and what music I'm listening to. (Hey, you never know.)

Good notes once helped me troubleshoot the problem in a horrible batch of porter I brewed. I noted in my lab notebook that I opened a new bottle of phosphoric acid for water treatment. The acid I was using came from a homebrew shop that bought the stuff in bulk and repackaged it. As it turns out, the stuff in the bottle wasn't phosphoric acid at all, but a pH buffer for calibrating pH meters. Without my notes, it probably would have taken me several brews to figure this out.

Your next brews

If you know, or strongly suspect, which difference caused your problem, simply brew the beer again, correcting for that variable. For example, if you were used to brewing with hard water, but the water at your new house is very soft, add some minerals to your water.

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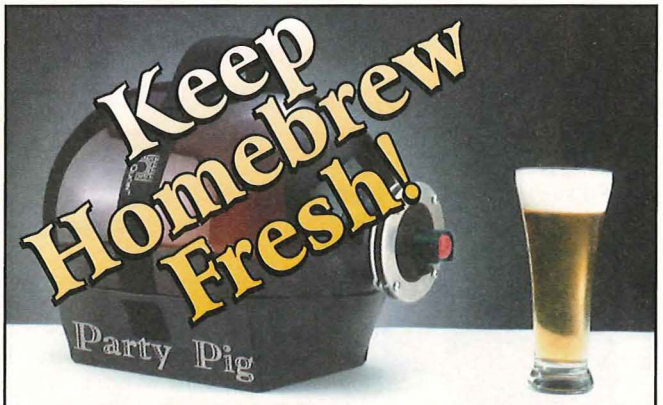

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Sometimes, you may identify several changes that you made in your bad batch. For example, if you make a different recipe every time you brew, plus try new procedures now and then, you've got a few different candidates for the problem variable. In this case, you want to cross as many candidates off the list as you can as quickly as you can. You can do this by going back and rebrewing a previous recipe with which you've had success. And, if you tried a new procedure in the bad batch, go back to your old ways.

If at first you don't succeed . . .

If your first guess at your problem doesn't pan out, try again to think of things that may have changed since your last good batch — especially things that may have changed on their own. For example, was your fermentation bucket or tubing nice and new then, but kind of crusty now? Is your dial thermometer slowly drifting out of calibration? When did you last change the cartridges on your water filter (or clean the lines from your keg)? Often, "creeping" problems may lurk in the background until they cross some threshold.

If you think you are going to need to make multiple batches of beer to find your problem, do yourself a favor and brew small batches. And, think about doing "mini-experiments" instead of brewing full batches, where appropriate. If you think, for example, that your CFC chiller is contaminating your beer, clean it, then run a gallon (~4 L) or so of simply-made wort (perhaps just some dried malt extract boiled in water) and ferment that. If it turns out contaminated, you've identified the problem without spoiling a whole batch of beer.

If you're absolutely clueless where to look next, start with things that have the most potential to affect your beer. Most beer is over 90% water, so changing your water source is a good place to go if your first best guesses don't pan out. Usually you find your problem before you get to the "stab in the dark" phase of troubleshooting, but it can happen.

The big picture

So, when you run into a problem with your homebrew, look for things that may have changed in your brewing procedures and try to identify the most likely cause of the problem. A troubleshooting chart is the best place to begin looking for information. Once you've identified the most likely cause of your woes, go back and brew a familiar beer, stressing brewing fundamentals and eliminating the suspect variable. If possible, test isolated parts of your procedure. Repeat this process until you've found the problem.

In all likelihood, you never need more than a couple "turns of the crank" to find your problem. If you do, don't give up — just think how sweet your beer will taste when you do solve the puzzle.

Chris Colby is the Editor of BYO.

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A troubleshooting table listing common problems and their likely causes.

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Burton Union

A homebrew version of an English fermentation system

Story and photos by Forrest Whitesides

Of the many unique and often complex fermentation systems over the long history of beer making, perhaps none can match the style and distinguished legacy of the famed Burton Union system. At present, you'll have to travel to the Marston, Thompson and Evershed brewery in England's Burton-on-Trent to see a working Burton Union fermentation system in operation. The brewery, which produces the world famous Marston's Pedigree ale (among others), is the only known commercial brewery still using the Union system.

The Burton Union system derives from England. The setup circulates yeast blowoff into a collection vessel then back into the primary fermenter. Here you can see the scaled-down version that we created for homebrewing.

Traditionally, a union system (later referred to as a Burton Union after becoming linked to its use in the Burton area) is a network of several wooden casks and troughs interconnected via copper plumbing. All of the casks work in union during fermentation, commingling their beer and yeast. As the beer ferments, pressure pushes some liquid up into long troughs above the casks (like blowoff in a homebrew setup), where the yeast settles out of suspension and the remaining volume of beer trickles back into the casks. This allows for easy harvesting of yeast — essentially a form of top cropping — for immediate reuse. It also minimizes the loss of beer through blowoff.

We can make use of two of the biggest advantages of a true Burton Union at home: easy yeast harvesting and minimal loss of brew volume. The second advantage also allows for brewing a given batch size in a smaller carboy — or use every bit of available volume in a larger carboy — because most of the blowoff liquid will be returned to the carboy during fermentation. In my experiments with this system, liquid loss from blowoff is kept at about 3–4 ounces (84–112 g) per 5 gallons (19 L) of wort. Volume loss from siphoning, however, is not affected by the union setup.

For this project, it is assumed that the carboy will be maxed out in terms of volume. This will give better results as far as yeast reclamation is concerned and will ensure that plenty of wort gets cycled through the collection vessel.

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- (1) 24-inch plastic racking cane $3
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- 4 feet, 5/16-inch tubing $3
- 4 feet, 3/8-inch tubing $3

The parts

Our homebrew-sized system will be a union of just two vessels: a 5-gallon (19-L) carboy and a 2-liter blowoff collection vessel. For the sake of safety and convenience, I chose a 5-gallon (19-L) PET plastic carboy and a generic square HDPE (high-density polyethylene) plastic jar, respectively. The two vessels will be connected via food-grade tubing and two plastic bulkheads. One piece of tubing delivers the pressurized blowoff foam (kräusen) from the carboy to the collection vessel. Once in the collection vessel, the foam returns to liquid form, allowing the yeast to settle to the bottom. The reconstituted wort is then returned, by gravity, to the carboy through the second piece of tubing.

Most of the parts for this project are available at many homebrew retailers (exceptions are noted). To find what you'll need to get your own Burton Union going at home take a look to the left, (assuming you already have a carboy and a standard airlock).

A quick bit of drilling

First, we'll need to drill some holes: three to be exact, and all three will be approximately ½-inch in diameter. I used a ½-inch paddle bit, but anything that will make a ½-inch hole will do the job. WARNING: Always wear safety glasses when using power tools!

Drill the first hole approximately 1.25 inches (3.2 cm) from the bottom and the second hole approximately 2 inches (5 cm) from the top of the 2-liter square plastic jar (Fig. 2). Now drill a hole in the center of the jar's screw-off lid.

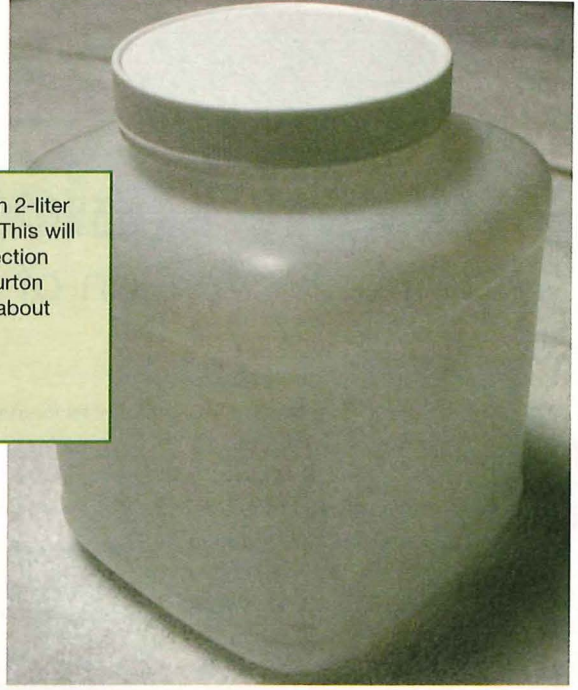
Grommets, gaskets, and bulkheads

Unscrew the removable nut from one of the bulkhead fittings (Fig. 3) and slide a Grolsch-style gasket on the shaft until it is flush with the stationary nut (Fig. 4), and then push the shaft through the inside bottom hole of the square plastic jar (Fig. 5). Now slide another gasket onto the shaft until it is flush with the jar and then tighten the removable nut on the shaft to seal the bulkhead (Fig. 6). Repeat the same procedure for the top hole bulkhead fitting.

To complete the seals on the collection vessel, fit the bucket lid grommet into the hole in the square jar lid (Fig. 7). Just add an airlock, and you've got a working blowoff collection vessel (Fig 8). We're halfway finished.

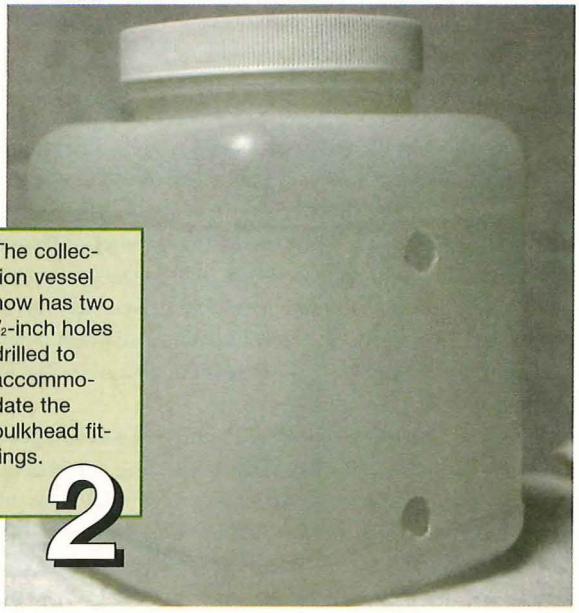
Plumbing the delivery system

Now we need to use the carboy cap, racking cane and tubing to create a system to get the blowoff to the collection vessel and provide a way for the wort to return to the carboy. The collection vessel needs to sit at least 6 inches (15 cm) or so above the carboy, so go ahead and figure out where you're going to be using your new Burton Union system. Once you have that determined, you'll be in a better position to determine how long your blowoff and return tubing should be.



Here is a common 2-liter HDPE plastic jar. This will be the yeast collection vessel for your Burton Union and costs about $4.00 (U.S.).

1



The collection vessel now has two ½-inch holes drilled to accommodate the bulkhead fittings.

2

Here are two 9/16-inch outside diameter polypropylene bulkhead fittings used to create tubing connections in the collection vessel.

3

But before you cut the tubing, remove the small white caps from the orange carboy cap and slide the racking cane in the larger diameter center nipple. This will take a little bit of effort, but it will fit. The idea here is to slide the racking cane in far enough so that when the carboy cap is seated on the carboy, the racking cane will dip a few inches below the level of the wort during fermentation. You may want to fill the carboy with water to figure out exactly how far in to slide the racking cane. Once you have the racking cane at the right depth, use a felt-tip pen to mark a line on the cane approximately 2 to 3 inches (5–7 cm) above where it sticks out of the carboy cap. Remove the racking cane and cut it on the line you marked. Depending on where your collection vessel is

positioned in relation to the carboy, it may be advantageous to cut the bottom of the racking cane and leave the 90-degree elbow intact. Each setup will be unique, so use common sense in determining how to cut the racking cane.

Now replace the racking cane in the carboy cap with the cut end of the cane sticking a few inches above the large center nipple of the cap (Fig. 9). Connect the 5/16-inch tubing to the racking cane and measure off the appropriate length to connect it to the bottom bulkhead fitting on the collection vessel. Again, this length will vary from setup to setup. Now fit the 3/8-inch tubing over the smaller diameter nipple on the carboy cap and measure off the right length to connect it to the top bulkhead fitting. The Burton Union is complete (see page 53).

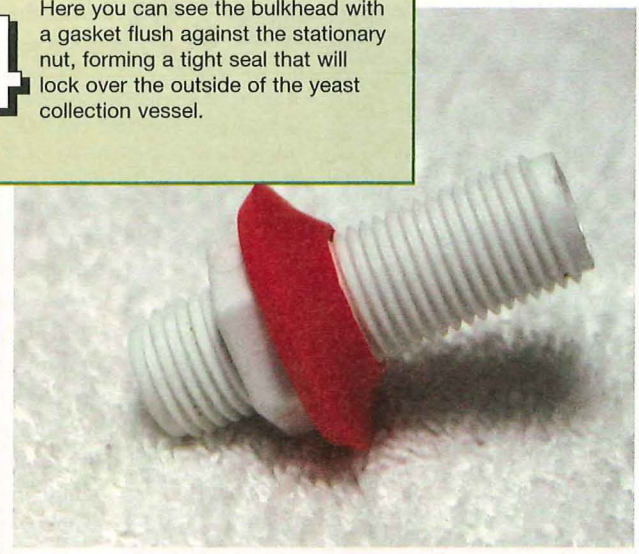
Greed: wort volume vs. yeast

Choosing a recipe for use with your new Burton Union will depend on whether or not you are interested in using it primarily for minimizing brew volume loss or as a means to harvest yeast.

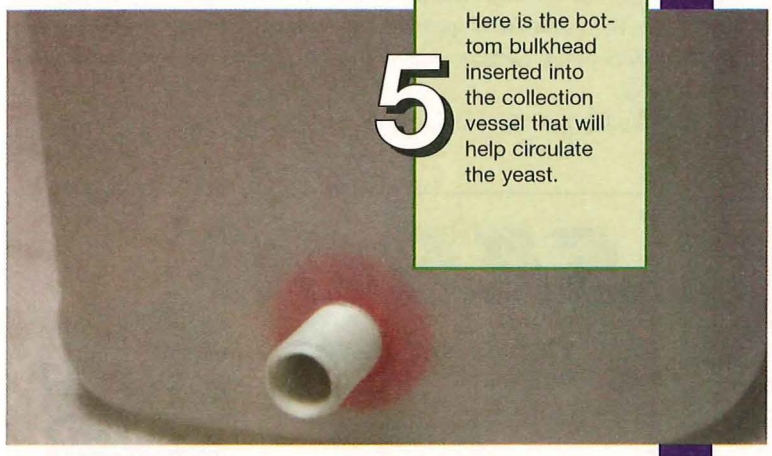
If your main objective is to end up with more volume, then any recipe will work just fine. All you need to do is make sure that the final volume that goes from your kettle into the fermenter makes the most use of the volume of the carboy. Fill the carboy up to approximately 2–3 inches (5–7 cm) below the bottom of the neck to be certain you get maximum utility from the wort-saving capabilities of the Burton Union system.

However, if your interest in this system lies in its ability to capture yeast during the height of fermentation, then recipe formulation is important in order to get the best results. Perhaps most critical is the choice of yeast. You should use a vigorous strain that is categorized as top-cropping. Possible yeast choices from Wyeast include WY1007, WY1010, WY1318, WY2565, WY3068, WY3333, WY3638, WY3787 and WY3944. Possible top-cropping strains from White Labs include WLP022, WLP300, WLP320, WLP350, WLP400 and WLP570. The preceding lists are a starting point and are by no means exhaustive. Any yeast that ferments vigorously and exhibits at least minimal top-cropping behavior will likely yield a healthy yeast deposit in the collection vessel. Pitching a large, healthy starter will help as well. Also, you may want to consider pellet hops when you formulate your recipe, as leaf hop particulate matter can easily clog the blowoff tubing.

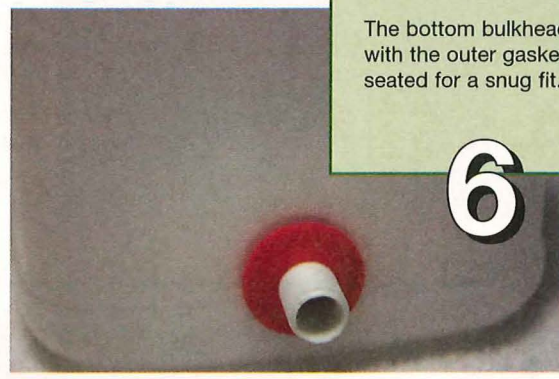
I've tested this specific setup with several recipes, the most effective of which for yeast harvesting was a simple extract hefeweizen using a big starter of WY3333. If you can get enough yeast going into the collection vessel, it will overflow back into the fermenter, effectively repitching continuously



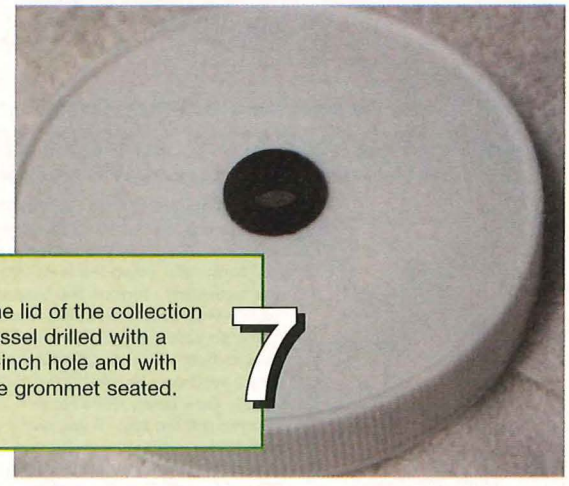
4 Here you can see the bulkhead with a gasket flush against the stationary nut, forming a tight seal that will lock over the outside of the yeast collection vessel.



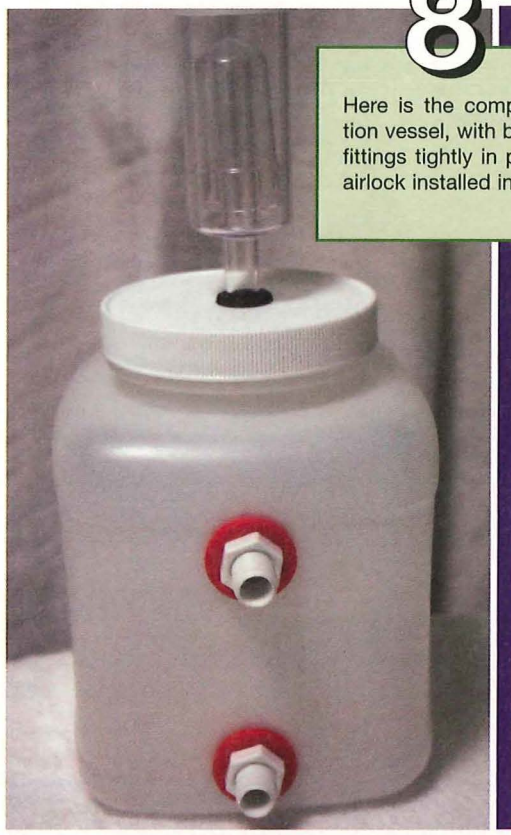
5 Here is the bottom bulkhead inserted into the collection vessel that will help circulate the yeast.



6 The bottom bulkhead with the outer gasket seated for a snug fit.



7 The lid of the collection vessel drilled with a 1/2-inch hole and with the grommet seated.



Here is the completed collection vessel, with both bulkhead fittings tightly in place and the airlock installed in the lid.

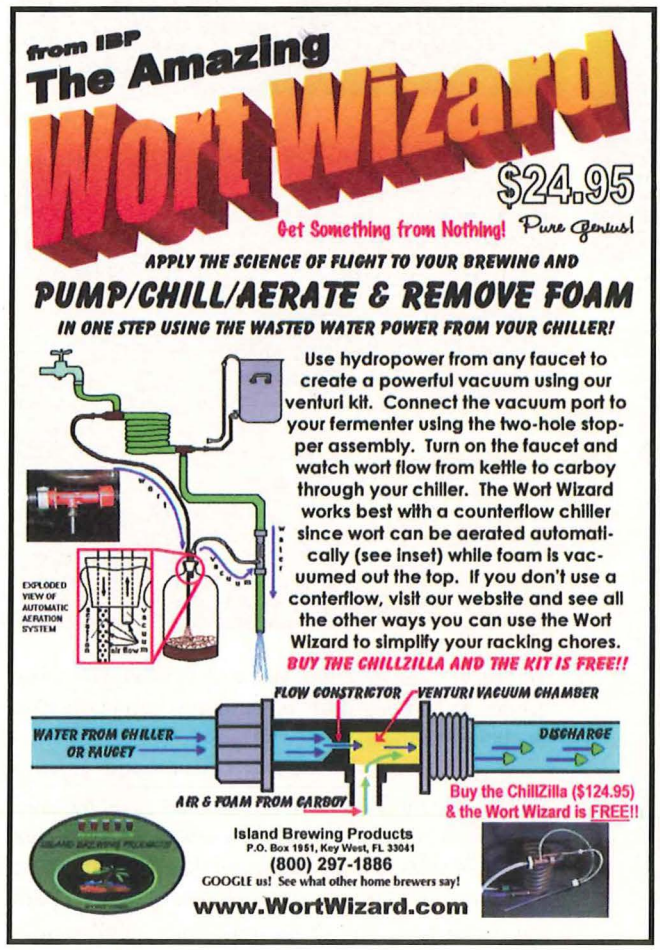
during the height of fermentation. Another interesting consideration when using our small-scale Burton Union is that there are two simultaneous active fermentations happening in a more or less closed system: one in the fermenter and one in the collection vessel.

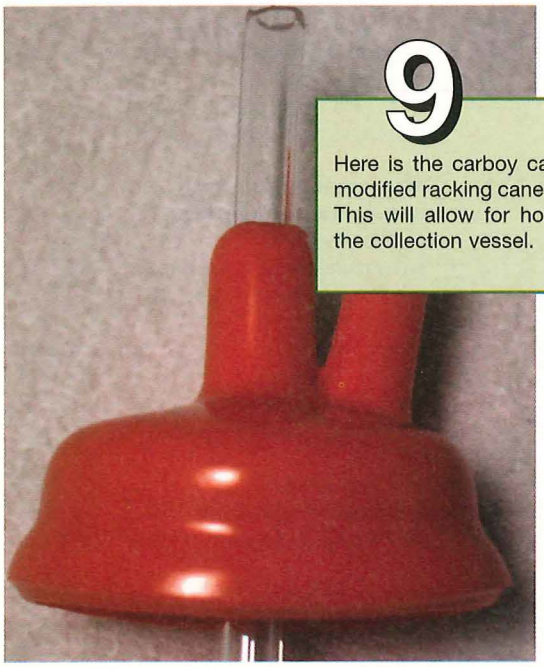
Alternative design considerations

The above guide for putting together a Burton Union system at home is just a general suggestion; just one way in which such a system could be put together. There are probably dozens, if not hundreds, of alternate methods to arrive at the same end product. For example, you could use a drilled carboy stopper instead of a carboy cap, or you could use a completely different type of container for the collection vessel. I actually designed a second yeast collection vessel using a Nalgene LEXAN square bottle (see fig. 10). Or, for a more true-to-the-original union setup, consider connecting two (or more) carboys to a single collection vessel. Yet another possibility includes leaving the top off of the collection vessel, creating a pseudo-open fermentation. Feel free to substitute the parts listed above with those you find available to you or parts you feel would better suit your specific brewing setup.

However there is one key design concept that should be followed in order to make things work: the positioning of the racking cane. The racking cane must dip below the wort in the fermenter in order for the Burton Union to work efficiently. The reason for this is because when the pressure from the CO_2 in the fermenter builds up, the kräusen is pushed up toward the top of the carboy. Positioning the bottom of the racking cane below the wort level allows it to act as a simple check valve.

The pressure building in the carboy is released much easier by blowing off





9

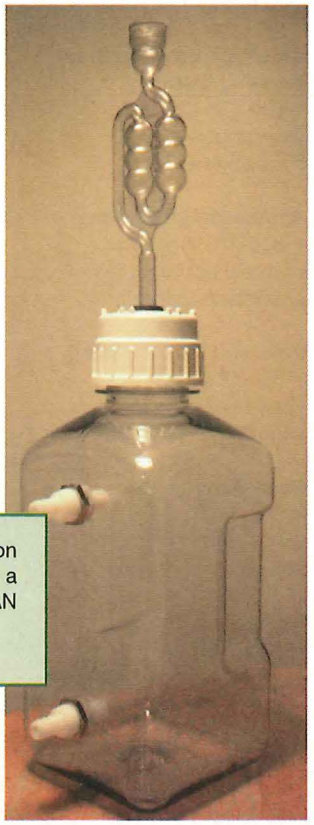
Here is the carboy cap with a modified racking cane inserted. This will allow for hook up to the collection vessel.

the kräusen than by pushing out the much heavier wort. This keeps the blowoff coming out of the carboy in one tube and the wort returning to the carboy in the other. Just about everything else is configurable to your specific needs or whims.

Feedback welcome

As you use your Burton Union system, please send feedback on recipes that work well or alternative equipment setups from which you think other brewers may be able to benefit. Experiment with all facets of the process, and by all means, have fun!

Forrest Whitesides is an editor by trade, homebrewer by choice and author by assignment. We welcome him on board as a new "Projects" contributor.



An alternative collection vessel design, using a 2-liter Nalgene LEXAN square bottle.

10

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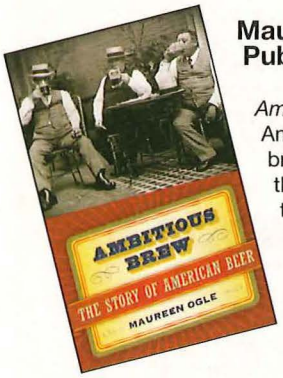

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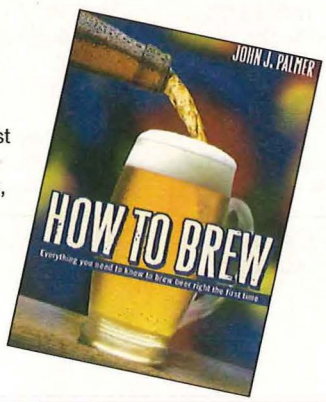

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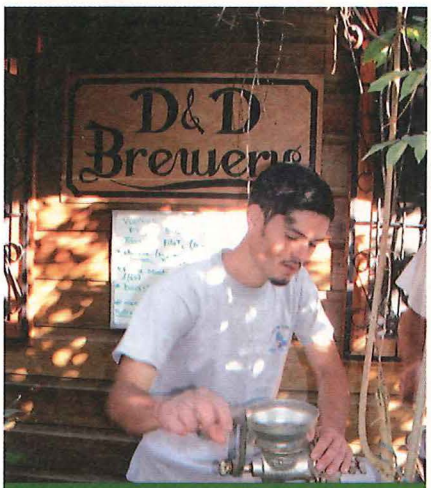
Honduras Brewing

A homebrewer relocates to Central America

by Michael Tepiccione • Jonesborough, Tennessee

After 27 years of teaching high school, I decided to call it quits and do some serious traveling. My wife and I wanted to experience Central America for a couple of months. Our plans were to fly into Honduras, spend about three weeks there and then work our way down to Panama. While in Gracias, Honduras, we decided to go to a hot springs. When we were in a pool of wonderful soothing water, we talked with a group of people from Scotland that were working with the Save the Children foundation. They told us about a homebrewer on Lake Yojoa that they had visited and drank some of his great beer! By this time I was sick of the Pilsners and lagers that Honduras had to offer, so the next day we took four buses, traveled for hours and reached the lake.



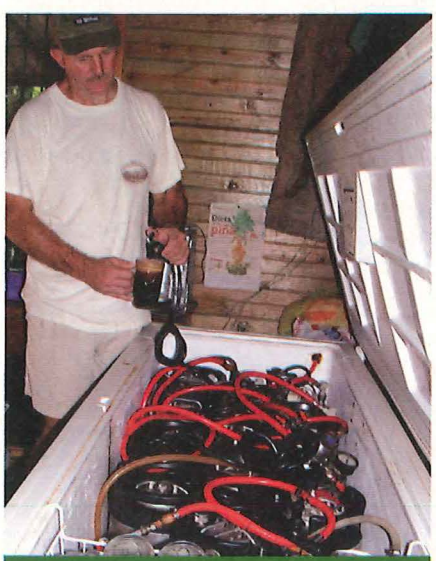
Freddy has been an assistant at D & D for seven years. He is crushing grain.

We landed in a small town called Pena Blanca. A taxi picked us up and I told him I wanted to get to D & D Bed and Breakfast, he acted like he knew the place and off we went. The main road was paved and we traveled about 2 miles and he let us off at the end of a dirt road. A small sign at the road said, D & D Brewery. We got our packs on our back and headed down the road. At first, I didn't see any brewery so we decided to ask at the next house:

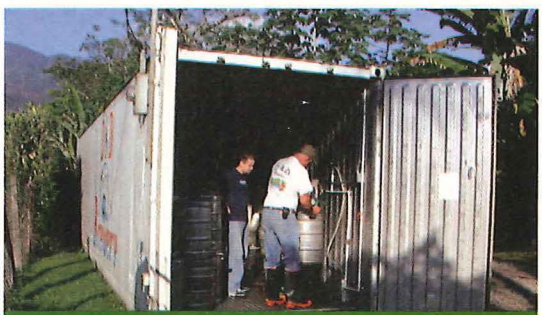
"D & D Brewery?" — "No!"
"D & D Bed and Breakfast?" — "No!"
"The man who makes his own beer?" — "Oh, the Gringo! Right down there and to the left!"

By this time we were quite hot and tired and hoped there would be a room available for the night. We saw a yard with a large cargo trailer with D&D Brewery on the side and we entered. When we did, a man came up to us and said, "You look like you need a good beer!" I agreed and before you knew it, I was drinking a cold Porter, fresh out of the tap! Later, the owner, Robert Dale, helped carry our packs to a basic, but very clean and comfortable room, for a much needed rest.

The man is Robert Dale, owner of D & D Brewery. He is originally from Oregon and started visiting Honduras around 1990 to hunt crystals in the mines out in the country. He found that he could bring back crystals to the states and sell them for enough money to pay for his trips. Honduras was a great place to vacation so he purchased about an acre and a quarter of land in 1997 with the idea of living there someday. In 1999 he sold his house, left his job of 14 years as a civil engineer, and started to gather equipment enough to run a small brewery in Honduras. Within six months, he was brewing and selling homemade beer and homemade sodas on his front porch.


As you can see, D & D brews small batches and offers a variety of styles.

The land Robert had purchased in 1997 had an old house on it, along with 61 species of orchids, banana trees, coffee plants and a good source of artesian water. (Good water is essential for good beer!) After many renovations, he ended up with four rooms to rent, a restaurant, a pool, a small coffee farm, and a place to live for he and his family.


A major component of the brewery is the trailer that carried Robert's possessions from the U.S.

The Monday after we arrived, Robert and I went through the total brewing process. We brewed 10 gallons (38 L) of porter and 10 gallons (38 L) of amber. Robert says that he uses extracts for brewing along with pelletized hops instead of brewing all-grain beers. Due to the weather and the storage conditions, extract works out much better. His set up is simple; old beer kegs cut and made into cookers, heated by propane gas. To cool his beer he uses a homemade submersible chiller. After the yeast has kicked in he transfers his potential brew to a 10' x 8' room in the back of his cargo container that is cooled with a 150,000 BTU air conditioner, keeping the room at a constant temperature. Once his beer is ready, he kegs it and transfers it to a drop in freezer and hooks it up to his CO_2 units ready to serve to his customers in the restaurant.

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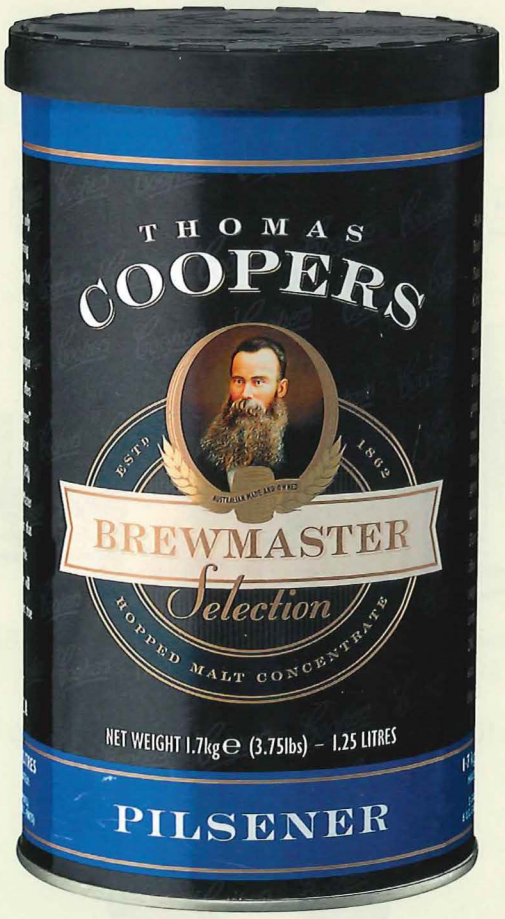

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