SPECIAL EQUIPMENT ISSUE! GEAR, GADGETS & PROJECTS

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THE HOW-TO HOMEBREW BEER MAGAZINE

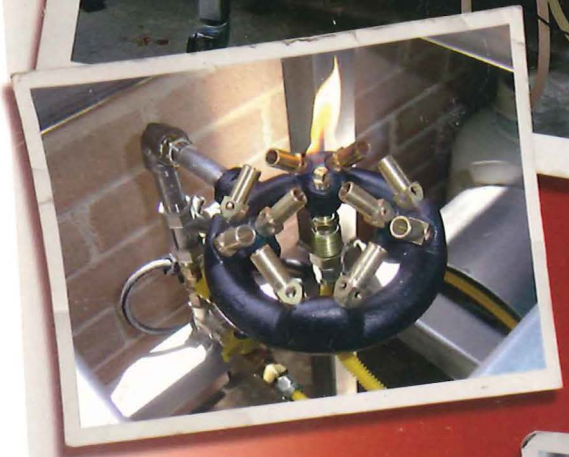
NOVEMBER 2007, VOL.13, NO.7

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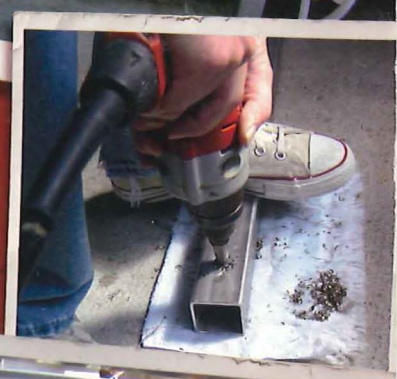


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Brew Your Own
THE HOW-TO HOMEBREW BEER MAGAZINE

NOVEMBER 2007
Volume 13 Number 7



Features

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by Betsy Parks
What's old is new again. Dogfish Head Brewery has been brewing Midas Touch, a beer based on the residue found in an ancient urn, for years. Now they've added a second historically-recreated brew to their lineup — Chateau Jiahu. Learn how to clone these "archaeobeers."

36 Back in Black: The Truth About Black Patent Malt
by Kristen England
Burnt? Acrid? Or just misunderstood? Learn the truth about how black malt is made and what it's good for. **Plus:** four clone recipes

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by Lonnie McAllister
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by John Palmer
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RAISE A GLASS!



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HERE'S TO BEER

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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.

Brew Your Own
THE HOW-TO HOMEBREW BEER MAGAZINE

EDITOR
Chris Colby

ART DIRECTOR
Coleen Jewett Heingartner

ASSISTANT EDITOR
Betsy Parks

TECHNICAL EDITOR
Ashton Lewis

CONTRIBUTING WRITERS
Steve Bader, Thom Cannell, Bill Pierce, Marc Martin, Terry Foster, Glenn BurnSilver, Kristin Grant, Forrest Whitesides, Jamil Zainasheff

CONTRIBUTING ARTISTS
Shawn Turner, Jim Woodward

CONTRIBUTING PHOTOGRAPHER
Charles A. Parker

CANINE ASSOCIATE
Heidi

PUBLISHER
Brad Ring

ASSOCIATE PUBLISHER & ADVERTISING DIRECTOR
Kiev Rattee

ADVERTISING SALES COORDINATOR
Dave Green

BOOKKEEPER
Dara Wentworth

OFFICE MANAGER
Andrew Putney

SPECIAL PROJECTS MANAGER
Julie Ring

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How to reach us

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

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

Advertising Contact
Kiev Rattee
kiev@byo.com

Editorial Contact
Chris Colby
chris@byo.com

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

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

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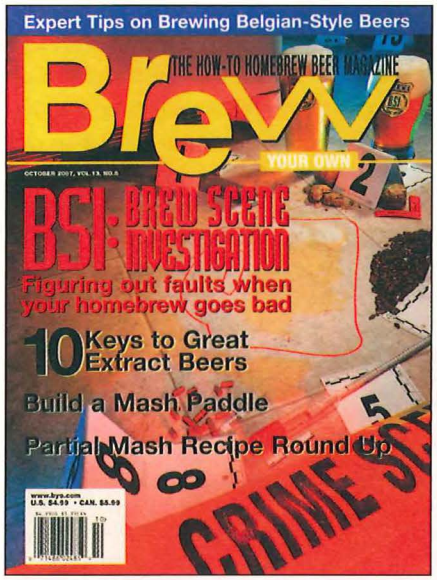
Cover Photo: Charles A. Parker

Evaluating Efficiency

Regarding the partial mashing article ("Partial Mash Permutations" October 2007), one issue not discussed is the efficiency of conversion using this process. (Of course in the interest of time and space, I understand that this would be a lengthy subject on its own.)

For giggles, I entered into my brewing software (BeerSmith) two of the partial mash recipes from the article (House of Paine and Axe of Angus) — just the malt bill — to see what specific gravity (SG) was reported. On the first, I had to set efficiency to 43% and the second to 60% to get the software to match the recipes' SG.

Mark Raker
Potomac, Maryland



Article author and BYO Editor Chris Colby responds: "The assumed extract efficiency was 65% for all the recipes in the partial mash story. I would guess that the discrepancy in BeerSmith's calculations vs. my numbers lies in the extract potential of the liquid malt extract (LME). LME varies in water content, and therefore extract potential. (Put simply, some are slightly thicker than others.)

"For all of our extract recipes, BYO assumes an extract potential of 1.033 for LME, a value at the low end of the scale (1.033–1.037). If BeerSmith uses 1.035 or 1.036 as their extract potential for LME, that would explain why it came up with 60% extract efficiency for Axe of Angus.

"The 43% calculated for House of Paine, however, seems way too low. Both these recipes use the same amount of grain and almost the same amount of extract. Both end up at 1.048. So, the extract efficiencies should end up a lot closer than that, even if the assumed specifications for other ingredients differ. (I would double-check that you typed the values in correctly.)

"Brewing calculators are fun. I have a couple and it's always interesting to type recipes into them and see how the values they kick out differ. Usually the differences are small — and occasionally non-existent — but sometimes I run across something surprising.

"Given the different default assumptions each software package makes for things like extract efficiency, extract potential of ingredients and hop utilization curves, the estimates they make won't all agree. However, most software packages allow you to change the default number to more closely match your ingredients and procedures. Still, the beer that ends up in your glass is far more important than the numbers on your screen. I'd rather drink a nice homebrew than stare at the spreadsheet describing that beer.

"In the article, I skipped discussing extract efficiency because I wanted to focus on the different base grains stovetop brewers could try and the different procedural variations they could employ. In most cases, the extract efficiency brewers obtain using this method will be lower than the extract efficiency obtained by all-grain brewers. Given the small scale of the mash, however, extract efficiency is one of the last things I would worry about unless my original gravities were much lower than the predicted OG of the recipe."

Up the Creek Without a Mash Paddle?

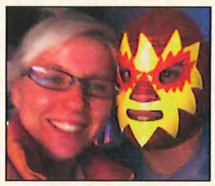
The mash paddle project in the last issue ("Make a Mash Paddle," October 2007) specifically indicated not to use red oak for a mash paddle. I have made a very nice mash paddle from red oak and it seems OK to me. Why not use red oak?

Steve Becker
via email

Different varieties of wood have different grain structures and different resin content. As such, some types of wood are more likely to impart off flavors to your beer. In the article, we gave the "safest" woods to use for the project. This doesn't mean that other types of wood absolutely wouldn't work. If you have made your own mash paddle from red oak and it doesn't seem to have any negative effects on your beer, by all means, keep using it.

Altered Ale

I just wanted to respond to the copper ale



Kristen England wrestles in Mexico under the stage name "el BJCP Continuing Education Directoro." (OK, not really.) He is the youngest Grand Master judge ever. (Really.) He has won numerous NHC and MCAB gold medals in addition to being named the 2005 Midwest Home Brewer of the Year and 2005 High Plains Brewer of the Year. He is also an active member of the St. Paul Home Brewers Club. In his spare time, Kristen recently received his PhD in Pharmacology from the University of Minnesota. He currently lives in St. Paul with his wife (left), 8 week-old daughter and a one-eyed dog.



Lonnie McAllister (Lonnie Mac) works as an aircraft designer by trade, hailing from Southeast Texas where beers are big and home breweries are real shiny! Brewing for seven years, he and his wife Moonbeam have a fledgling brewing podcast (found at www.alenuts.com). In this issue on page 44, he shows you how to build Brutus Ten, his 10-gallon (38-L), stainless steel, semi-automated, single-tier brewery.



Ralph Olson is the general manager and owner of Hopunion CBS LLC. While he admits he doesn't homebrew enough, he has been at it for more than 10 years. This hop expert has been buying, selling, handling, storing and processing hops for more than 25 years. He loves to work in the garden and go jeeping (as pictured here with his 1968 Landcruiser which has been with him for more than 20 years). He regularly contributes to *Brew Your Own* as a member of our Editorial Review Board.

recipe of Chris Colby's in the March-April 2007 issue of BYO ("Balanced Recipe Formulation," p. 38) . I have made this recipe 3–4 times and really like it, but the last time I made an adjustment to it by adding ¾ oz. Northern Brewer hops at 10 minutes. If anybody makes this recipe give it a try. It is a really good beer.

Dan Hodges
Thedford, Nebraska

Chris Colby responds: "Three-quarters of an ounce of Northern Brewer hops? At 10 minutes? Oh my god, you've ruined my recipe! Just kidding. Glad you liked it and found a way to modify it more to your liking. The article that the recipe appeared in was about balance and my copper ale is a very middle of the road beer in many respects. I've served it a couple times at fairly big gatherings and it seemed to both please craft beer lovers and also attract fizzy yellow beer drinkers. (I think that, because it doesn't look yellow, they approached it with a somewhat open mind.) As a middle of the road beer, there certainly are a lot of ways it could be tweaked to suit someone else's tastes. With homebrewing, you can always take a recipe as a starting point and alter it to your preference, making it your own.

Step Up Starters?

When using the Wyeast range of liquid yeast, what size packets have you witnessed your readers using? The only range that is available to me is the Propagator range which I believe has 25 billion cells. The larger packet obviously has more. I have been making half-gallon starters with light malt extract, and leaving them for two days, but I think I'm underpitching because my last brew tasted a bit appley? Should I make a starter up in steps or pitch the yeast into final volume (eg., 2 quarts or 2 liters for 5 gallons).

Your magazine has helped my homebrewing so much!

Matthew Brown
East Sussex, England

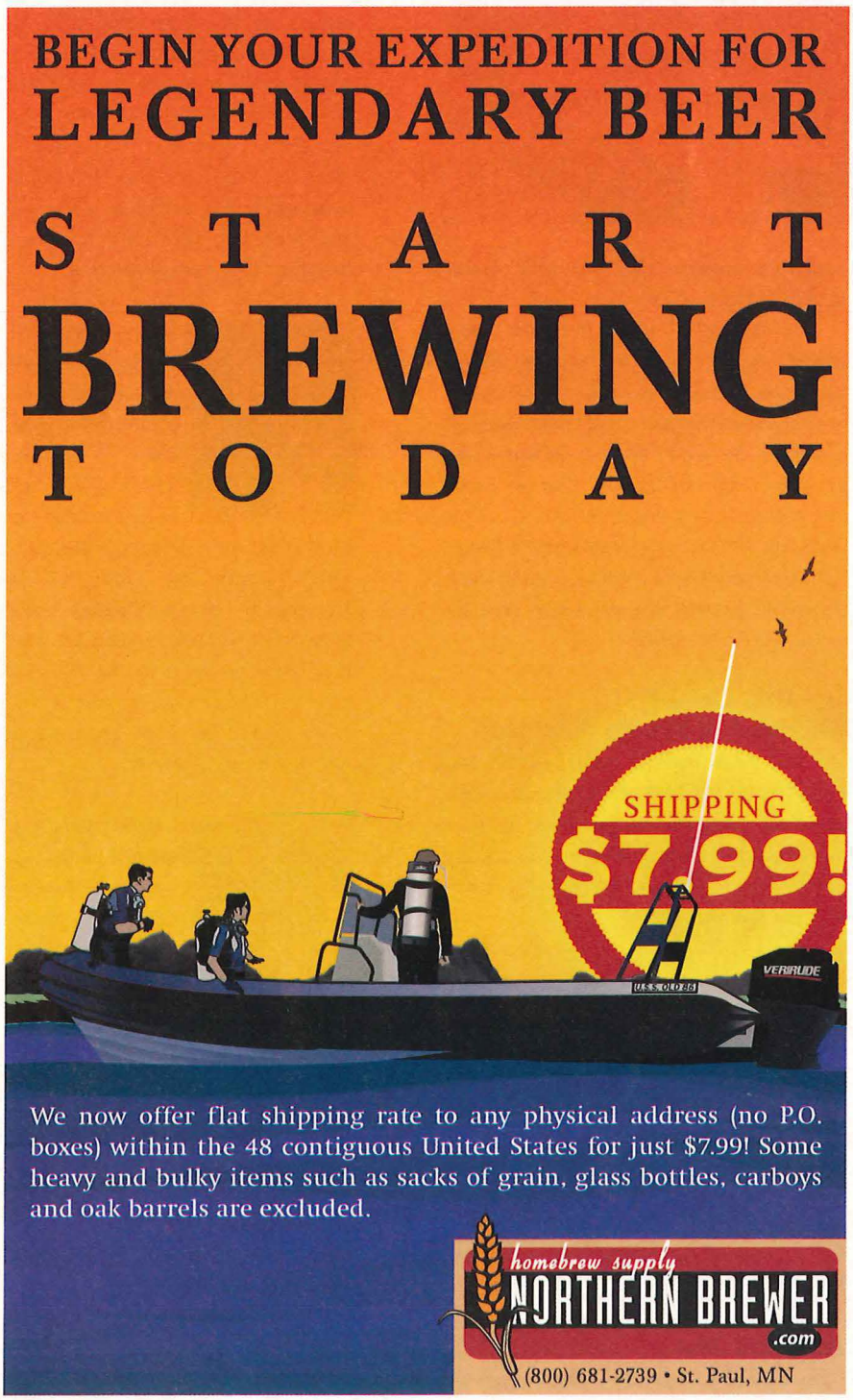
We've been assuming that most Wyeast users have switched to the newer, bigger Wyeast packs (called Activators). Thanks for reminding us that these aren't available everywhere yet.

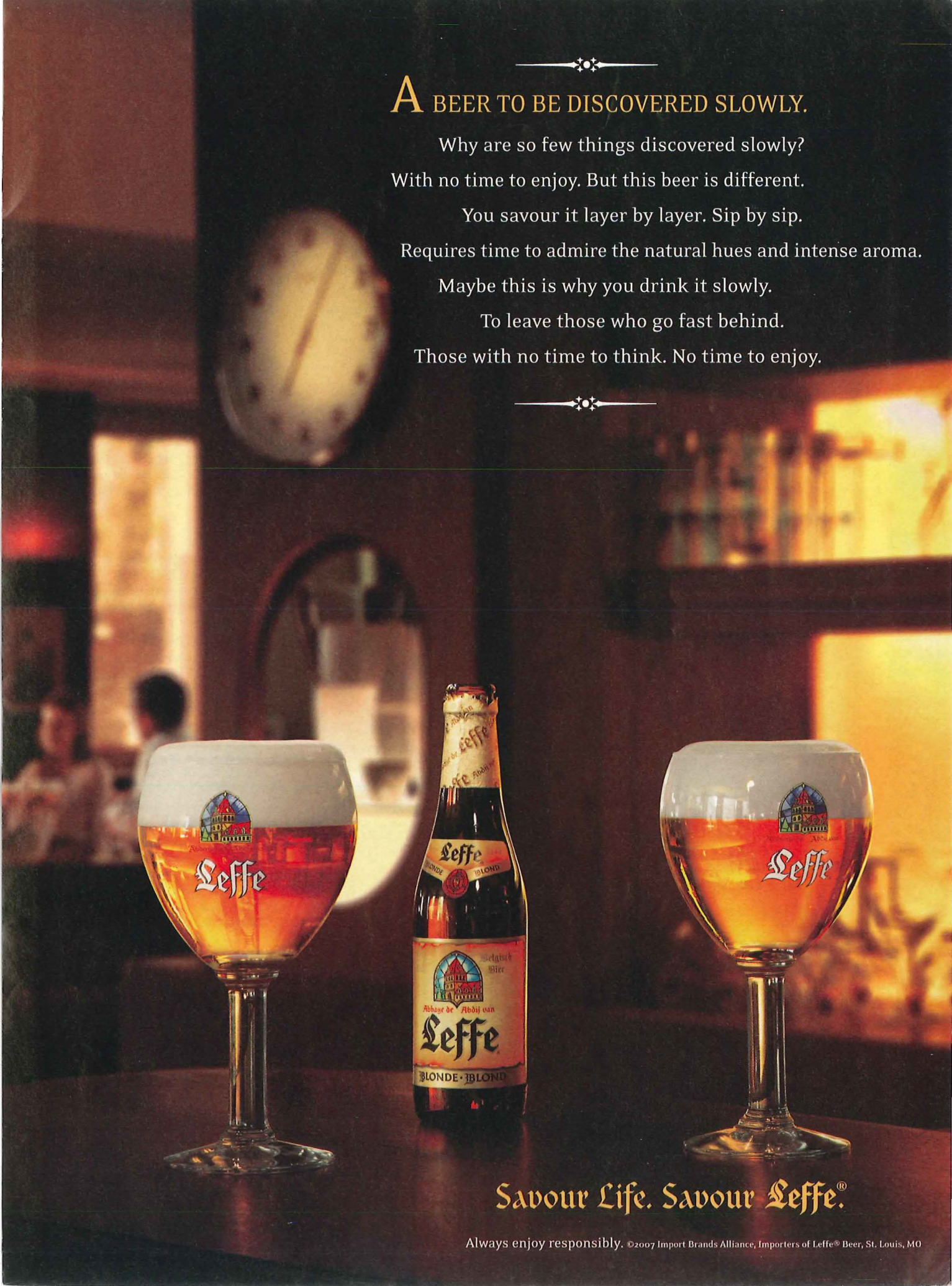
Wyeast reports that their Propagator packs contain a minimum of 25 billion cells. They recommend pitching the yeast from a pack into a 1–2 quart (~1–2 L) yeast starter with a specific gravity of 1.030–1.060.

In commercial breweries, pitching rates vary, but 1 million cells per milliliter per degree Plato of wort is a commonly stated rule of thumb. If you make your starter wort at a specific gravity of 1.032 (~8 °Plato), 25 billion cells is enough to pitch 2 quarts (2 L) of starter wort at the optimal rate.

Of course, optimal and what will work well enough are two separate things and we wouldn't worry pitching this quantity of yeast into a 1 gallon starter (3.8 L) starter at 1.032. With proper aeration, the yeast would only need to replicate once to reach the proper density.

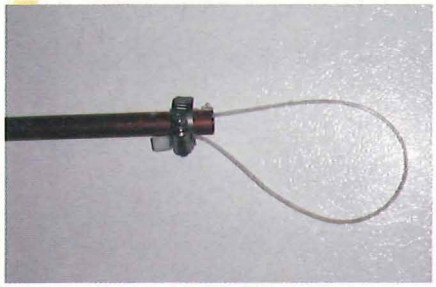
The aroma of apples in a beer usually indicates the presence of acetaldehyde. This can result from overpitching (although you need to overpitch by a large amount for this to happen), underaerating, fermenting too warm or separating the beer from the yeast too soon. Acetaldehyde can often be cleaned up by conditioning the beer in contact with the yeast. Raise the temperature of the finished beer to the upper end of the accepted temperature range (or just a bit beyond) and let it condition a few days.




A BEER TO BE DISCOVERED SLOWLY.
Why are so few things discovered slowly?
With no time to enjoy. But this beer is different.
You savour it layer by layer. Sip by sip.
Requires time to admire the natural hues and intense aroma.
Maybe this is why you drink it slowly.
To leave those who go fast behind.
Those with no time to think. No time to enjoy.
Leffe
Leffe
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BLONDE · BLOND
Savour Life. Savour Leffe.®
Always enjoy responsibly. ©2007 Import Brands Alliance, Importers of Leffe® Beer, St. Louis, MO

reader GADGET The Dumpster Diver

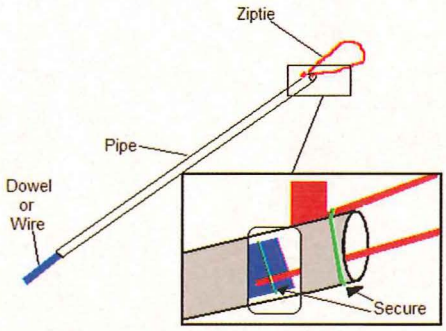
Jeff Jameson • Aurora, Colorado



Jeff Jameson devised a handy way to grab empty bottles from afar.

Here in the Denver area, we have "brown bottle only" recycling which is a great source for good bottles.

I constructed "The Dumpster Diver" by attaching a large zip-tie to one end of a piece of pipe (½ inch copper in my case) with a band clamp. Next I attached a piece of heavy gage wire to the loose end of the zip-tie by drilling a hole in the zip-tie, inserting the wire and then twisting the wire around itself to make the connection (next time I would replace the wire with a piece of pipe or dowel with a diameter to fit inside of the outer pipe.) Then I inserted the wire in to the end of the pipe where the zip-tie is fixed. Finally, I extended the wire out of the pipe and created a handle, allowing the catching loop to constrict from the operating end.



reader RECIPE Kraig Krist • Manassas, Virginia



Chocolate Raspberry Ale

(5 gallons/19 L, extract with grains)

Ingredients

6.6 lbs. (3 kg) Muntons light liquid malt extract
1 lb. (0.45 kg) crystal malt 20 °L
4 oz. (113 g) chocolate malt
4 bags (12 oz./340 g) red raspberries
6 oz. (170 g) unsweetened, dark chocolates
7.5 AAU Fuggle pellet hops (55 minutes)
(1.5 oz./43 g at 5% alpha acids)
1 oz. East Kent Goldings pellet hops (last five minutes)
Wyeast 1098 (British Ale) liquid yeast
¾ Cup corn sugar (for priming)

Step by step

Mill or coarsely crack the crystal and chocolate grains. Place the grains in one gallon (3.8 L) of water. Heat until 150 °F (66 °C). Remove pot from heat and wait for sparge water to reach 170 °F (77 °C). Sparge into brew kettle.

Add the malt extract to the brew kettle. Increase brew kettle liquid to 3 gallons (11 L). Stir well. Bring liquid to a boil.

When 55 minutes remain, add Fuggle hop pellets. When 15 minutes remain, add unsweetened, dark chocolate. Stir well. When 5 minutes remain, add East Kent Goldings pellet hops.

Cool the wort then transfer to the primary fermenter. Add enough clean water to get 5 gallons (19 L) and pitch the yeast.

After two weeks, add the red raspberries and transfer the beer from the primary to the secondary fermenter. Avoid splashing. When the hydrometer reading is at or near 1.012, bottle with corn sugar. Allow to bottle condition for three to four months before serving.

Homebrew CALENDAR

November 3

New England Regional Homebrew Competition
Manchester, New Hampshire
The second annual event to benefit the American Cancer Society in memory of Don Merkey. Entries must be received by Oct. 26 at 5 p.m. For more information, visit http://www.bfd.org/nerhbc/.

November 3

Novembeerfest
Kent, Washington
The Impaling Alers 2007 Home Brewing Competition. Entries must be received by Oct. 29. Entry forms, labels, rules and regulations can be found at: http://www.impalingalers.org/.

November 10

FOSSILS Porter Competition
New Albany, Indiana
Annual competition for porters only, according to 2004 BJCP Guidelines. Entries must be received by November 8. More information available online at http://fossils.org/Porter_competition.html.

November 17

Land of the Muddy Waters
Rock Island, Illinois
Do you have a homebrew the color of the Muddy Mississippi? In addition to the standard BJCP/AHA beer styles, enter your unique brew in the "Muddy Waters" category. Details and entry forms at http://www.mugz.org/lotmw/DearFellowBrewers.asp.

November 17–18

Great Brews of America Classic Beer Festival
Lake Harmony, Pennsylvania
The 16th annual craft brew gathering at Split Rock Resort. Festivities include live music, beer and food pairing dinner and a homebrew competition. More event information available at http://www.splitrockresort.com/beerfest/index.php.

club PROFILE

Snake River Brewers • Treasure Valley, Idaho

The Snake River Brewers is a homebrewing club in Southwest Idaho, which covers Boise, Nampa, Caldwell, Eagle, Meridian — and even more if you're willing to drive.

We have monthly meetings on the second Thursday of every month and do a yearly hop tour, run yearly experiments and have multiple club brew days.



Members gather at a recent meeting.



Snake River brewers collaborating during a stone brewing project.

Meetings typically include club business followed by an educational presentation or town-hall type discussion on a particular brewing topic. Tasting and judging doesn't happen until after all club business is done (which sure makes the meetings more efficient).

In 2004, we did a Stone Brew, where the club made a traditional German stein beer. This is where the water is heated by heating hot rocks in a fire pit and placing the hot rocks into the boil kettle.

In 2006, the project was a gypsum experiment where we brewed separate batches and used gypsum on some and not on others to determine the flavors that gypsum added to beer. We were especially interested in how gypsum affected the taste of hoppy beers.

This year is the All-Idaho Beer Project. We are making a batch of beer from ingredients native to the state. Idaho grown hops, grain, yeast, and water will be used to make a drink that the whole state can be proud of.

Club president, Matthew Kunzman has recently worked with Jamil Zainasheff in creating a help file for his Mr. Malty Pitching Rate Calculator. The pitching rate calculator and help file can be found at http://www.mrmalty.com. Matt is also best known for his "Random Brewing Tips" articles that circulate throughout the homebrewing community on the Internet.

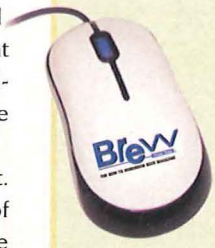
Other club members include Ted Hausotter, who last year received a Gold medal for his Cream Ale in the AHA national competition. Ted was recently elected the BJCP Mountain/Northwest Region representative.

Another member, Steve Dockter, received a Silver Medal for his Oatmeal Stout at the 2007 Arizona Homebrew Competition.

But Steve, Ted and Matt are only a few of the many folks that round out this group of Idaho brewers. The members are what really make this club so great — every single one of them contributes and just has fun. We really love to brew and we're also great people to be around.

If you are interested in joining the Snake River Brewers club, curious about any of our upcoming events, passing through the area or just have a question, check out our Web site at: www.geocities.com/snakeriverbrewers for more information, or email us at matt_hew@rocketmail.com.

byo.com BREW POLL



What is your favorite beer style to brew for the Fall?

Oktoberfest: 23%
IPA: 22%
Porter: 13%
Pumpkin Ale: 13%
Stout: 12%
Scottish Ale: 8%
Pale Ale: 8%
California Common: 2%

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WE WANT YOU



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

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

homebrew systems that make you DROOL

Michael Overstreet • Rogers, Arkansas



This is a HERMS configuration that uses 220 volt to heat the hot liquor tank. The hot liquor and mash tanks were fabricated out of scrap kegs. The stand and "barrels" are white oak. The system heats quickly, keeps temperatures within a degree using PID controllers, which have fuzzy logic and can be programmed for a multiple step infusion mash.



The mash/lauter tun is covered with high-density polyethylene (HDPE). The line entering the top goes into a sparge arm. Depending on how the valves are set, it will either re-circulate mash from the mash/lauter tun, or flow water from the hot liquor tank onto the mash during a sparge.



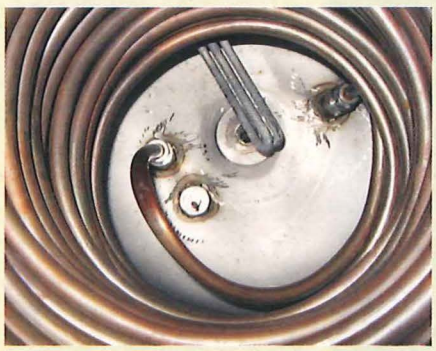
This is the mash/lauter tun top and sparge arm. The sparge arm is adjustable and provides a gentle flow across the grain bed.

"On the brew day, you add water, set the temperature set points, leave it for 45 minutes, and it's ready for the grain to be added."

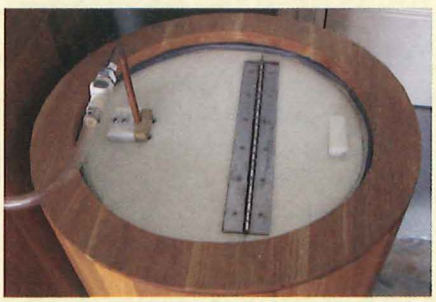


I designed my system to be user friendly. The mash/lauter tun is positioned low with a removable top, which makes it easy to clean. The false bottom can also be quickly removed by taking off one wing nut. It is designed to drain completely to keep water from standing when cleaning is complete.

"Once the grain is in and set to recalculate, you leave for the time that a multiple step infusion mash is programmed, and it will complete all temperature rises, including mash out, on its own."



There is a heater element, coil, and temperature probe in the hot liquor tank. The hot liquor tank and mash/lauter tun are located on the oak stand.



White oak was used for both the base and barrels of the hot liquor tank and mash/lauter tun. Both are converted kegs that are insulated and covered with oak slats which I crafted to make them look like wooden barrels.



The kettle is a jacketed unit from a system that was parted out and sold on eBay. The fermenter is temperature controlled. My plan was to control every aspect of the brewing process to produce the same product over and over again. I worked for about two years to complete this brewery. The woodworking was tedious, but it exceeded all my expectations and brewing is now more enjoyable for me.



Dear Replicator,

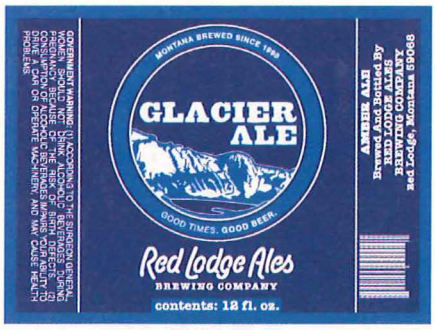
I have a friend who recently honeymooned in Montana and was fortunate enough to visit the Red Lodge Ales Brewing Company in a town of the same name. He tried the Glacier Ale and loved it so he bought some to bring home to me. I wonder if you could get me some information on how to brew this wonderful alt-styled ale so I could share some with a good friend who is now craving this beer.

Darin Prince
Montesano, Washington

If there are breweries in the lower 48 states more isolated than Red Lodge Ales Brewing Company there certainly can't be many. Located in a town of only about 2,000 people, on a two-lane highway half way between Billings, Montana and Yellowstone National Park, calling it remote would be an understatement. But remote is just what owner Sam Hoffmann says he prefers. He claims that if folks are determined enough to find his brewery, they must be serious about good beer.

It is evident that the odd location hasn't dampened his beer sales as he estimates that he will brew about 1,800 barrels this year. Sam started as a homebrewer when he was 20. After four years of developing recipes, he decided he could make money at his favorite hobby. With a seven-barrel system and no employees, he opened Red Lodge Ales in 1998. For three years it remained a one-man operation with Sam working nonstop, covering all job functions. His perseverance paid off as now he has a 15-barrel system with four brewhouse employees and one person for marketing and sales.

His distribution area is only about a



100 mile radius populated with cattle and cowboys. Fortunately, this includes the restaurants and bars in Yellowstone Park and Cody, Wyoming which draw plenty of thirsty tourists. He is succeeding in winning over the locals, too, and operates Sam's Tap House adjacent to the brewery.

Drawing on his German heritage, Sam's original goal was to dedicate his brewery to alt and Kölsch styles. His travels to Germany and talks with those brewers have helped him hone those styles. Glacier Ale is a prime example of a traditional alt beer and ties with his weizen for the brewery's two best sellers.

Sam describes this beer as a clear, crisp, copper-colored ale with a relatively dry finish. By using traditional Hallertauer hops for only two additions, he achieves just the right bittering balance. The grain bill is somewhat unusual in that both German and American Munich malts are used. Sam reports that this seems to boost the complexity of the malt flavor profile. He says this is a perfect beer for late fall and should be a great complement to a Thanksgiving turkey. Glacier Ale also won a gold medal last June at the North American Beer Awards in Idaho Falls, Idaho. Now you can fire up your kettle and "brew your own."

For more about Red Lodge, visit them on the Web at www.redlodgeales.net or call 406-446-4607.

Red Lodge Ales Glacier Ale

(5 Gallons/ 19L. extract with grain)

OG = 1.048 FG = 1.009
IBU = 24 SRM = 14.5 ABV = 5.0 %

Ingredients

3.3 lbs. (1.5 kg) Muntons Light, unhopped, liquid malt extract
1.5 lbs. (0.68 kg.) Muntons light dried malt extract
1.0 lbs. (0.45 kg) German Munich malt
1.0 lb. (0.45 kg) U.S. Munich malt
7 oz. (0.2 kg) crystal malt (60 °L)
2 oz. (57 g) chocolate malt
½ tsp. Irish moss (15 min.)
6 AAU Hallertauer pellet hops (60 min.) (1.5 oz./ 43 g of 4% alpha acid)
1 AAU Willamette pellet hops (15 min.) (0.25 oz./ 7 g of 4.0% alpha acid)
White Labs WLP029 (German Ale) or Wyeast 1007 (German Ale) yeast
¾ cup (150 g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 2 gallons (7.6 L) of water at 150 °F (66 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.9 L) of hot water. Add the liquid and dried malt extracts and bring to a boil. While boiling, add the hops as per the hopping schedule. Add the Irish moss after 45 minutes of boiling. Now add the wort to 2 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Let the beer condition for one week and then bottle or keg. Allow to carbonate two weeks then cold condition for two additional weeks and enjoy your Glacier Ale.

All-grain option:

This is a single step infusion mash. Replace the malt syrup and dry extract with 6.6 lbs. (3 kg) 2-row pale malt, 22 oz. (0.62 kg) of each of the Munich malts, 9 oz. (0.25 kg) of the crystal malt and 3 oz. (85 g) of the chocolate malt. Mix the crushed grain with 3.5 gallons (15.9 L) of 168 °F (76 °C) water to stabilize at 150 °F (66 °C) for 60 minutes.

Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the 60-minute hop addition to 1.25 oz. (35 g) to allow for the higher utilization factor of a full wort boil. The remainder of this recipe's procedures are the same as the extract with grain recipe.

BEGINNER'S block

All-grain to Extract

How to convert homebrew recipes

by Betsy Parks

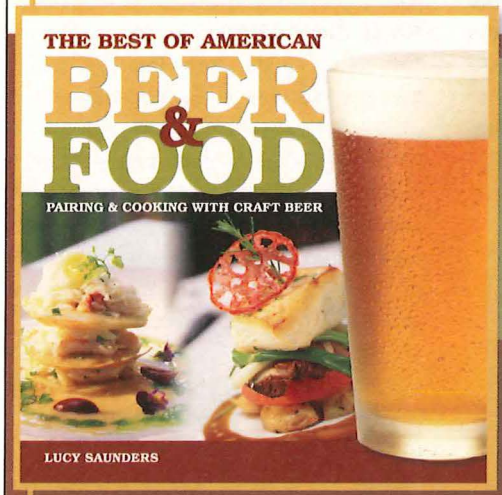
You're an extract brewer, but the recipe in front of you is all-grain. Thankfully, that shouldn't stop you. Follow some simple conversions and you can make many all-grain recipe extract-ready.

Each recipe contains a list of ingredients, including at least one or two base malts, which make up the majority of the composition. The rest of the ingredients are the specialty malts, grains, hops and yeasts that make each style unique. When converting recipes, the quantities of specialty malts stay the same. Extract and all-grain recipes are different in that the base malts are either liquid or dried malt extracts or grains that need to be mashed, which is the process of steeping grains in hot water to gelatinize the starches and convert them into fermentable sugars. Extracts, as you may know by now, are akin to premade, dehydrated worts, so the mashing is already done. So if you're faced with an all-grain recipe, make it an extract recipe by figuring out how much base malt you need to achieve the same specific gravity as the original recipe.

For general purposes, most homebrew setups get about 68% yield from malt. Liquid malt extract typically is about 75% solids and dry malt extract is about 98% solids (25% and 2% water respectively). To figure out how much malt extract you will need, multiply the amount of base malt grain by 0.70 for dried malt extract and 0.90 for liquid malt extract. For example, if a recipe calls for 9 pounds (4 kg) of 2-row pale malt grain, multiply by 0.90 to get 8.1 pounds (3.4 kg) of light liquid malt extract. These "rules" are generic however — not all liquid malt extracts have the same solids content. Getting the conversion "exactly" right (for your taste) may take some tweaking.

Once you've converted the base malts, follow the brewing procedures from the original recipe (minus the mashing instructions) by steeping any grains that don't need mashing in your brewing water at about 150–160 °F (65–71 °C) for 15–30 minutes before adding the extract. Follow the same hops schedule as the original recipe if you plan to boil the full volume of wort. If you're planning a partial boil, however, you will need to compensate for a change in hops utilization. A partial boil is boiling less wort than the full recipe and adding water to top off to the full volume which is useful if you can't boil large batches. Partial boils lower hops utilization because of the higher gravity in the wort, therefore the hops used for bittering should be increased.

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American Amber

Much more than a pioneering pale ale

by Betsy Parks

The Beer Judge Certification Program style guidelines say it's, "like an American pale ale with more body, more caramel richness, and a balance more towards malt than hops." We say it's a refreshing and delicious beverage. Three U.S. brewers have some insight to share this issue about this all-American ale — whether you call it amber (as in waves of grain) or red (with no white and blue).



JOHN HARRIS, Brewmaster at Full Sail Brewing in Hood River, Oregon, has 21 years of experience in the brewing industry. He manages the Full Sail Riverplace brewery, which produces the Brewmaster Reserve line of beers and serves as a research and development center. He also received the Brewer's Association Russell Schehrer Award for innovation in 2001.

The amber category is one of the most diversely interpreted styles. It sets itself apart from an American pale ale with a red-orange color, good caramel malt character with a touch of nuttiness and a floral hop character.

Use a good caramel malt made from 2-row barley at around 60 to 80 °L. A little dark roasted barley will help turn the color towards red. It will also lend a greater malt character and a slight nuttiness.

American aroma hop varieties are best, especially those with a more pronounced American character with a fruity and lightly citrus quality like Cascade, Mt. Hood and Crystal. Hops like Willamette and Mt. Rainier will lend a more earthy character and should be avoided. Super citrus hops like Columbus and Simcoe will also overwhelm the malt character.

I recommend using a good yeast culture with a healthy count. Yeast should interplay with the caramel malts and hops to lend fruitiness to the beer. Try Wyeast 1056 (American Ale), 1272 (American Ale II) and 1332 (Northwest Ale).

Ambers should have some residual sweetness but leave the palate with a fruity crispness. A mash in the 152 °F (67 °C) range will allow good fermentability yet will leave the beer a bit drier than a higher mash conversion temperature.

The beauty of this style is that it is open to individual interpretation. Try caramel malts of various colors. Blending lighter and darker versions will lend more complexity to your beer. Lighter dry hopping will add to the fruitiness. The key to this style is to make it more than an underhopped pale ale. It should stand alone.



JOHN TROGNER started his brewing career at Oasis Brewing in Boulder, Colorado when he and his brother Chris became simultaneously interested in craft brewing. He worked his way up from apprenticing to head brewer, and attended brewing classes at Chicago's Siebel Institute, UC-Davis and the Weihenstephan Institute in Germany before opening Tröegs in Harrisburg, Pennsylvania with his brother in 1997.

An American amber is an interesting balance between hops and malt. It should be brewed so that you can taste both flavors individually. This style is definitely the one I would choose if I were stranded on a desert island.

When we make our HopBack Amber, what we shoot for is a really clean, malty character, which we achieve with American Pilsner base malts and German Munich malts for the nutty characters. Once we have the profile we want, we crisp it up with roasted barley and dark crystal malts.

For hops, we always shoot for spicy, American, high alpha hops. There are definitely lots and lots of Nugget hops in HopBack Amber.

For yeast, we always use clean American yeast strains. I would say that yeast isn't necessarily the star of an American amber. It should lend a more neutral character. The catch, however, is that the yeast needs to be very healthy. You can't just smack the pack and throw it in. I would recommend letting the yeast grow up a few times to make it stong and healthy before using it in your amber. This style also needs lots of aeration and cooler fermentation temperatures than some other styles. I like to shoot for 62–65 °F (17–18 °C).

One of the biggest differences in making our amber is that we use a hopback after the boil (but while the wort is still hot) with whole flower hops. This is really the key to this beer (hence the name HopBack Amber). I feel that it really develops the aroma and essence of the hops without imparting the bitterness like dry hopping does.

Also, at Tröegs the water is quite soft so before we brew our amber we harden the water quite a bit to get 150 ppm of calcium and 80–100 ppm of chloride.

My advice to homebrewers who want to make a great American amber is to always make sure your yeast is really healthy, which is actually true for all styles. You can make many great beers with strong yeast — it's one of the biggest factors we concentrate on here.



JOHN HIIVA started working in the kitchen at Steamworks Brewing Company in Durango, Colorado while he attended Fort Lewis College. Since then he has worked in nearly every position, from waiting tables to janitor to intern, and finally as a member of the Steamworks "Brewdogs" brewing team. He holds a certificate in brewing and packaging from UC-Davis and is now the Head Brewer of their Bayfield, Colorado brewpub as well as the director of brewing operations.

In my opinion, a great American-style red (or amber) ale is all about balance and drinkability. The characteristics of this beer should always leave the drinker wanting more. With our Lizard Head Red, we stress a darker caramel malt presence balanced with prominent hop flavor and aroma.

For malts, we use American-grown, 2-row malt for the base and specialties. The brewer can use any number of malts to achieve a desired flavor, but what is most important is the color. The use of a small amount of darker caramel malts will give the final beer its characteristic red color.

We tend to lean towards the American varieties of hops for our beer, for example, Nugget, Cascade, and Mt. Hood. But this is, of course, all a matter of a brewer's interpretation and personal preference.

Do take notice, however, of the fact that the malts used for the color of the beer are strong and one should balance this with stronger hop character (with both bitterness and aroma).

To ferment Lizard Head Red, our house ale yeast is used at average ale fermentation temperatures. Slightly higher temperatures can be used to impart desirable esters in the finished beer as well.

My advice for brewing this style is to make sure you achieve the correct mash temperature for proper starch breakdown. We tend to stop runnings at about 5–6 °P (1.020–1.024 SG) to ensure proper pH because we have found that it has a positive impact on drinkabilty and balance.

I feel that the biggest challenge with an American red or amber ale is achieving the right color without going too far and overpowering the final result with the darker malt character.

Also, making sure that proper fermentation and conditioning temperatures are achieved is vital in the success of making great American-style amber or red ales.

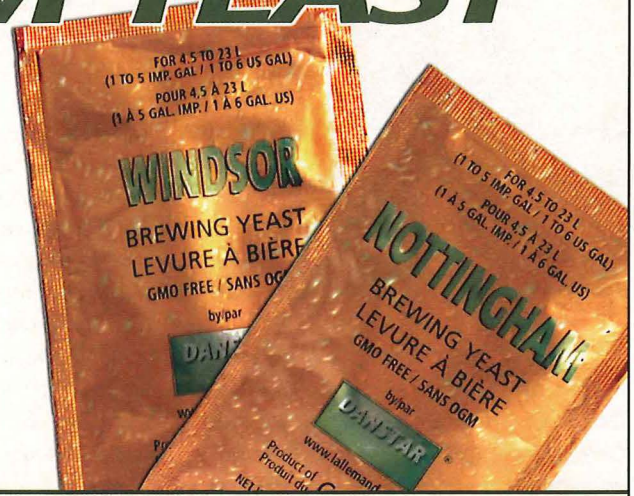
Finally, the best advice is to take your time. Remaining patient with this style is key. Let the yeast do what it does, keep it healthy and you will end up with a beer all your friends will come back for over and over again.

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High Fiber Brewing

Storing extract and a dry hopping dilemma

"Help Me, Mr. Wizard"

by Ashton Lewis

Heart-healthy homebrew?

I have for years been breakfasting with oatmeal to lower my LDL cholesterol and to lower my risk of colon cancer by increasing my fiber intake. According to my doctor's office, one needs 5 to 10 grams of soluble fiber a day to lower cholesterol 5%, and I pretty much get that most days. I like oatmeal and, of course, have tried it in my beer. In fact I use a lot of it — close to three-fifths of the grist in my oatmeal pale and brown ales is *Avena sativa* (oats). I have been able to avoid stuck mashes by using 6-row pale malt for the base. Also, and more importantly, on the advice of Stephan Galente in his BYO article "Oatmeal Stout" from October 1997, I employ a 110–120 °F (43–49 °C) beta-glucanase rest before converting starch at 150–160 °F (66–71 °C).

Since lowering my cholesterol is a good thing to do, can I do it with oat beer? With the mash schedule I described, am I brewing beer that has soluble fiber surviving to the bottle? Is the silky texture of my beer due to soluble fiber? Would I even like a beer that has a maximized amount of soluble fiber in it?

Moses Denny
Roanoke, Virginia

I've been writing this column for 12 years now and am always surprised by the creativity of homebrewers, especially when it comes to redefining the daily role of beer in one's life.

Topics of beer and health are unfortunately avoided in the United States and many other countries because of labeling laws and discussions of the beneficial effects of beer consumption are left to medical and health journals that most people do not read.

The wine industry was fortunate when the TV program 60 Minutes aired a segment in 1991 on "The French Paradox." In Wizard words, this episode addressed the apparent contradiction between a diet high in saturated fat and cholesterol and the relatively low incidence of coronary heart disease in the population eating this diet. The obvious equalizer in this equation was red wine. Ever since, the wine industry has been able to benefit from a topic totally off limits to beer because the French do not drink much beer. Many beers, especially dark and hoppy beers, contain more antioxidants than red wine but brewers have avoided really pursuing this information because of the potential backlash from powerful social groups with strong neo-prohibitionist tendencies. As it turns out, however, the data that was used to point out this paradox apparently underestimated the incidence of coronary heart disease in France and, well, that glass of Cabernet Sauvignon may not really negate the fat in your foie gras after all.

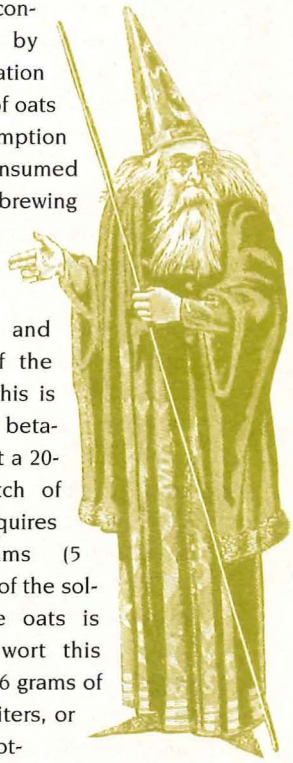
There is a huge body of data supporting the positive affects of foods rich in antioxidants, antioxidant dietary supplements and the consumption of dietary fiber on cardiovascular and GI tract health.

So you want to add dietary fiber to your beer and do a little double duty with your double oatmeal stout? Before attempting to answer your question I feel it is important to define dietary fiber and also review the current recommendations on how much fiber you should consume. The American Association of Cereal Chemists (AACC) submitted a report in 2001 that had the following definition for dietary fiber: "Dietary fiber is the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Dietary fiber includes polysaccharides, oligosaccharides, lignin and associated plant substances. Dietary fibers promote beneficial physiological effects, including laxation and/or blood cholesterol attenuation and/or blood glucose attenuation." The recommended daily allowance (RDA) of dietary fiber is 38 grams/day for men age 31–50 and 25 grams/day for women age 31–50.

It is clear from the definition of dietary fiber that you can actually brew a beer that is "fortified" with dietary fiber. Prior to the definition published by the AACC in 2001 this would not be so easy because the definition originally excluded many low and medium molecular weight gums that are soluble in an 80% solution (vol/vol) of ethanol (a test that was part of an older definition). A version of this test using 50% ethanol is useful for determining if there are large molecular weight pectins in wine, cider and fruit beers that may cause filtration problems.

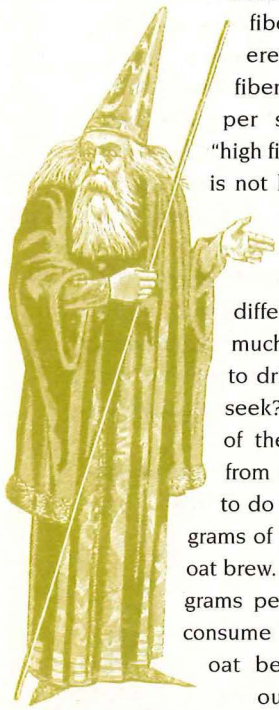
The long and short of the story is that the new definition of dietary fiber includes polysaccharides and oligosaccharides that are not absorbed in the small intestine, regardless of their solubility in a solution of ethanol.

So now let's go through an estimate of how much dietary fiber you may get in your oat beers containing 60% oats by weight. Most information on the fiber content of oats is based on the assumption that the oats are consumed whole. In the case of brewing the only fiber you get from oats is soluble fiber, a small portion of the total fiber and approximately 5% of the weight of the oats. This is mainly made up of beta-glucan. I estimate that a 20-liter (~5-gallon) batch of beer with 60% oats requires about 2.3 kilograms (5 pounds) of oats. If all of the soluble fiber from the oats is extracted into the wort this translates to about 116 grams of soluble fiber per 20 liters, or about 2 grams per bottle. Since there are inherent inefficiencies in wort production the actual yield will most certainly be lower than 2 grams/bottle. Your use of a beta-glucanase rest is a good way to get as much of the soluble fibers out of the oats and into the wort in



your brew kettle, thereby maximizing the yield from the oats.

According to U.S. Food and Drug Administration labeling rules related to this topic, 2 grams per serving is not enough fiber to earn the title "added fiber" to a food label. A boost of at least 2.5 grams per serving (compared to a reference food with no added fiber) is required to use the term "added fiber". An addition of 2.5–4.9 grams of fiber per serving is considered a "good source" of fiber and 5 grams and more per serving is considered "high fiber." So far, the oat beer is not looking all that impressive from a fiber per serving perspective.



Let's look at this from a different angle and ask, how much beer you would need to drink to get the fiber you seek? If you want to get 25% of the RDA of dietary fiber from beer, you may be able to do that if you consume 9.5 grams of fiber per day from your oat brew. Assuming you can get 2 grams per serving, you need to consume 1.6 liters (1.6 quarts) of oat beer, or about five 12-ounce bottles per day. Your ultimate goal is to boost your cardiovascular health, however, and there are plenty of studies that indicate that excessive alcohol consumption has a negative effect on cardiovascular health so you may want to think long and hard before choosing this course of action.

Again, oat beer does not appear to be a real fiber powerhouse. You could get close to 5 grams per day by drinking two bottles of oat beer, but that is not much of a contribution to the RDA for dietary fiber.

If you really want to pursue this idea there are ingredients targeted to beverage producers that add dietary fiber to beverages without affecting mouthfeel and flavor. Among these is a product called Fibersol-2 with some sort of maltodextrin as the source of the fiber. According to the marketing literature, fiber-fortified lemonade simply tastes like lemonade. So you could augment the fiber from the oats to a higher level with a fiber additive.

"You may find that the most pleasurable way to 'have your fiber and drink it, too' is to enjoy a beer or two along with a meal that includes high fiber foods . . ."

Aside from fiber, oats will give your beer added mouthfeel and I think your description of silky is fitting for the contribution that oats lend to beer. In some styles, such as Belgian wit, oats also contribute a stable cloudiness to beer. In fact, many unfiltered beers get their cloudiness from unmalted wheat and oats and, to a lesser extent, yeast. And finally, if brewers are not as careful as you are with mashing technique and malt selection, oat can cause a headache in the brewhouse.

I am not a nutritionist or dietician, although I did take a few nutrition classes while earning by BS and MS in food science, and encourage readers to consult medical and health professionals for their assessments of health topics. I do have a pretty simple view of diets, however, that is consistent with the advice of many nutritionists and that is to consume a balanced diet based on moderate servings of a variety of foods. You may find that the most pleasurable way to "have your fiber and drink it, too" is to enjoy a beer or two along with a meal that includes some high fiber foods, such as broccoli, cauliflower, spinach, fresh fruits, lentils or brown rice.

Extract storing solutions

The recent discussion in *Brew Your Own* of preserving starter wort and the safety of the practice has raised (in my mind) several questions on the safety of my malt extract storing practice. Shortly after beginning brewing 18 months ago, I discovered that extract could be purchased in 15-kilogram plastic jugs for half the price per pound of canned extract. Being of a frugal nature, I immediately began buying in this quantity. After opening a jug to make a batch of beer, I pour the excess in plastic tubs and top with a splash of vodka to inhibit mold growth and store in my fridge at about 40 °F (4 °C). Can botulism spores ever grow in concentrated extract with its high sugar content? I assume the jugs I buy are not pressure canned because they are plastic. Quality questions aside, how long can I safely store extract in this manner? Would freezing have any effect on its quality?

Ken Graffis
Hendersonville, Tennessee

Before answering this question about malt extract storage I want to remind our readers that there are no safety issues concerning the storage of wort that has been properly canned in a pressure canner. This whole topic began in 2006 when an article was published in the September issue of *Brew Your Own* describing canning wort using a boiling water bath instead of a pressure canner. Although the topic of botulism was addressed in the original article, *Brew Your Own* received a reader letter with stronger warnings and this was printed in the November 2006 issue. To sum all of this up, if you want to can wort and use it for yeast starters, go buy yourself a pressure canner and you will be just fine. I have written about the many uses of pressure canners in previous columns and think every serious brewer and cook should have at least one of them!

Now with that out of the way let's discuss why brewers do not to spend any time at all worrying about the growth of *Clostridium botulinum* in the malt extract. Malt extract, whether liquid or dry, is concentrated by removing water. One key attribute of food products used to gauge their susceptibility to spoilage is a property known as water activity or AW. Pure water has a water activity of 1.0 and as solids content increases the AW decreases. The definition of AW is not important here, but relates to equilibrium relative

humidity. If you want to read more there is a bunch of information about water activity online and in food science books.

At any rate, *Clostridium botulinum* is not a problem in foods with an AW less than 0.93 because it doesn't grow. The water activity of liquid malt extract (LME) is somewhere around 0.60 depending on its concentration. Honey has an AW between 0.55 and 0.60, so it stands to reason that liquid malt extract with a similar concentration is going to be in the same range. Dried malt extract has an AW of about 0.20 making it very shelf stable from a microbiological view. You are correct that liquid malt extract is not pressure canned because there is no safety concern requiring it to be.

Molds and yeasts can grow on the surface of containers of liquid malt extract that have been opened. One would figure that if the fungi can grow on the surface they should be able to grow throughout the bulk of the LME, but they don't. The reason for this is that the AW of foods products is not homogenous once the package has been opened because water from the air (humidity) changes the AW at the food-air interface. This is why LME can have mold colonies form on the surface. Covering the surface with vodka is one way to keep the surface clean. Another method is to repackage your 15 kilograms of LME in convenient sized portions using zipper storage bags so that the air can be eliminated from the headspace of the bag, keeping the AW homogeneous.

So from a safety stance you can store LME indefinitely, although the quality may change. To be realistic, if you store it in a clean refrigerator that does not contain a lot of smelly food that could impart odors into the LME, the shelf life is likely to be well over a year. If you really want to toss your LME into a freezer because you have more freezer space than refrigerator space you will certainly do no harm to it and will completely eliminate the possibility of any mold growth.

Dry hopping hazards

I have been dry hopping the last few beers of mine in secondary, and it seems to always create the same problem. Once the hops hit the beer, it looks like it has spurred the fermentation, seen by the large amount of carbonation rising to the top. This effect can last for two or three weeks. First, I thought maybe there were contaminants on the hops, but now I can't believe that, seeing as this is about the fourth or fifth time in a row it has happened. It happened with my IPA, and after dry hopping, it fermented for two more weeks until I crashed it in the fridge. But, it doesn't taste dry at all, like it hadn't been affected a bit. I'm a very patient brewer and never rack until my target FG is reached. Is there a reaction between hops and finished beer that agitate or release the CO_2 or am I having strange (not bad until it ruins a beer) luck?

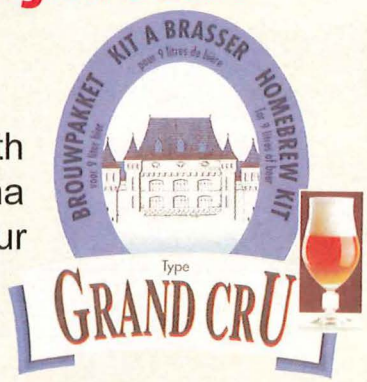
Mike Kling
via email

I strongly encourage readers to send in questions because it gives me some job stability and keeps things inter-

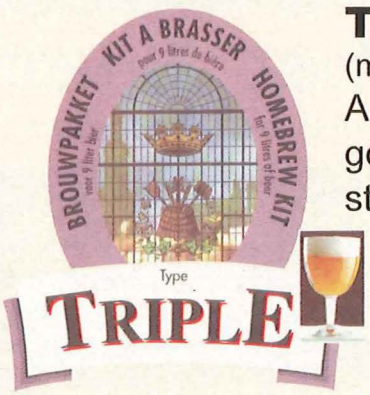


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esting in my department. However, I also encourage brewers to critically approach issues like the one described in this letter.

After reading this question it's interesting to me that there seems to be a "problem" although there is no mention of off-flavors, delayed fermentation, bottle explosions or some of the other real woes many homebrewers face. Sometimes brewing techniques cause things to appear different or strange, but at the end of the day if the beer tastes good I question if we really have a problem.

In this case, Mike, you are correct that the hops, be they cone or pellet, cause CO_2 in the fermented beer to be released. You mention that you monitor specific gravity and that is something I strongly encourage because it gives valuable information related to fermentation.

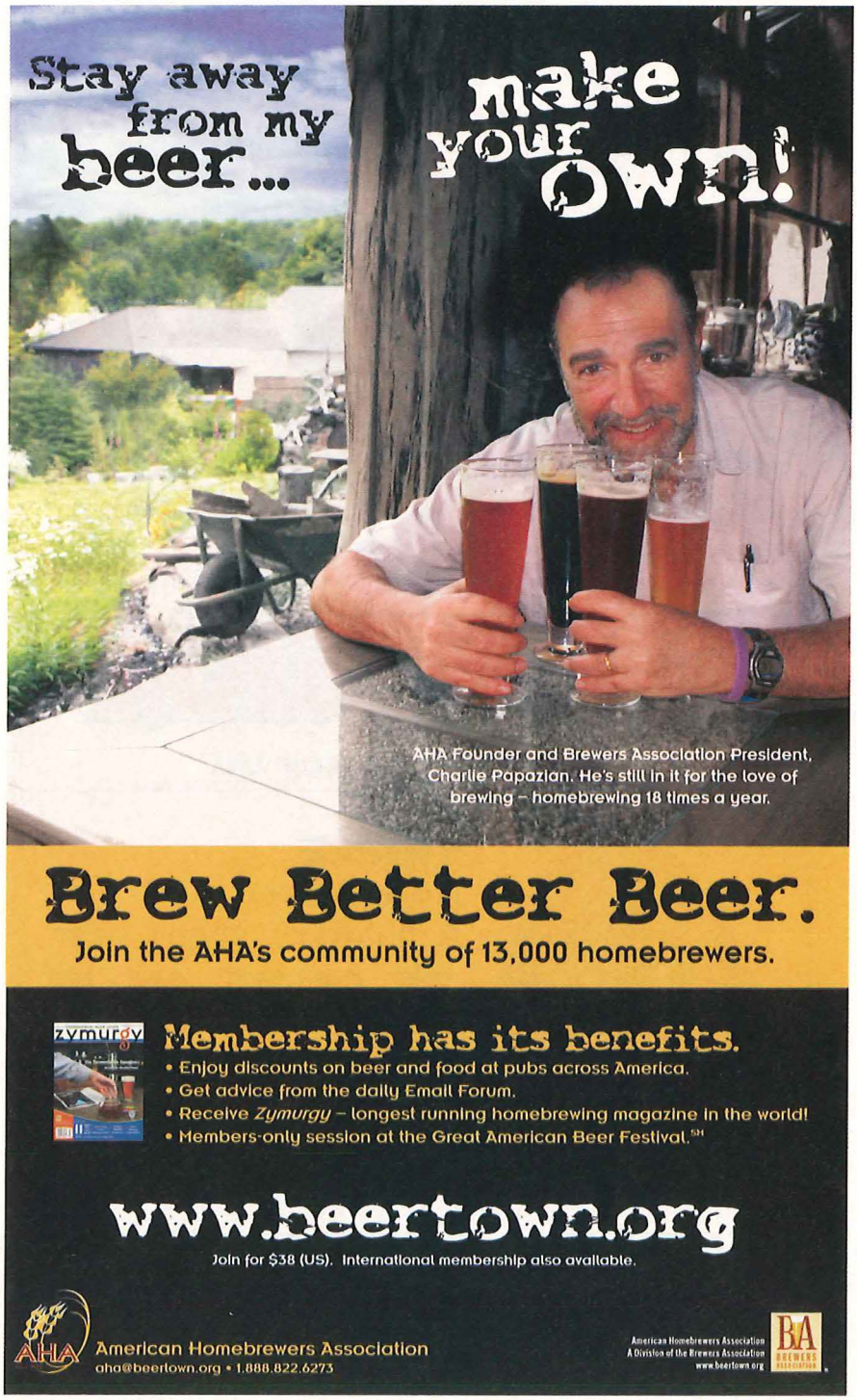
If you add hops to beer that is totally done fermenting, the hops act as a nucleation site for CO_2 dissolved in your beer and the beer may appear to begin fermenting again. After a day or so the appearance of the top of the beer will return as it was before the hops were added. If there is still some fermentation occurring, even just a little bit, the appearance may look "weird" until fermentation stops.



As far as the possibility of contaminating beer during dry hopping, don't worry. Hops are not known to carry microorganisms that spoil beer.

Dry hopping is a great technique when you want to create a nice hop punch of aroma and flavor. If it makes the beer look funky in the carboy that's OK . . . my hair looks pretty funky when it's all sudsy with shampoo but I wash my hair every morning!

You're not having any bad luck or doing anything wrong, so keep dry hopping and keeping an eye for real problems that may come your way.



Web extra:



Want more information about dry hopping? Read more at: **www.byo.com/departments/1105.html**



Brew Your Own Technical Editor Ashton Lewis has been answering homebrew questions as his alter ego Mr. Wizard for the last 12 years. A selection of his Wizard columns have been collected in "The Homebrewer's Answer Book," just released, available online at brewyourownstore.com.
Do you have a homebrewing question for Ashton? Send inquiries to *Brew Your Own*, 5053 Main Street, Suite A, Manchester Center, VT 05255 or send your e-mail to wiz@byo.com. If you submit your question by e-mail, please include your full name and hometown. In every issue, the Wizard will select a few questions for publication. Unfortunately, he can't respond personally. Sorry!

American Amber

An easy-drinking, patriotic ale

by Jamil Zainasheff

As I walked back from Mount Rushmore, I began to think about what kind of beer I would enjoy when I got back to my RV. I was feeling somewhat inspired, patriotic and quite hot and sweaty. I was much more impressed by Mount Rushmore than I anticipated and it seemed obvious that I needed something uniquely American. By the time I reached the refrigerator, my choice was clear — American amber ale.

American amber spans a wide range of characteristics. The color ranges from amber to coppery brown, the hop aroma from low to moderate, and the hop flavor from moderate to high. This is often a beer with a very clean fermentation profile, though some examples will have up to a modest amount of fruity esters. The body is medium to medium-full. The alcohol is usually restrained, but can be fairly substantial and slightly warming.



Photo by Jim Witmer

While it might be debatable how much crystal malt is appropriate for American pale ale, American amber ale should always have significant caramel flavors with a little more residual malt sweetness than American pale ales, which helps balance the hop bitterness. Some American ambers are modest and restrained while others are big, hoppy and bold. Regardless, this should always be a great, easy-drinking beer.

The BJCP style guide mentions that this style is called red ale in some regions and amber ale in others. While there is ambiguity, I feel that people are beginning to think of the two as different substyles: amber as a gentler, more malt-focused beer with an even balance, lighter color, and more restrained hop character and red as trending toward bigger, bolder, hoppier beers like those from the U.S. West Coast, which often have higher alcohol (in some examples over 6.5% ABV), increased bold, dark crystal flavors, and bold hop character full of American citrusy/piney flavors and aromas.

You have some flexibility in choosing base malt for American amber/red. Domestic 2-row will give the beer a clean, subtle background malt character. North American pale ale malt adds a slightly richer background malt character, somewhat of a light bready note. Less common is British pale ale malt, which provides an even greater depth of malt character to the beer, mainly a biscuit-like taste and aroma common in many British beers. I enjoy the more obvious malt background of British pale malt and this is one style that can handle it. However, some folks feel it can be too much, so if you prefer a more subtle, restrained malt background, go with North American 2-row or pale ale malt. Extract brewers can use a British pale ale malt extract if they want a richer malt background or a light color North American malt extract if they want a more

(story continued on page 21)

AMERICAN AMBER by the numbers

OG:	1.045–1.060 (11.2–14.7°P)
FG:	1.010–1.015 (2.6–3.8°P)
SRM:	10–17
IBU:	25–40
ABV:	4.5–6.2%

RECIPE

Amber Waves

(5 gallons/19 L, all-grain)

OG = 1.051 (12.6 °P)
FG = 1.013 (3.2 °P)
IBU = 35 SRM = 10 ABV = 5.1%

Ingredients

9.5 lb. (4.3 kg) Great Western 2-row malt (2 °L) (or light, North American 2-row)
0.75 lb. (340 g) Great Western crystal malt (40 °L)
0.5 lb. (227 g) Durst Munich malt (8 °L)
0.25 lb. (113 g) Great Western crystal malt (120 °L)
6.5 AAU Horizon hops, (60 min) (0.5 oz./14 g at 13% alpha acids)
1.5 AAU Cascade hops, (10 min) (0.25 oz./7 g at 6% alpha acids)
2.25 AAU Centennial hops, (10 min) (0.25 oz./7 g at 9% alpha acids)
1.5 AAU Cascade hops, (0 min) (0.25 oz./7 g at 6% alpha acids)
2.25 AAU Centennial hops, (0 min) (0.25 oz./7 g at 9% alpha acids)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 154 °F (68 °C). Hold the mash at 154 °F (68 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (25 L) and the gravity is 1.040 (9.9°P).

Total wort boil time is 90 minutes. Add the bittering hops with 60 min-

recipe continued from page 19

utes remaining in the boil. Add Irish moss or other kettle finings with 15 minutes left. Add other hop additions at 10 minutes remaining and flame out. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is 9 grams of rehydrated dry yeast, 2 packages of liquid yeast or 1 package of liquid yeast in a 1.5-liter starter.

Ferment at 67 °F (19 °C) until the yeast drops clear. Fermentation should be complete in about one week. Allow the lees to settle and the brew to mature without pressure for another two days after fermentation appears finished. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2 to 2.5 volumes.

Amber Waves
(5 gallons/19 L, extract plus grains)

OG = 1.051 (12.6 °P)
FG = 1.013 (3.2 °P)
IBU = 35 SRM = 10 ABV = 5.1%

Ingredients

6.0 lb. (2.72 kg) Alexander's light liquid malt extract (2 °L)
0.75 lb. (340 g) Great Western crystal malt (40 °L)
0.5 lb. (227 g) Durst Munich malt (8 °L)
0.25 lb. (113 g) Great Western crystal malt (120 °L)
6.5 AAU Horizon hops, (60 min) (0.5 oz./14 g at 13% alpha acids)
1.5 AAU Cascade hops, (10 min) (0.25 oz./7 g at 6% alpha acids)
2.25 AAU Centennial hops, (10 min) (0.25 oz./7 g at 9% alpha acids)
1.5 AAU Cascade hops, (0 min) (0.25 oz./7 g at 6% alpha acids)
2.25 AAU Centennial hops, (0 min) (0.25 oz./7 g at 9% alpha acids)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast.

Step by Step

Mill or coarsely crack the specialty malts. Mix them well and place loosely in a grain bag. Avoid packing the grains too tightly. Steep the bag in about 1 gallon (~4 liters) of water at roughly 170 °F (77 °C) for about 30 minutes. Lift the grain bag out of the steeping liquid and rinse with warm water. Allow the bags to drip into the kettle without squeezing for a few minutes while you add the malt extract. Add water to the steeping liquor and malt extract to make a volume of 5.9 gallons (22.3 liters) and a gravity of 1.043 (10.8°P). Stir thoroughly and bring to a boil.

Once the wort is boiling, add the bittering hops. Total wort boil time is one hour after adding the bittering hops. During that time add the Irish moss or other kettle finings at 15 minutes before shut-down. Add other hop additions at 10 minutes remaining and flame out. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is 9 grams of rehydrated dry yeast, 2 packages of liquid yeast or 1 package of liquid yeast in a 1.5-liter starter. Follow the remaining instructions for the all-grain version.

West Coast Blaster
(5 gallons/19 L, all-grain)

OG = 1.067 (16.4°P)
FG = 1.015 (3.9 °P)
IBU = 66 SRM = 17 ABV = 6.9%

11.4 lb. (5.17 kg) Muntons pale ale malt (3°L) (or Great Western British pale ale malt)
1.0 lb. (0.45 kg) Great Western crystal malt (40 °L)
1.0 lb. (0.45 kg) Durst Munich malt (8 °L)
0.5 lb. (227 g) Victory malt (28 °L)
0.5 lb. (227 g) Great Western crystal malt (120 °L)
2.5 oz. (71 g) pale chocolate malt (200 °L)
11.44 AAU Horizon hops (60 min.) (0.88 oz./25 g at 13% alpha acids)
6 AAU Cascade hops (10 min.) (1.0 oz./28 g 6% at alpha acids)
9 AAU Centennial hops (10 min.) (1.0 oz./28 g 9% at alpha acids)
6 AAU Cascade hops (0 min.) (1.0 oz./28 g 6% at alpha acids)
9 AAU Centennial hops (0 min.) (1.0 oz./28 g 9% at alpha acids)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 152° F (67 °C). Hold the mash at 152 °F (67 °C) until enzymatic conversion is complete. Infuse the mash with near boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.5 gallons (25 L) and the gravity is 1.052 (12.9 °P).

The total wort boil time is 90 minutes. Add the bittering hops with 60 minutes remaining in the boil. Add Irish moss or other kettle finings with 15 minutes left in the boil. Add other hop additions at 10 minutes remaining and flame out. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is 12 grams of rehydrated dry yeast, 2 packages of liquid yeast or 1 package of liquid yeast in a 2.5-liter starter.

Ferment at 67 °F (19 °C) until the yeast drops clear. Fermentation should be complete in about one week. Allow the lees to settle and the brew to mature without pressure for another two days after fermentation appears finished. Rack to a keg and force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2 to 2.5 volumes.

West Coast Blaster
(5 gallons/19 L, extract plus grains)

OG = 1.066 (16 °P)
FG = 1.015 (3.8 °P)
IBU = 66 SRM = 17 ABV = 6.7%

7.0 lb. (3.17 kg) John Bull Maris Otter or Edme Maris Otter English pale ale liquid malt extract (or English-style pale ale liquid malt extract) (3.5 °L)

(story continued from page 19)

1.0 lb. (0.45 kg) Great Western crystal malt (40 °L)
1.0 lb. (0.45 kg) Durst Munich malt (8 °L)
0.5 lb. (227 g) Victory malt (28 °L)
0.5 lb. (227 g) Great Western crystal malt (120 °L)
2.5 oz. (71 g) Beeston pale chocolate malt (200 °L)
11.44 AAU Horizon hops (60 min.) (0.88 oz./25 g at 13% alpha acids)
6 AAU Cascade hops (10 min.) (1.0 oz./28 g 6% at alpha acids)
9 AAU Centennial hops (10 min.) (1.0 oz./28 g 9% at alpha acids)
6 AAU Cascade hops (0 min.) (1.0 oz./28 g 6% at alpha acids)
9 AAU Centennial hops (0 min.) (1.0 oz./28 g 9% at alpha acids)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis Safale US-05 yeast

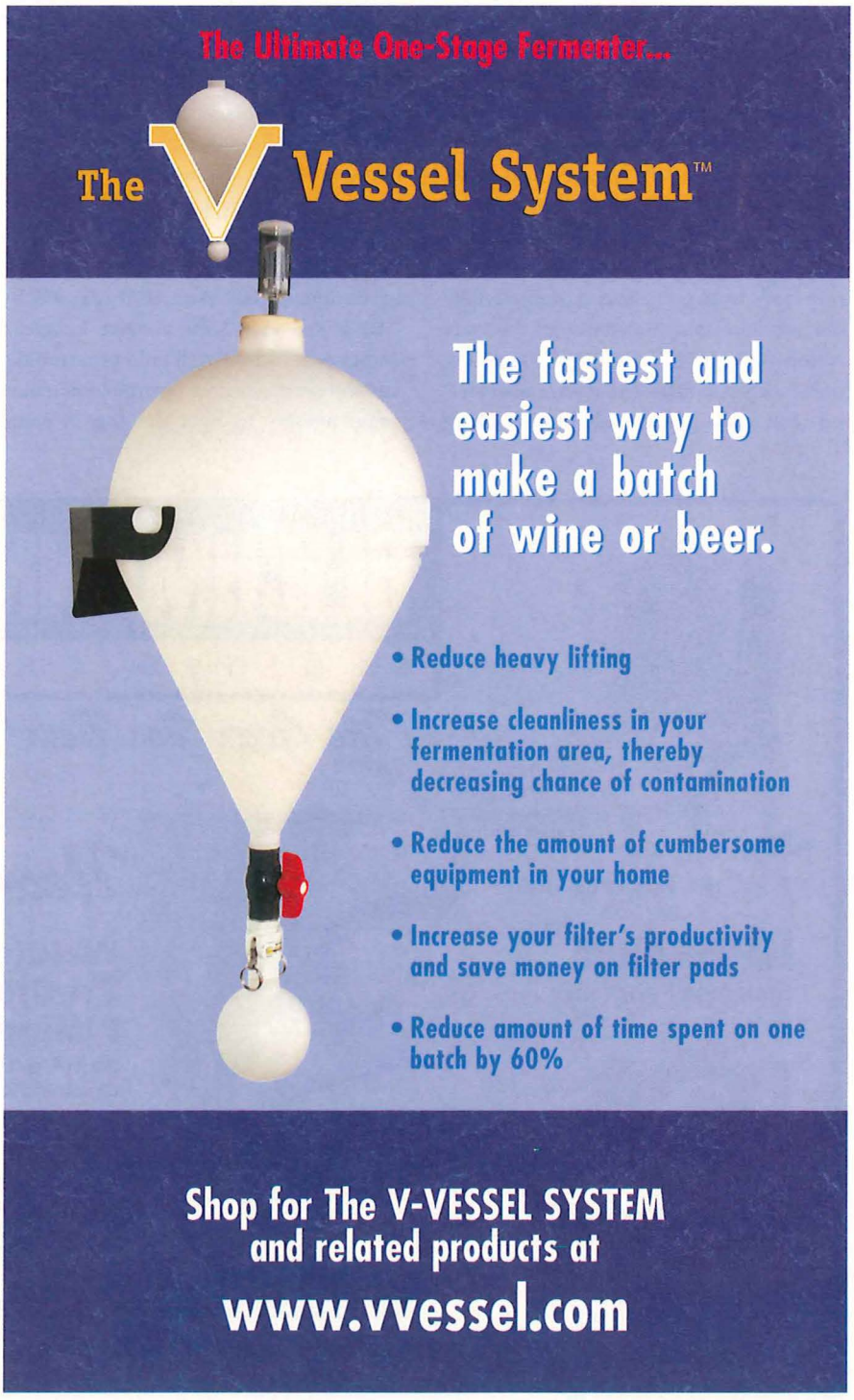
Step by Step

Mill or coarsely crack the specialty malts. Mix well and place loosely in a grain bag. Avoid packing the grains too tightly. Steep the bag in about 2 gallons (~8 liters) of water at roughly 170 °F (77 °C) for about 30 minutes. Lift the grain bag out of the steeping liquid and rinse with warm water. Allow the bags to drip into the kettle without squeezing for a few minutes while you add the malt extract. Add water to the steeping liquor and malt extract to make 5.9 gallons (22.3 liters) and a gravity of 1.056 (13.7 °P). Stir thoroughly and bring to a boil.

Once the wort is boiling, add the bittering hops. Total wort boil time is 1 hour after adding the bittering hops. During that time add the Irish moss or other kettle finings at 15 minutes before shut-down. Add other hop additions at 10 minutes remaining and flame out. Chill the wort to 67 °F (19 °C) and aerate thoroughly. The proper pitch rate is 11 grams of rehydrated dry yeast, 2 packages of liquid yeast or 1 package of liquid yeast in a 2.5-liter starter. Follow fermentation and packaging instructions for the all-grain version.

subtle taste. All-grain brewers can use a single infusion mash and should target a mash that will leave enough long chain sugars to help fill out the body. A temperature around 152–154 °F (67–68 °C) creates wort with a nice balance between fermentable and non-fermentable sugars.

A great deal of an American amber or red's character comes from specialty malts. Every American amber/red needs a firm caramel note and experimenting with the amounts and colors of crystal malts is a great way to change the character. You can use mid-color crystal (40–60 °L), darker crystal (80–150 °L) or a combination of colors. The mid-color crystal malts add more caramel flavors, while the darker crystal malts add progressively more plum, raisin, and burnt caramel notes as they get darker. Darker crystal malts also



tend to be less sweet than the lighter crystal malts. If you're brewing a more restrained version of this style, you'll want to focus mainly on the mid-color crystal malts and you'll want to use less overall. If you're brewing a bigger, bolder version of this style, you'll want to include some darker crystal malts. The darker crystal malts have a more complex, bolder flavor and can help balance the higher alcohol and hop levels. Even though you have a lot of leeway, don't add a lot of low color crystal malt (< 30 °L) as it adds sweetness without much caramel character. Also watch the quantity. If the crystal malt exceeds 15% of the grist it can result in an overly sweet and heavy beer.

Even with a high level of bitterness, there is a limit to how much sweetness is acceptable. While you can balance hop bitterness with malt sweetness, that is true only to a point and it doesn't take much before the drinkability of the beer suffers. One of the other benefits of the darkest crystal malts is that any dark roasted malt can enhance the perception of dryness, and in bigger examples this can be a welcome accent. When making a big American red ale I like to add a little dark-kilned malt like pale chocolate (200 °L) to help balance the finish and add more character. Highly-kilned grains are also useful for enhancing the red color. For a deep red, a couple ounces (28–57 g) of 500 °L or darker grains can help.

For a clean, gentle pub amber, keep it simple with only the crystal malts. For a bigger, richer beer, this style can support other character grain additions. I can't get enough bready-toasty-biscuit character so I like to add Munich and Victory malts for about 10% of the grist on a big red ale.

You have quite a bit of flexibility in hopping American amber/red ales. The bittering can range from slightly sweet to boldly bitter, with the bigger reds often being a bit more bitter. Target a bitterness to starting gravity ratio (IBU divided by OG) of 0.5 to 0.7 for a more balanced amber or 0.7 to 1.0 for a bold red. Hop flavor and aroma also varies from minimal in some ambers to over the top in some reds. Generally, reds have higher levels of hop flavor and aroma. Hops for American amber/red should be American varieties. Cascade, Centennial, Columbus, Simcoe, and Amarillo are all suitable choices.

American amber/red most often has a clean fermentation profile with very low to no fruity esters. A slight fruitiness can be welcome, as long as it isn't excessive. I prefer a clean, moderately attenuating yeast, such as Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale). Oxygenate the wort and pitch an appropriate amount of clean, healthy yeast to help create a clean, American pub-style profile. Ferment around 67 °F (19 °C). Maintain temperature throughout fermentation for a proper level of attenuation and avoiding off-flavors. Temperature swings can result in the yeast flocculating early or producing solventy and/or estery beers.

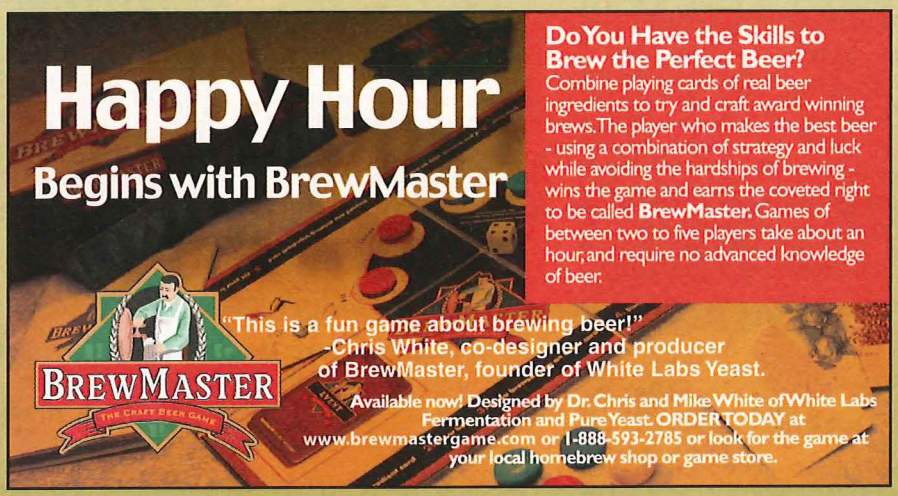
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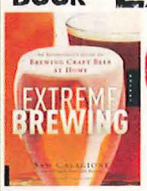
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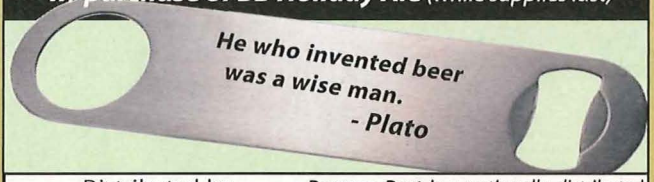
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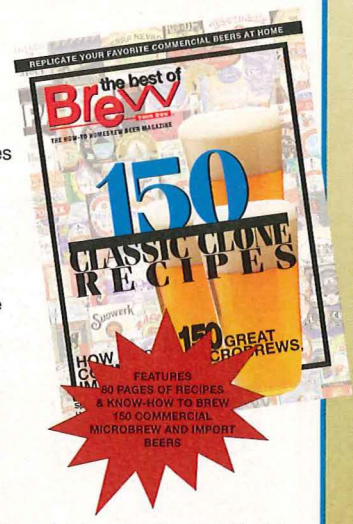


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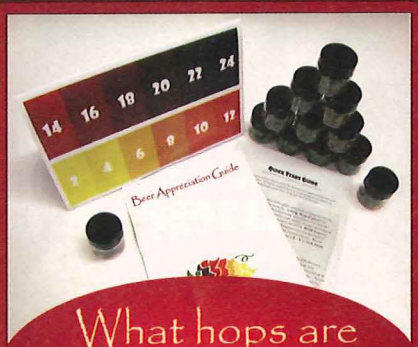
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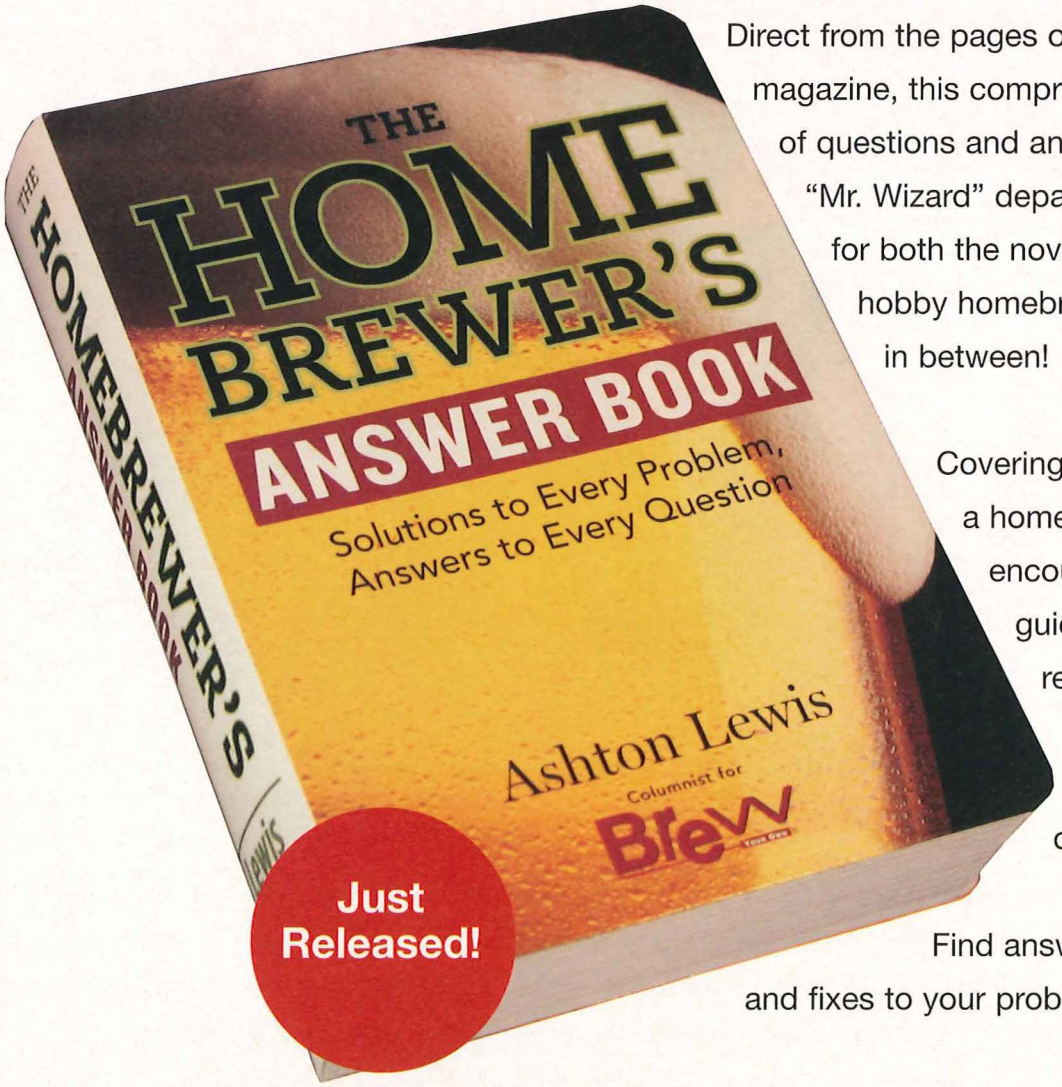
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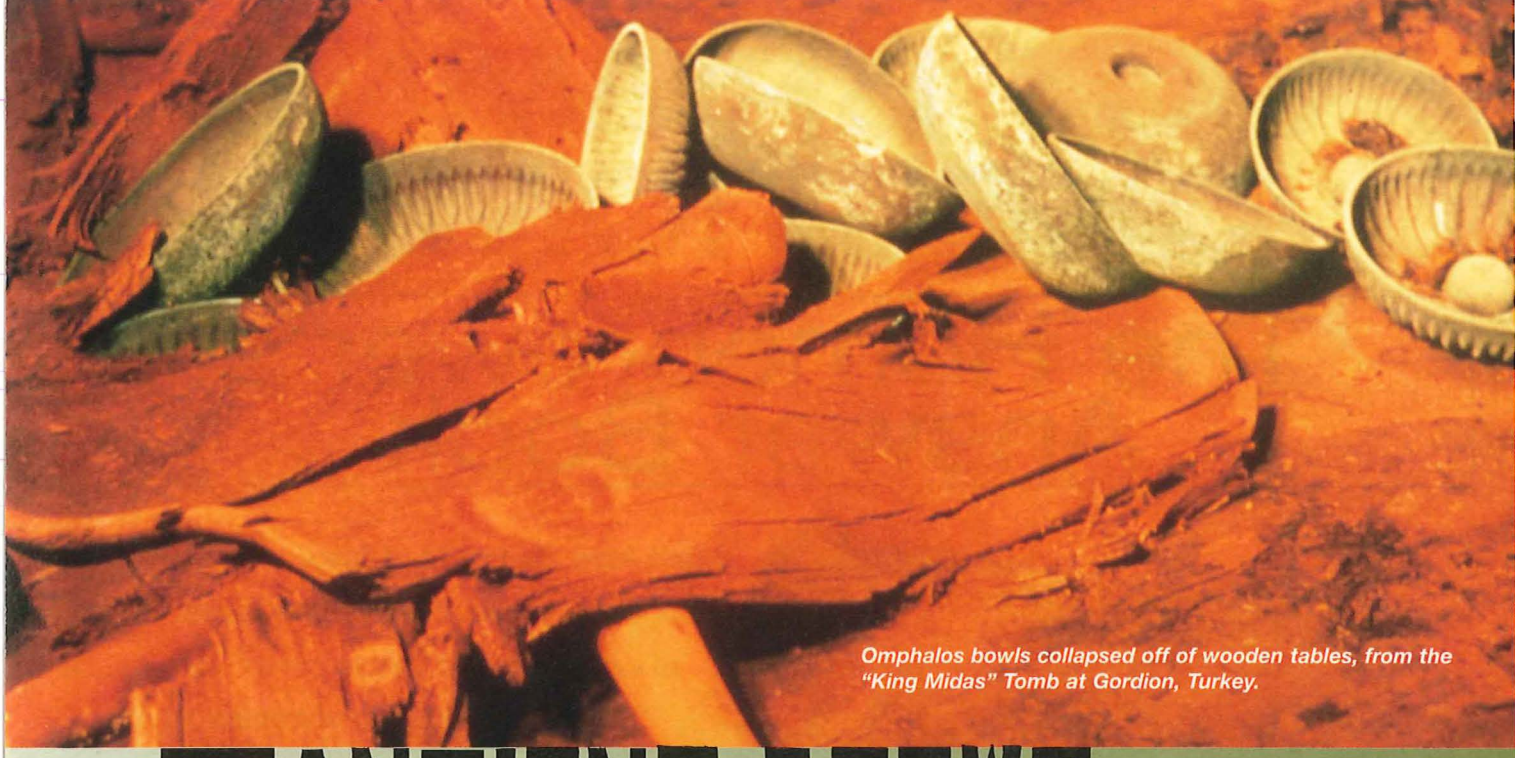
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Omphalos bowls collapsed off of wooden tables, from the "King Midas" Tomb at Gordion, Turkey.

ANCIENT BREWS two

CLONE RECIPES FROM THE PAST

In early 2001, Sam Calagione of Dogfish Head Craft Brewery in Milton, Delaware joined a group of archaeologists from the University of Pennsylvania for a recreation of the funeral feast of the famed King Midas. His contribution? A craft-brewed beverage based on chemical remnants found in Midas' tomb in 1957. A combination of 2-row pale malt, honey, Muscat grapes and saffron, the "golden elixer" Midas Touch has since become a regular in Dogfish Head's brewing schedule. Calagione and his crew of brewers expanded their selection of archaeological brews with Chateau Jiahu — another ancient beverage, this time based on 9,000-year-old residue found in pottery jars in the Neolithic village of Jiahu, in Henan province, Northern China. Will this new "archaeobeer" made from rice, honey, Muscat grapes, barley malt, hawthorn fruit and Chrysanthemum flowers continue to feed a growing interest in the beers of the past? Or will it give today's brewers permission for further experimentation?

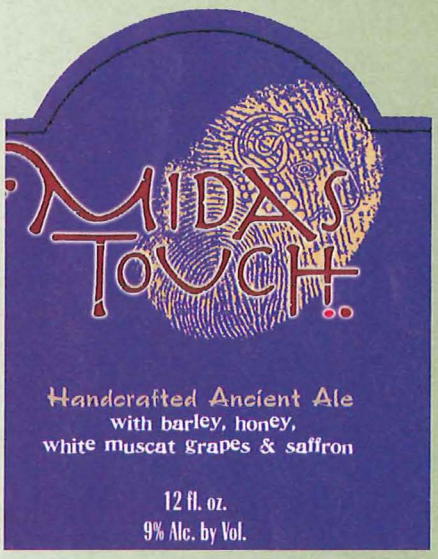
by **Betsy Parks**



"King Midas" laid out in state on piles of purple-and-blue-dyed textiles in his coffin, Tumulus MM tomb chamber at Gordion, Turkey.

Photos courtesy of University of Pennsylvania Museum





DOGFISH HEAD CRAFT BREWERY, KNOWN FOR THEIR INNOVATION AND ESOTERIC BEERS, HAVE PROVEN THAT WHAT'S OLD IS NEW IF YOU GO BACK FAR ENOUGH IN TIME.

Through their brewing experiments with ancient fermented beverages, they've introduced the modern world to the tastes and methods of primitive brewers, and infiltrated the craft brew market with a very different genre. And although you may not be able to time travel, they've also proven that anyone can drink (and brew) a little history — even at home.

"My intention was to stay accurate to the archaeological findings while appealing to modern, sophisticated tastes in beer," Sam Calagione, founder and president of Dogfish Head, said of his reasons for creating the brewery's two historically-inspired "archaeobeers," Midas Touch and Chateau Jiahu.

These brews, both based on the chemical analysis of trace residues in ancient drinking vessels, isolated by University of Pennsylvania Professor and molecular archaeologist Dr. Patrick McGovern with the university's Molecular Archaeology Laboratory in the Museum Applied Science Center for Archaeology, have managed to bridge the gap between ancient history and brewing innovation.

Starting with the release of Midas Touch, Dogfish Head became one of the world's few breweries to commercially produce a beer based on an historical recipe. The experiments began in 1997 when archaeologist Elizabeth Simpson asked McGovern to analyze a dry yellow powder and brown residue that was scraped from the interior of drinking vessels found in the tomb of King Midas, who ruled over Phrygia, which is now central Turkey, around 700 B.C.

Simpson was researching the original dig by archaeologist Rodney Young, who first excavated the tomb in 1957, for a book about the excavation of King Midas' tomb.

Through extensive chemical testing, McGovern and his team of researchers found evidence of beeswax, calcium oxalate (or beerstone) and tartaric acid, which they concluded was chemical evidence of an ancient cocktail of grape wine, barley beer and honey mead or evidence that the vessels stored different fermented liquids. To satisfy their curiosity about what the ancient beverage might have tasted like, McGovern consulted Calagione.

From there, Calagione and Dogfish Head developed a recipe for a brew to resemble (or at least include the main ingredients of) the beverage served at King Midas' funeral feast more than 2,700 years ago. The first batch of the recreated brew, known as Midas Touch, was a formulation of 2-row pale malt, Italian thyme honey and white Muscat grape, flavored with Indian saffron and fermented with mead yeast.

Midas Touch made its debut (at room temperature) at a banquet at the University of Pennsylvania in 2000 featuring food and drink all based on McGovern's chemical evidence from the original funeral feast. But once the feast was finished, Dogfish Head decided to continue brewing it as a commercial beer.

To make Midas Touch, Dogfish Head brewers mash pale malt to make up around 60% of the total sugars. Then they boil the wort and add honey to make another 20%. In place of most of the hops is saffron, which is native to Turkey, although there is a small amount of Willamette hops. After the wort and honey is cooled, the final 20% of fermentable sugars is added as white Muscat grape juice to bring the original gravity to about 1.075—1.080.

With a little experience under their belt, Dogfish went back in time again in 2005 to develop Chateau Jiahu, a brew based on 9,000-year-old reside from pottery jars found in the Neolithic village of Jiahu, in Henan province in Northern China.

Based once more on McGovern's chemical findings, Chateau Jiahu is formulated from chemical evidence found on

continued on page 32

OTHER COMMERCIAL ARCHAEOBEERS

Dogfish Head isn't the only brewery to recreate historical beers. Here are some other examples of commercial recreations of ancient beer recipes.

1988:

Original Flag Porter

Darwin Brewery, Sunderland, England

A traditional 19th century British recipe using yeast salvaged from a vessel, which sank in the English Channel in 1825. Dr. Keith Thomas, brewer and microbiologist cultured the cells to make a strain for what became Original Flag Porter, which is available commercially. http://www.legendslimited.com/flag.html for more info.

1989:

Sumerian Beer

Anchor Brewing Company, San Francisco, California

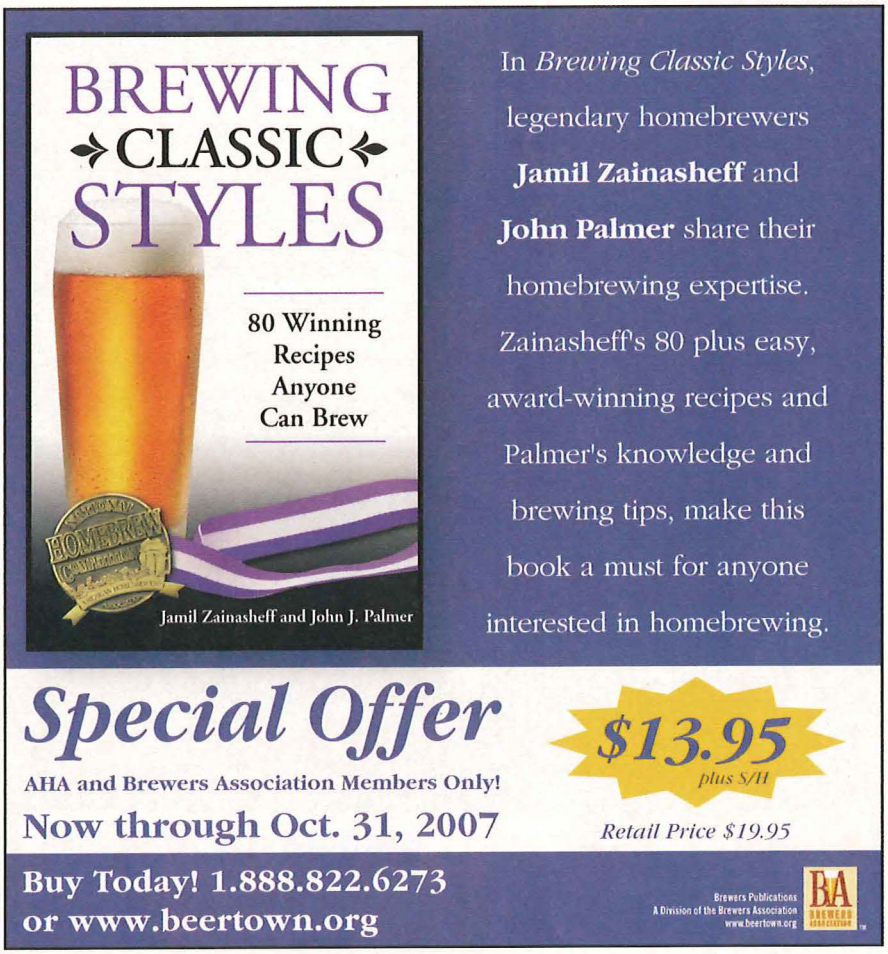
Fritz Maytag created a beer based on "The Hymn to Ninkasi," which is an ancient Sumarian verse that describes the brewing process while praising Ninkasi, the Sumarian goddess of brewing, written in stone around 1800 B.C. Read more at http://www.anchorbrewing.com/beers/ninkasi.htm.

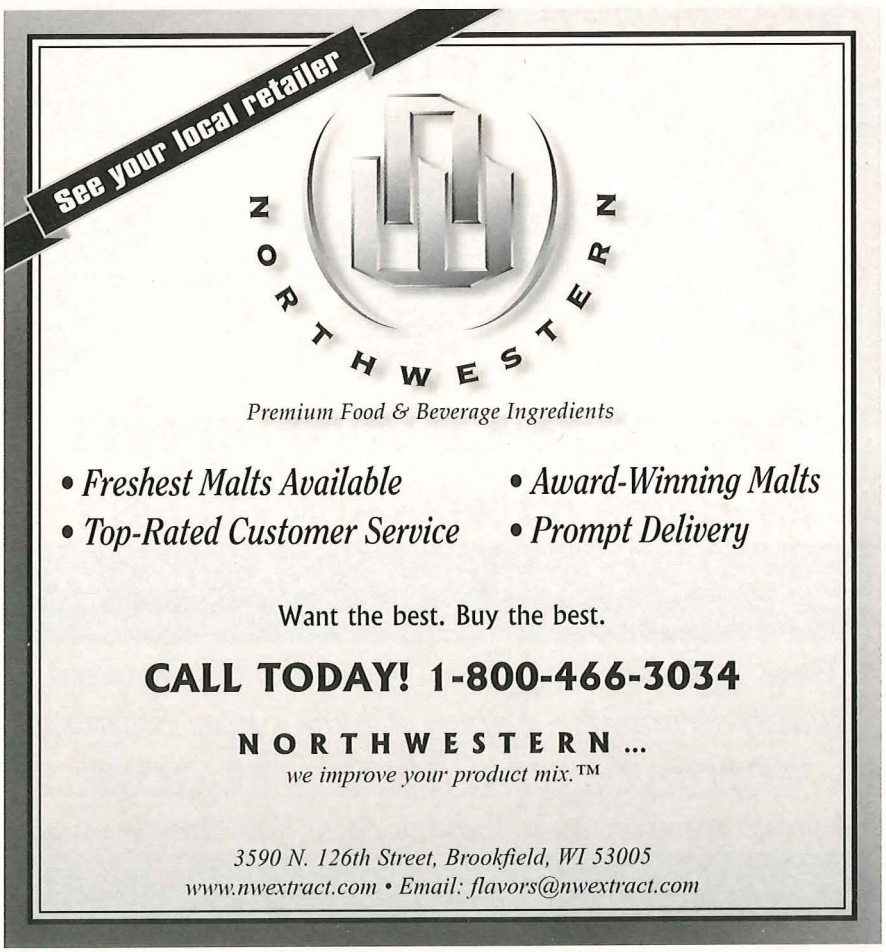
1996:

Tutankhamun Ale

Scottish and Newcastle Breweries, England

Delwen Samuel, an archaeobotanist at the McDonald Institute for Archaeological Research at the University of Cambridge in England and brewers from Scottish and Newcastle breweries developed Tutankhamun Ale, made from emmer and coriander, based on sediment found in the Sun Temple of Nefertiti, which is more than 3,500 years old. Nefertiti was the wife of Akhenaten who Egyptologists believe was Tutankhamun's ("King Tut's") father. Brewers produced around 1,000 bottles, which are now some of the most expensive bottles of beer in the world. Samuel later developed a recipe based on remnants from ancient druids.





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continued from page 30



". . . the fact that a beer based on a 9000-year-old recipe can sit on a shelf next to a New World IPA is a signal that innovation can be more than new hops or malts . . ."



shards of pottery of a fermented beverage made with rice, honey, Muscat grapes, barley malt, hawthorn fruit and chrysanthemum flowers. This time around, Calagione and his brewers recreated the brew using pre-gelatinized rice flakes and barley malt in the mash and used honey, grapes, hawthorn fruit and chrysanthemums — just as the original — also adding some Simcoe hops. The mixture was fermented for a month with shoji sake yeast, which was used as both a nod to tradition as it was a better match for the yeasts available to the ancient brewers, and also for its affinity for rice.

Although certainly not the only brewery to dabble in historical beverages (see sidebar on page 31), Dogfish Head has set themselves apart from other projects by developing their ancient recipe adaptations to appeal to craft beer drinkers and for commercial production — to be beers that you would actually want to drink.

"I wanted to make beverages that were both romantic and historical," Calagione said. "Fritz Maytag's Ninkasi

was faithful to the historical information, but it was awkward. Of course there's a lot of room for interpretation — things we really don't know, or some liberties we can take."

These liberties include filtering and carbonation, as the original beverages were likely cloudy (or even chunky!) and if they were carbonated, probably lost their fizz rather quickly. Differences also include refrigeration, basic measurements, color and alcohol by volume.

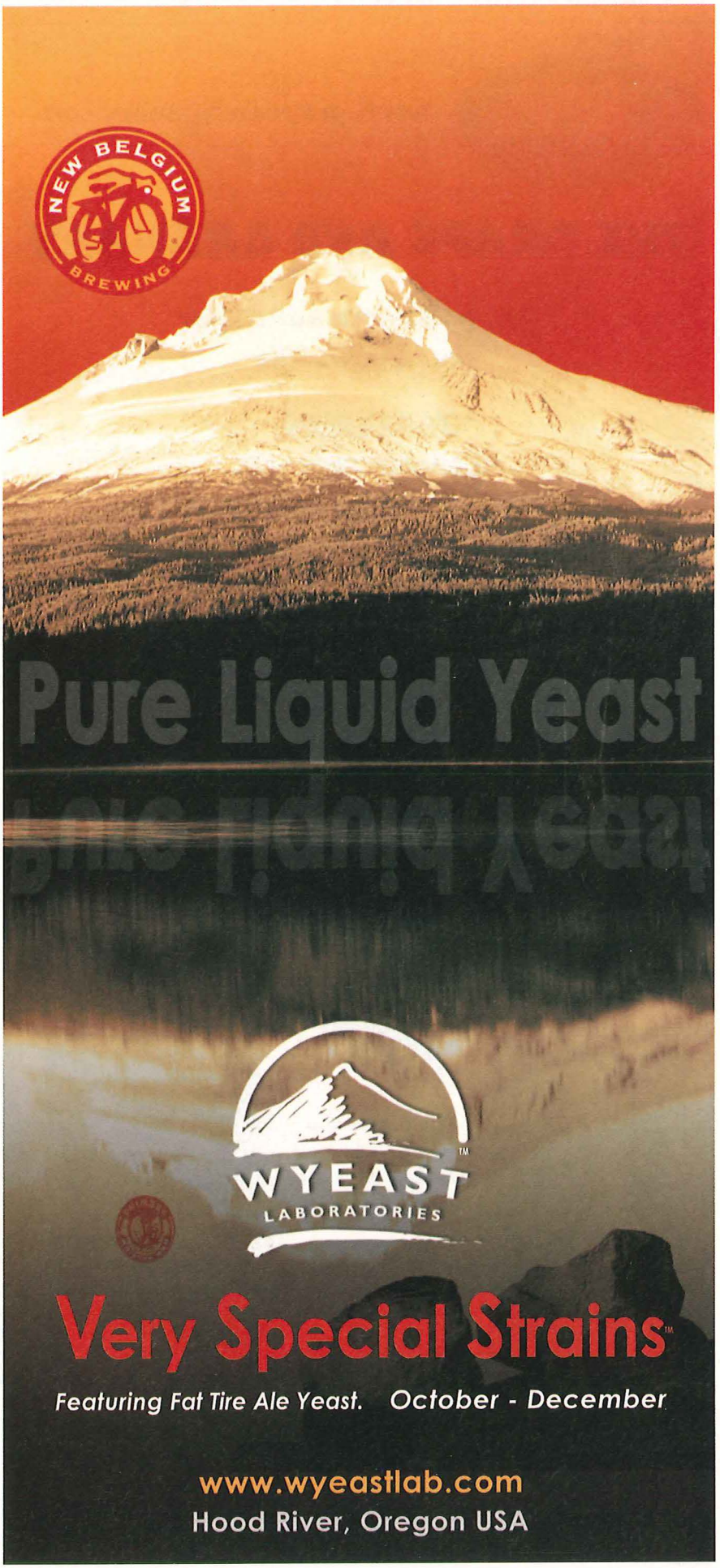
"We don't know what the colors were of the ancient brews," said Calagione. "We don't know what alcohol levels they attained, and while we know what the main ingredients were, we don't know what proportions they used. We don't even know for sure if grains, honey and grapes were fermented together, or if these were blends of beer, wine and mead."

But while there's no way of knowing how the original beverages looked or tasted, interest in Dogfish's archaeological experiments has intrigued both brewers and drinkers alike. Midas was well received — both historically and commercially — and these days the brewery produces their "golden elixir" in limited monthly batches in 12-ounce bottles year-round.

The success of Chateau Jiahu remains to be seen, but the fact that a beer based on a 9,000-year-old recipe can sit on a shelf next to a New World IPA is a signal that innovation can be more than new hops or malts — it can also be reinvention.

So, what about an ancient homebrew? Is it possible to recreate one of these beers in your own brewpot? After all, the earliest brewers certainly never heard of a conical fermenter or a RIMS. So not surprisingly, the brewers at Dogfish Head say that brewing ancient beers at home is very possible. In fact, brewing one of these recipes can be nearly as simple as most other brews, with the exception of a few distinct ingredients (see clone recipes on page 35). That's because thankfully when you're homebrewing you don't have to tackle with issues the Dogfish Head brewers face in their commercial brewing facility.

"When one of these specialty brews



comes up on the schedule, the brewers either cringe or sigh," Dogfish Head's Lead Brewer Bryan Selders said, explaining that beers like Midas and Jiahu (and many of Dogfish Head's specialty beers) involve more labor and ingredients than the average ale. But that doesn't mean, in his opinion, that you'll encounter the same problems. You won't have to dump buckets of honey or grapes into your fermenter, for example. Selders does recommend, however, following their recipes very carefully, paying close attention to timing. Some special ingredients need certain conditions to shine.

"When adding Muscat grape juice, we try not to add it too soon or the volatiles will be driven off in the boil," said Selders. "We add it when there's about 4 °P (1.016 SG) left." Chateau Jiahu also calls for using sake yeast, which he says shouldn't scare anyone off, as long as they feel comfortable making a yeast starter. (Read more about making a yeast starter on page 51 of the July-August 2007 issue of *Brew Your Own*). Otherwise, the brewing procedures are pretty straightforward.

As for more archaeobeer experiments in the future, Selders says Dogfish Head is always up for something different, especially when challenged with ingredients they don't use on a daily basis. And because of their relationship with McGovern, he says there is always a chance for another collaboration.

"We're certainly open to it and we're excited about new challenges and flavors," Selders said. "But we can let the historians and archaeologists worry about the other parts."

Interest in the ancient beers and their recipes, especially from fellow brewers, also always inspires, according to Calagione.

"Homebrewers are the real beer champions," said Calagione. "I still think of Dogfish Head as a 100-barrel homebrew kit!"

Betsy Parks is the assistant editor of Brew Your Own. *To read more about the science of beer archaeology, check out Dan Mouer's "Archaeobeer" story in the September 2007 issue.*

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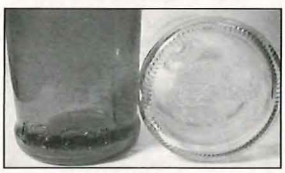
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ANCIENT CLONES

Dogfish Head Midas Touch

(5 gallons, extract with grains and adjuncts)

OG = 1.078 FG = 1.010 IBUs = 10
ABV = 9.0%

Ingredients

3.3 lbs. Briess light malt extract syrup
1.5 lbs. Briess light dry malt extract
3 lbs. honey (do not boil)
2 lbs. Alexander's Muscat grape concentrate (do not boil)
0.5 teaspoon dry saffron (boil 15 minutes)
2.5 AAU Willamette hops (bittering hop) (0.5 oz. of 5.0% alpha acid)
2.5 AAU Willamette hops (flavor hop) (0.5 oz. of 5.0% alpha acid)
1 tsp. Irish moss
White Labs WLP500 (Trappist) or Wyeast 3787 (Trappist) yeast
¾ cup of corn sugar (for priming)

Step by step

Heat 2.5 gallons of water to a boil, add malt syrup and powder and return to a boil. Add Willamette hops, Irish moss and boil for 60 minutes. Add 0.5 ounce of Willamette hops and the Saffron for last 15 minutes of the boil. Add honey at the end of the boil after you turn off the heat. Let stand for 5 minutes to sanitize the honey.

Strain out the hops, add wort to two gallons cool water in a sanitary fermenter, then add the Muscat concentrate and top off to 5.5 gallons. Cool the wort to 80° F, aerate the beer and pitch your yeast. (For a high-gravity fermentation such as this, be sure to make a yeast starter.) Allow the beer to cool to 68-70° F, and ferment for 10 to 14 days. Bottle your beer, age for three to four weeks and enjoy!

All-grain option

Replace the light syrup with 6.0 lbs. two-row pale malt. Mash your grains at 155° F for 45 minutes. Lower the amount of bittering hops to 0.4 ounces.

Chateau Jiahu clone

(5 gallons/19 L, all-grain)

OG = 1.088 FG = 1.014
ABV = 10%

Ingredients:

11 lb. 6 oz. (5.2 kg) two-row pale malt
3.0 lbs. (1.4 kg) orange blossom honey
2.0 lbs. (0.91 kg) rice syrup
1.0 lb. (0.45 kg) Alexander's Muscat grape juice concentrate
0.5 lbs. (0.23 kg) Hawthorn berry powder
0.25 oz. (7.1 g) Simcoe hops (60 mins)
Wyeast 4134 (Sake #9) yeast

Step by Step

The day before brewday, prepare a 1 qt. (~1 L) yeast starter. Mash with 3.5 gallons (13 L) of water to achieve a temperature of 149 °F (65 °C). Rest for 30 minutes. During the rest, heat 4.5 gallons (17 L) of water to 170 °F (77 °C) for sparging. After the 30 minute rest, vorlauf until wort of acceptable clarity is obtained. Begin collecting wort in the brew kettle. Sparge as normal. Collect 6.25 gallons (24 L) of wort. Once the kettle is full, add rice syrup. Boil 15 minutes. Add Simcoe hops. Boil for 60 minutes. Turn off heat and stir in honey and hawthorn berry powder. Stir to create a whirlpool. Chill, aerate and pitch sake yeast starter. As fermentation starts to subside, add Muscat grape juice concentrate. Cool the beer after 12–14 days. Cold condition for 21 days. Keg or bottle as normal. Allow whatever time you deem necessary for proper conditioning and enjoy!

Chateau Jiahu clone

(5 gallons/19 L, extract with grains)

OG = 1.088 FG = 1.014
ABV = 10%

Ingredients:

2.0 lbs. (0.91 kg) two-row pale malt
2 lb. 2 oz. (0.96 kg) Muntons light dried malt extract
4.0 lbs. (1.8 kg) Muntons light liquid malt extract
3.0 lbs. (1.4 kg) orange blossom honey
2.0 lbs. (0.91 kg) rice syrup
1.0 lb. (0.45 kg) Alexander's Muscat grape juice concentrate
0.5 lbs. (0.23 kg) Hawthorn berry powder
0.25 oz. (7.1 g) Simcoe hops (60 mins)
Wyeast 4134 (Sake #9) yeast

Step by Step

Place crushed grains in a nylon steeping bag and steep (in a separate pot) in 2.5 quarts (2.4 L) of water at 149 °F (65 °C) for 45 minutes. (This is actually a small mash, so follow temperatures and volumes as closely as is feasible.) Bring 2 gallons (7.6 L) of water to a boil in your brewpot while grains are steeping. After steep, place grain bag in colander over brewpot. Pour "grain tea" through grain bag (to strain out grain husks), then rinse grain bag with 1.5 quarts (~1.5 L) of 170 °F (77 °C) water. Bring this wort to a boil, then add dried malt extract. Boil 15 minutes. Add Simcoe hops. Boil for 60 minutes.

Stir in liquid malt extract with 15 minutes left in boil. Turn off heat and stir in honey and hawthorn berry powder. Chill wort in brewpot, then transfer to fermenter. Bring fermenter volume to 5 gallons (19 L) with water, aerate and pitch sake yeast starter. As fermentation starts to subside, add Muscat grape juice concentrate. Cool the beer after 12–14 days. Cold condition for 21 days. Keg or bottle as normal. Allow whatever time you deem necessary for proper conditioning and enjoy!

BACK IN BLACK

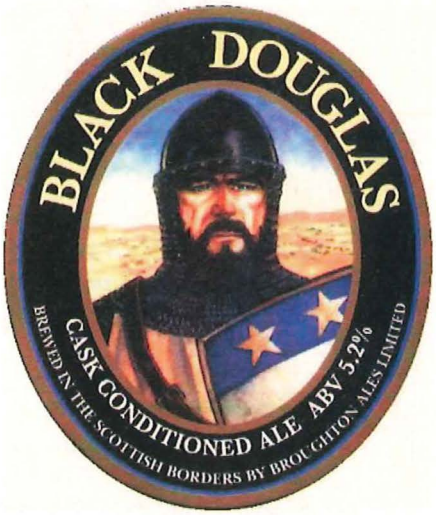




Photo by Charles A. Parker

the truth about black patent malt

by Kristen England

Many articles about specialty malts talk about the history of a malt, how it came into being or how three hogsheads of it appeared on a ship's manifest in 1780 or whatever. That sort of historical information may be interesting in the abstract, but what interests me the most is practical information I can use in my home brewery. With that in mind, I'd like to kick off a series of articles discussing three of the biggest, baddest and darkest grains we brewers use, namely black malt, chocolate malt and roasted barley. In the series, I'll teach you the functional uses of the malts and present a few commercial clones that highlight the malt in question. First up, the dreaded black malt.

A Black Mark Up Against Its Name

If there ever was a malt equivalent of the crazy uncle that lives under the stairs, black malt (also called black patent malt) would be it. Few people use it, most people don't think they like it and everyone is afraid of it. Why, you ask? Because all the current literature tells you so. A usual description goes something like this, "Black malt lends a very sharp, acrid, burnt flavor whose harshness is beyond that of both chocolate malt and roasted barley." Sometimes, it is additionally described as "ashy." To top it off, many sources advise brewers that it should only be used sparingly. With a sales department like that, I would stay away from this stuff too! Let me tell you, however, the assessment of black malt as a harsh malt that should only be used in small quantities is W-R-O-N-G! When used properly, in the right beer, nothing can replace black malt for what it lends to a beer. Black malt primarily gives a highly roasted flavor, that carries some bitterness and acidity. But it can also show a deep fruity character reminiscent of currants, blackberries or sultanas. It gives deep contrast to a round malty beer by giving it some elbows, without being pushy. Most importantly, even in very small quantities, it provides a drying quality that brightens up the finish of any beer.

How Black Malt is Made

Black malt is made from fully-modified pale malt, containing around 5% moisture. In contrast, some other specialty malts, including crystal malts, are made from "green" (undried) malt. Plump, full-sized kernels — as uniform in size as possible — are selected because smaller kernels would heat up too quickly in the intense roasting process. The malt is then placed in a roasting drum and rewetted. Next it is kilned at 221–233 °C (420–450 °F) for up to four hours. The exact time depends on the size of the batch. David Kuske, Director of Malting Operations at Briess says that they roast 6,000 lbs. (2,700 kg) at a time. During roasting, the malt loses around 10–15% of its original dry weight.

The temperature of the kiln needs to be tightly monitored. If it rises to 250 °C (480 °F), the malt can turn to charcoal and catch fire. As the malt is kilned and develops its dark color, its progress is carefully monitored. Kuske says that one tool used by Briess is a device that crosscuts the malt, so the interior of the grain can be inspected. Pitting in the endosperm is a sign that the roasting has gone too far.

The color of the malt increases as roasting time increases. Interestingly, though, if roasting is extended too far, extractable color can actually decrease. Given the long, intense roasting period, almost all the volatiles are driven off, leading to a malt that — in stark contrast to its reputation — is actually fairly "mellow" compared to other dark roasted grains. When the desired depth of roasting is reached, it is sprayed with water over a period of 10 minutes. The water cools the malt and stops the development of color. Black malt actually has a moisture content (around 6%) higher than most other specialty grains. The moisture content gives the malt some added stability while it quickly cools the malt.

Another interesting fact about black patent malt is that — unlike pale malts — it is nearly sterile. Some commercial breweries, in fact, use black malt





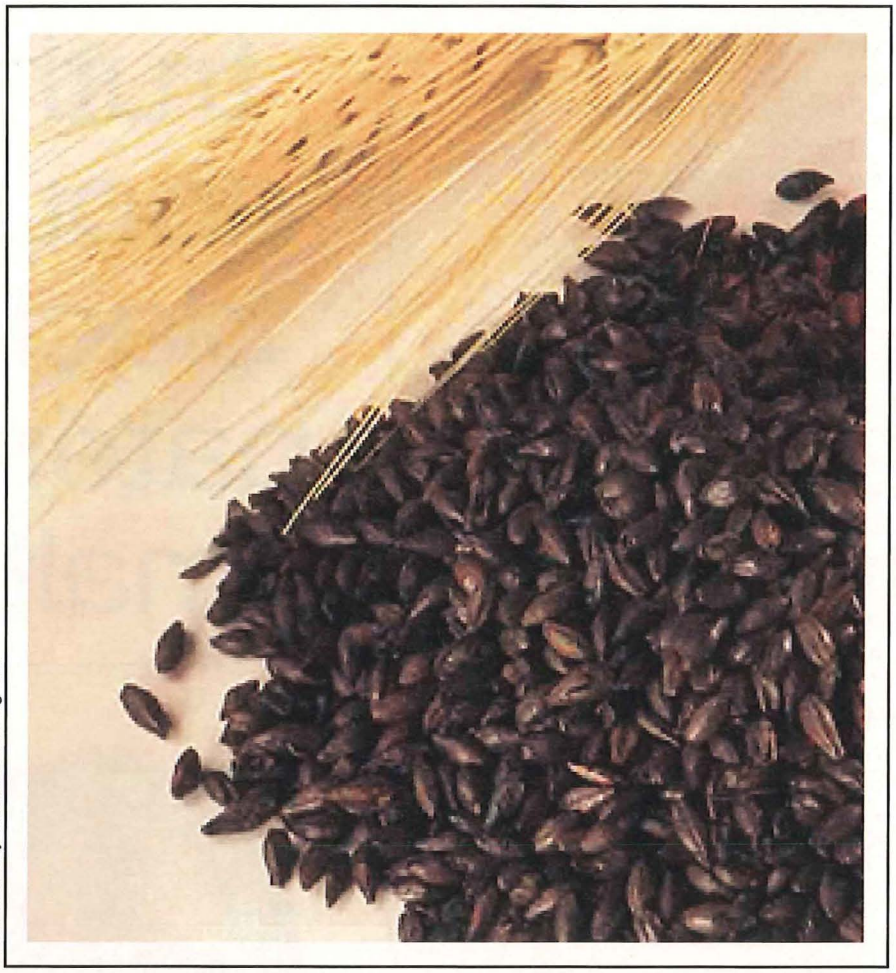


Photo courtesy of Briess Malting Co.

Black malt, chocolate malt and roasted barley are the darkest grains used in brewing. If handled properly, they can yield some excellent (and surprising) results.

(or black malt flour) in their fermenters rather than the mash tun.

The color of the malt varies from around 470 to around 620 °L and it has an extract potential around 1.025. (In other words, a pound of black malt would yield a specific gravity of 1.025 when mashed in a gallon of water.) Most of the extract from the grain is not fermentable.

Some maltsters offer debittered black malt, black malt that has had its husk removed. The intent is to produce a malt with the roast character, but without the bitterness associated with the husk.

Recipe Considerations

In dark beers, black malt can complement other dark malts and grains such as chocolate and roasted barley. It can also be used successfully in conjunction with the darker crystal malts. If you have a dark beer recipe, such as a porter or stout, that uses one dark malt for all of its roast character, substituting a blend of dark grains — including black malt — can lend a note of complexity.

Like all dark grains, black malt is an acidic malt. A mash of black malt only would yield a pH value under 4. In beers that use a substantial amount of it, adding carbonates — either from calcium carbonate (chalk) or sodium bicarbonate (baking soda) to your water may be needed to keep the mash in the proper range.

Another fact about dark grains is that the polyphenols (tannins) in their husks are more easily extractable, compared to paler malts. As such, dark grains can lend some astringency to a beer. In most beers, astringency is something brewers strive to avoid. In some beers, however, a little bit of drying astringency can be a positive attribute, as it is in many red wines (or oak-aged brews).

Color Adjustment

Black malt is frequently used to adjust color in pale beers. Schwarzbier and the "dunkel" version of many European Pilsners are colored with black malt. (Black malt flour and liquid color extracts are also used for this purpose). Just one ounce (28 g) in 5 gallons (19 L) of pale beer adds 5–6 SRM, depending on the Lovibond rating of the malt.

Commercial Examples

One usually finds black malt associated with higher gravity porters and stouts, but don't let that fool you into thinking other styles won't benefit from a hit of the "black stuff." In a session-style brown porter, it lends a distinct heavy dark fruit note. When used in large amounts, it can play a big role in emphasizing ripe dark fruits and give a raisiny character to a big American stout. In an old ale, it emphasizes the vinous, port-like character of aged examples. Used in a Scottish 80/-, the drying character brings out the kettle caramelized malt.

To further your knowledge of this wonderful malt, I present four different clone recipes.

Sierra Nevada Stout clone
(5 gallons/19 L, all-grain)

OG = 1.065 FG = 1.019
IBU = 60 SRM = 40 ABV = 5.8%
Creamy and malty with notes of dark caramel, chocolate, light molasses and ripe plums. An American stout that truly typifies citrusy hops and black malt.

Ingredients

9.0 lbs. (4.1 kg) American pale malt
3.0 lbs. (1.4 kg) Munich malt (10 °L)
1.0 lb. (0.45 kg) American Black Patent malt (500 °L)
0.67 lbs. (0.30 kg) American crystal malt (60 °L)
14 AAU Magnum hops (60 mins) (1.0 oz./28 g of 14% alpha acids)
5.8 AAU Cascade hops (10 mins) (1.0 oz./28 g of 5.75% alpha acids)
2.0 oz. (57 g) Willamette hops (0 min)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Safale US-05 yeast
1 cup corn sugar (for priming)

Step by Step

Mash 154 °F (68 °C) for 60 minutes in 16 qts. (15 L) of mash liquor. Boil wort for

60 minutes. Ferment for 7 days at 68 °F (20 °C). Rack to secondary and condition for 14 days at 68 °F (20 °C).

Sierra Nevada Stout clone
(5 gallons/19 L, partial mash)

OG = 1.065 FG = 1.019 IBU = 60
SRM = 40 ABV = 5.8%

Ingredients

0.33 lbs. (0.15 kg) American pale malt
3.0 lbs. (1.4 kg) Munich malt (10 °L)
1.0 lb. (0.45 kg) American black patent malt (500 °L)
0.67 lbs. (0.30 kg) American crystal malt (60 °L)
2.0 lbs. (0.91 kg) Briess Light dried malt extract
4.0 lbs. (1.8 kg) Briess Light liquid malt extract (late addition)
14 AAU Magnum hops (60 mins) (1.0 oz./28 g of 14% alpha acids)
5.8 AAU Cascade hops (10 mins) (1.0 oz./28 g of 5.75% alpha acids)
2.0 oz. (57 g) Willamette hops (0 min)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Safale US-05 yeast
1 cup corn sugar (for priming)

Step by Step

Mash at 154 °F (68 °C) for 60 minutes in 7.5 qts. (7.1 L) of mash liquor. Combine partial mash wort with dried malt extract and enough water to make at least 3.5 gallons (13 L). Boil wort for 60 minutes. Add liquid malt extract with 15 minutes left in boil. Ferment at 68 °F (20 °C). Rack to secondary and condition beer for 14 days at 68 °F (20 °C).

Gale's Prize Old Ale clone
(5 gallons/19 L, all-grain)

OG = 1.090 FG = ~1.020
IBU = 53 SRM = 21 ABV = +9.0%

This opens with a deep caramel apple character with notes of plums and sultanas. The tart fruity finish has hints of raisins and a spiciness lent by the rustic hops. One of the best examples of an old ale on the market.

Ingredients

14.5 lbs. (6.6 kg) 2-row pale ale malt (Maris Otter)
0.33 lbs. (0.15 kg) English black patent malt
2.0 lbs. (0.91 kg) Lyle's Golden Syrup
15 AAU Challenger hops (60 mins)(2.0 oz./57 g of 7.5% alpha acids)
2.6 AAU Fuggles hops (10 min) (0.50 oz./14 g of 5.25% alpha acids)
2.5 AAU Kent Goldings (10 min) (0.50 oz./14 g of 5% alpha acids)
Wyeast 1099 (Whitbread Ale) or White Labs WLP007 (Dry English Ale) yeast
1 cup corn sugar (for priming)

Step by Step

Mash at 154 °F (68 °C) for 60 minutes in 4.5 gallons (17 L) of mash liquor. Boil wort for 60 minutes. Add sugar syrup with 15 minutes left in boil. Ferment at 62 °F (17 °C), about 7 days. Rack to secondary and condition for 14 days at 62 °F (17 °C). This beer should be bottle conditioned at

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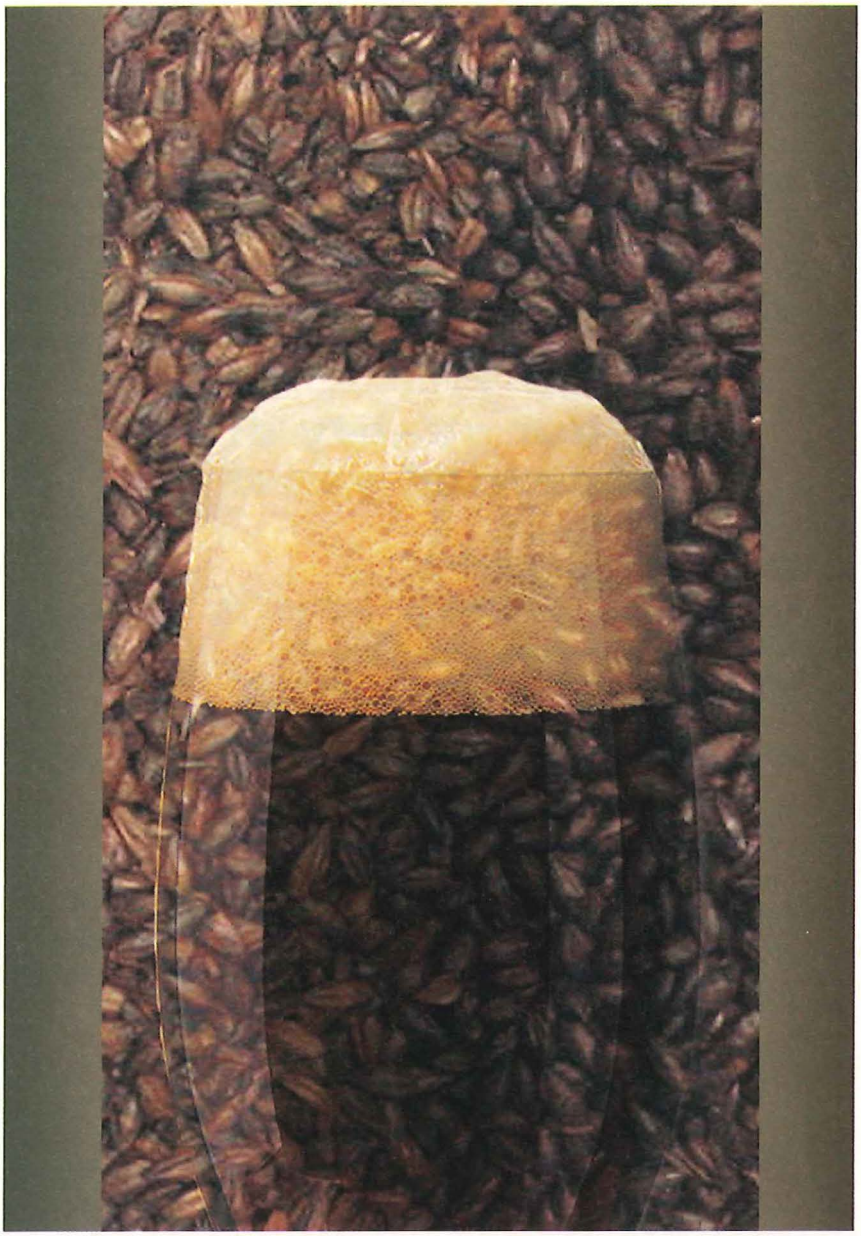


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Black malt can bring out flavors of dark, ripe fruit. In aged beers, they can emphasize port-like qualities while also lending some drying astringency.

about 2–2.5 volumes of CO_2. As it ages it will take on a brandy-like character and dry out considerably.

Gale's Prize Old Ale clone
(5 gallons/19 L, extract with grains)

OG = 1.090 FG = ~1.020
IBU = 53 SRM = 21 ABV = +9.0%

Ingredients

1.67 lbs. (0.76 kg) 2-row pale ale malt (Maris Otter)
0.33 lbs. (0.15 kg) English black patent malt
2.5 lbs. (1.1 kg) Muntons Light dried malt extract
6.6 lbs. (3.0 kg) Muntons Light liquid malt extract (late addition)
2.0 lbs. (0.91 kg) Lyle's Golden Syrup
5.6 AAU Challenger hops (60 mins) (0.75 oz./21 g of 7.5% alpha acids)
2.6 AAU Fuggles hops (10 min) (0.50 oz./14 g of 5.25% alpha acids)
2.5 AAU Kent Goldings (10 min) (0.50 oz./14 g of 5% alpha acids)
Wyeast 1099 (Whitbread Ale) or White Labs WLP007 (Dry English Ale) yeast
1 cup corn sugar (for priming)

Step by Step

Steep grains at 154 °F (68 °C) for 60 minutes in 3.0 quarts (2.8 L) of water. Add dried malt extract and water to make 3 gallons (11 L) of wort. Boil wort for 60 minutes. Add sugar syrup and liquid malt extract with 15 minutes left in boil. Ferment at 62 °F (17 °C), about 7 days. Rack to secondary and condition for 14 days at 62 °F (17 °C). This beer should be bottled conditioned at about 2–2.5 volumes of CO_2. As it ages it will take on a brandy-like character.

Broughton Black Douglas clone
(5 gallons/19 L, all-grain)

OG = 1.053 FG = 1.012
IBU = 30 SRM = 32 ABV = 5.2%

Dark caramelized fruit, bready malt and treacle fill out the flavors of this beer. The finish dries out just enough to highlight the deep malt character. A unique take on the Scottish 80/- style that may even be better with a touch of smoky Scotch whiskey added to it.

Ingredients

10 lbs. (4.5 kg) English pale ale malt (Optic)
0.75 lbs. (0.34 kg) English black patent malt
0.33 lbs. (0.15 kg) English crystal malt (150 °L)
5.3 AAU Challenger hops (60 mins) (0.75oz./21 g of 7.0% alpha acids)
4.5 AAU First Gold hops (20 mins) (0.5 oz./14 g of 9.0% alpha acids)
Wyeast 1728 (Scottish Ale) or White Labs WLP028 (Edinburgh Ale) yeast
¾ cup corn sugar (for priming)

Step by Step

Mash at 153 °F (67 °C) for 60 minutes in 3.2 gallons (12 L) of mash liquor. Boil for 180 minutes. Ferment at 62 °F (17 °C). Condition for 14 days at 62 °F (17 °C).

Broughton Black Douglas clone
(5 gallons/19 L, extract with grains)

OG = 1.053 FG = 1.012
IBU = 30 SRM = 32 ABV = 5.2%

Ingredients

1.0 lbs. (0.45 kg) English pale ale malt (Optic)

0.75 lbs. (0.34 kg) English black patent malt
0.33 lbs. (0.15 kg) English crystal malt (150 °L)
2.5 lbs. (1.1 kg) Muntons light dried malt extract
3.3 lbs. (1.5 kg) Muntons light liquid malt extract
5.3 AAU Challenger hops (60 mins) (0.75oz./21 g of 7.0% alpha acids)
4.5 AAU First Gold hops (20 mins) (0.5 oz./14 g of 9.0% alpha acids)
Wyeast 1728 (Scottish Ale) or White Labs WLP028 (Edinburgh Ale) yeast
¾ cup corn sugar (for priming)

Step by Step

Steep grains at 153 °F (67 °C) for 60 minutes in 3.0 quarts (2.8 L) of water. Add dried malt extract and water to make 3.0 gallons (11 L) of wort. Boil wort for 90 minutes. Keep a second pot of boiling water handy and don't let wort volume drop below 2.5 gallons (9.5 L). Add liquid malt extract with 15 minutes left in boil. Ferment at 62 °F (17 °C), about 7 days. Rack to secondary and condition for 14 days at 62 °F (17 °C).

RCH Old Slug Porter clone
(5 gallons/19 L, all-grain)

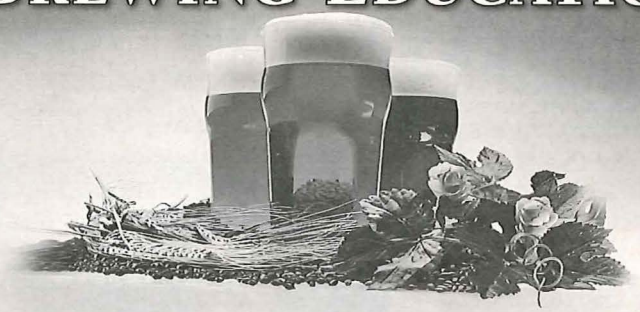
OG = 1.043 FG = 1.011
IBU = 22 SRM = 33 ABV = 4.3%

A session-style English brown porter that despite its low gravity has deep flavors of dark chocolate, blackcurrant and tawny port. One of the very best brown porters of which most people have never heard of.

Ingredients

7.25 lbs. (3.3 kg) English pale ale malt (Maris Otter)
0.67 lbs. (0.30 kg) English black patent malt
0.5 lbs. (0.23 kg) English crystal malt (150 °L)
1.7 AAU East Kent Goldings hops (60 mins) (0.33 oz./9.4 kg of 5% alpha acids)
1.7 AAU Fuggles hops (60 mins) (0.33 oz./9.4 g of 5.25% alpha acids)
1.7 AAU East Kent Goldings hops (20 mins) (0.33 oz./9.4 kg of 5% alpha acids)
1.7 AAU Fuggles hops (20 mins) (0.33 oz./9.4 g of 5.25% alpha acids)

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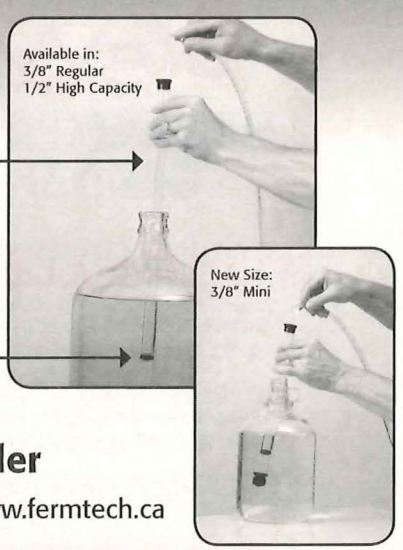
Kit includes: Instructional Homebrewing DVD, Instructional book, 6.5 Gallon Fermenter and Lid, 6.5 Gallon Bottling Bucket with Spigot, 8 Oz. of Easy Clean No-Rinse Cleanser, Airlock, Hydrometer, Bottle Brush, Twin Lever Red Baron Bottle Capper, Bottle Caps, Liquid Crystal Thermometer, Bottle Filler, Racking Tube with Bucket Clip, and Siphon Tubing. Midwest also offers over 100 Beer Recipe kits.

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Lallemand Nottingham ale yeast
¾ cup corn sugar
(for priming)

Step by Step

Mash at 151 °F (66 °C) for 60 minutes in 9 quarts (~9 L) of mash liquor. Boil for 60 minutes. Ferment at 66 °F (19 °C). Rack to secondary and condition for 7 days at 66 °F (19 °C).

RCH Old Slug Porter clone
(5 gallons/19 L, extract with grains)

OG = 1.043 FG = 1.011
IBU = 22 SRM = 33 ABV = 4.3%

Ingredients

13 oz. (0.37 kg) English pale ale malt (Maris Otter)
0.67 lbs. (0.30 kg) English black patent malt
0.5 lbs. (0.23 kg) English crystal malt (150 °L)
1.5 lbs. (0.68 kg) Muntons light dried malt extract
3.3 lbs. (1.5 kg) Muntons light liquid malt extract (late addition)
1.7 AAU East Kent Goldings hops (60 mins)
(0.33 oz./9.4 kg of 5% alpha acids)
1.7 AAU Fuggles hops (60 mins)
(0.33 oz./9.4 g of 5.25% alpha acids)
1.7 AAU East Kent Goldings hops (20 mins)
(0.33 oz./9.4 kg of 5% alpha acids)
1.7 AAU Fuggles hops (20 mins)
(0.33 oz./9.4 g of 5.25% alpha acids)
Lallemand Nottingham ale yeast
¾ cup corn sugar
(for priming)

Step by Step

Steep grains at 151 °F (66 °C) for 60 minutes in 3.0 quarts (2.8 L) of water. Add dried malt extract and water to make 2.5 gallons (9.5 L) of wort. Boil wort for 60 minutes. Add liquid malt extract with 15 minutes left in boil. Cool wort and transfer to fermenter. Top up to 5 gallons (19 L) and pitch yeast. Ferment at 66 °F (19 °C). Rack to secondary and condition for 14 days at 66 °F (19 °C).

Kristen England is the Continuing Education Director for the Beer Judge Certification Program.

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Build



BRUTUS TEN

See my cool brewery? I call it Brutus Ten. If you'd like one just like it, I have just one thing to say — build your own! Heck, I'll even show you how.

Brutus Ten is a 10-gallon (38-L), single-tier brewery situated on a stainless steel frame. The temperature of the hot liquor tank and mash tun are maintained automatically by two temperature controllers. Other aspects of the brewery, such as turning the pumps on and off are done manually. If you know how to weld and have some basic electrical skills, you can make your Brutus Ten for under $2,500.

You don't need a ton of space to do this. I built Brutus on my living room carpet and my small 6' X 8' apartment patio. The raw stainless steel alone stretched across the threshold, from the dining room to the patio door. I hooked up a 220-volt welder to the dryer outlet. During the daytime, no one knew that, beneath the blinding flashes illuminating the whole complex, lay the birth and free-will-victory that is now Brutus Ten.

From Brisbane to Anchorage to Baghdad to Choupiqué, other Brutus systems are popping up everywhere. It humbles me to see that others are building their versions of Brutus. Here's how to build yours.



by **Lonnie McAllister**

BRUTUS TEN Materials List

	Part Number	Vendor	QTY	Unit Cost	Total
Silicone Tubing	H985	MoreBeer!	35	$2.10	$73.50
14 Gal Kettles	7372	Northern Brewer	3	$145.00	$435.00
½" SS Valves	P029	Northern Brewer	5	$16.00	$80.00
SS ½" Couplings	P025	Northern Brewer	8	$5.25	$42.00
H315 March Pump	H315	MoreBeer!	2	$129.00	$258.00
Love Temp Controller	EW-93520-00	Cole Parmer	2	$49.00	$98.00
Burners	H209	MoreBeer!	3	$39.50	$118.50
Low Pressure Regulator	H212A	MoreBeer!	1	$38.00	$38.00
Stainless for Brewstand, 2" X 2" X .120" wall (40ft)		Great Western Metals	1	$300.00	$300.00
SS 90 Deg fittings		Northern Brewer	3	$4.50	$13.50
Stainless False Bottom	H101	MoreBeer!	2	$55.00	$110.00
Brass Ball Valve - Gas	H220	MoreBeer!	5	$6.50	$32.50
Thermowell	FE612	MoreBeer!	2	$19.50	$39.00
ASCO Valve, (SS)	#SC8210G37	Ebay	2	$57.00	$114.00
Switches	7343K712	McMaster Carr	1	$56.00	$56.00
SS Tee Fittings	H621	MoreBeer!	3	$4.50	$13.50
Leveling Tubes / SS Sheet, 304 grade .120" X 12" X 24"	60945K31	McMaster Carr	1	$71.92	$71.92
Casters	3BP4X	Caster City	4	$12.00	$48.00
Textured Stainless Sheet, 0.024" X 12" X 24"	9077K123	McMaster Carr	1	$56.00	$56.00
SS Nipples / Gas	P024	McMaster Carr	1	$54.00	$54.00
Zymico Temp Gauges		Ebay	4	$17.00	$68.00
Misc fittings and gas flex gas lines		Lowes	1	$120.00	$120.00
Stainless pipe for gas nipples		McMaster Carr	1	$53.00	$53.00
				Total	$2,292.42

Specifications

Mash: Direct-fired mash (Recirculation heat)
Controls: 2 each ASCO Red Hat stainless ½" NPT solenoid valves (Model SC8210G37)
Temp Control: 2 each LOVE TS temperature switches (Cole-Parmer EW-93520-00)
Fire: 3 each 100,000 BTU low pressure burners and low pressure regulators
Material: 2" X 2" X 0.120" wall 304 stainless steel
Weight: 210 lbs. (95 kg) dry, everything ready to roll
Fluid Dynamics: 2 each March pumps — high temperature polysulphone
Boil Capacity: 13.5 gallons (51 L)
Mash Tun Capacity: 33 lbs. (15 kg)
Finish Volume: 11 gallons (42 L)
Voltage: 110V

Planning

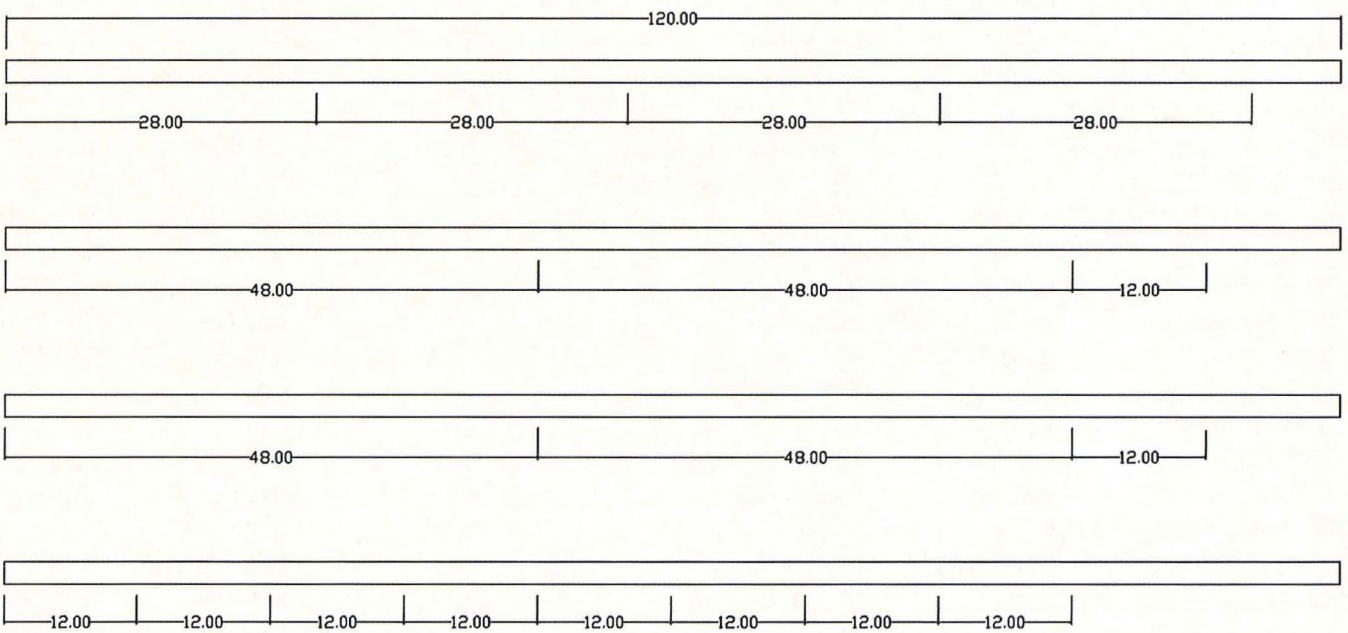
You know with a full keg and an enthusiastic welding pal, you can pave your way to your own version of your brewing vision. I am a tinkerer, a quasi-welder, a semi-electrician, a hydraulics-smithmen and though my very first real mash was sparged with a plastic bucket affixed to the roof of my rickety house seven years ago, even then I knew that it wouldn't stop there. Though my plans for anything usually reside in my head, I first crafted Brutus Ten in a 3D CAD environment down to the last bolt. There is nothing like a visual before cutting begins. I probably spent more time in CAD than the actual build, but this method of calculation and foresight gave me time to really think of my brewing wants. Everyone needs a good plan and of course mine didn't re-invent the wheel, but there are a few innovative features that Brutus sports. If only born from necessity, they insure a great consistent brewing day. With total consistency, I can make the same great beer over and over. Likewise with the bad! I found that once I had a plan, the hardest part really was procuring all the items that I needed for the build. This was quite a task of looking, finding, ordering etc. A lot of footwork went into the small list of up-front items purchased, but it all came together in the end!

Design

For the central design phase, I kept in mind brewing space limitations; I envisioned a small foot-print device, yet a traveling brewery for the occasional Mashtronaut brew-in. (The Mashtronauts are my Houston area homebrew club.) This brewery would be an all-in-one crescendo of semi-mechanized automation, yet again still leaving the fun in our brewday. It would be mobile and docile, maintain its gorgeous looks and yield great beer without the hassles of carboys, iodophor, or other means of cold sterilization. The first design task would be the only automation I would care to fit into any brewing scheme — temperature control!

It's All About Control!

Mash and sparge temperature control, as important as it is, is taken care of with a most simple device; ASCO Red Hat solenoid valves under each the mash tun and the HLT. These handy little gadgets are nothing more than fancy switches. Built on stone-age principals, the ASCO gas valve requires only one simple thing; something to tell it when to open, allowing the gas to flow to the burner. Likewise, when a signal tells it to close, it shuts off the gas flow. The signaling is accomplished with the dynamic little LOVE TS switches; my favorite feature-packed temperature controller. The LOVE TS switch is simple in its operation. It opens, allowing power to flow to the ASCO valve, and turns off when the set temperature is reached as sensed by its temperature probe, just like a Ranco or Johnson controller would do. These little devices cost about the same, and have a ton of features crammed into its little



Two 20' lengths or four 10' lengths of 2" X 2" X 0.120"-wall 304 stainless steel provides the material for the frame, with some scrap left over. You will need four long rails (48"), four legs (28") and ten cross beams (12"). The diagram above shows one way to make the cuts required to yield the frame pieces. Measurements in the above diagram are given in inches.

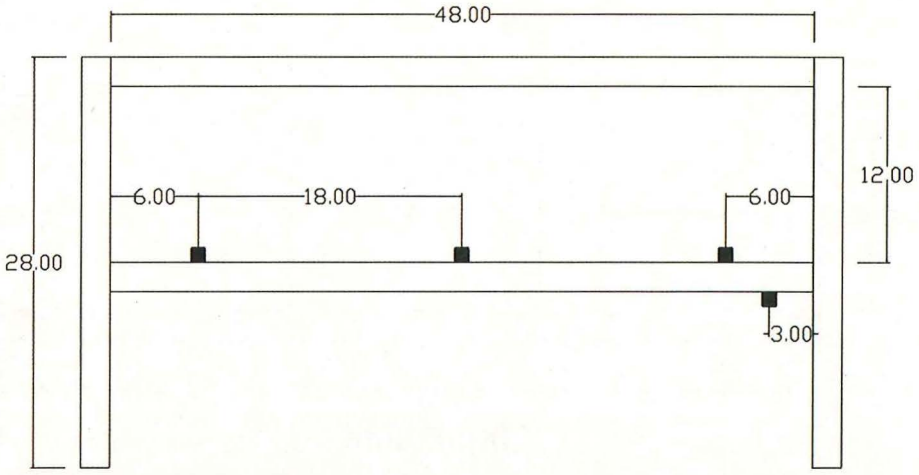
stout frame. To get this setup to work, there needs be to one constant; a pilot light! I should say first that with any pilot light system, attentive brewing is in order. Truly, we wouldn't want to brew up more than just beer! Barring an expensive auto pilot system, I chose to use gas flame pilot lights under the mash and the hot liquor tank (HLT) pots. The pilots themselves consist of a small brass square sided plug with a small hole drilled into each flat. The low pressure burners have provisions for a plug of this sort. The theory is, as the wind is blowing on that brew-out, this little pilot will dance like Olivia Newton-John in Grease! It hasn't failed me to this day.

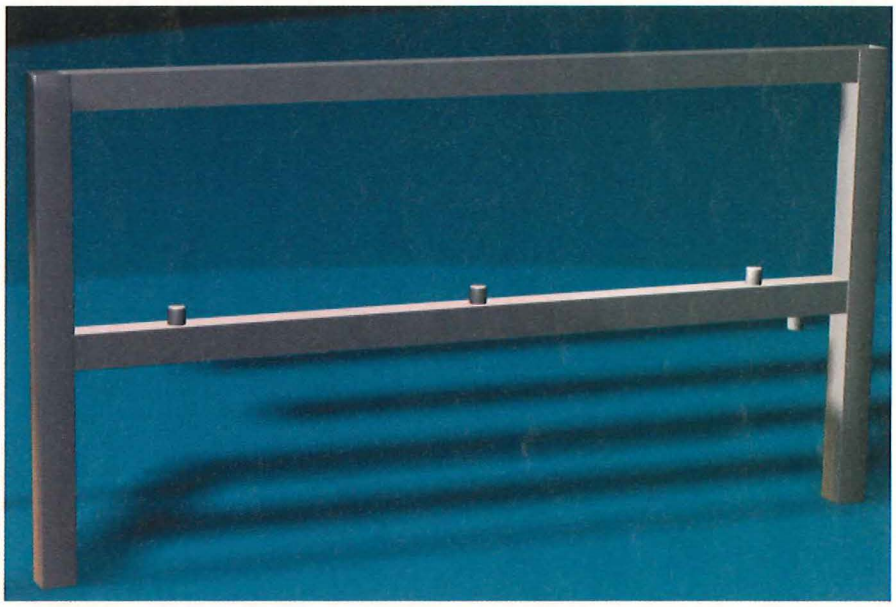
The Stand

We should start at the roots of Brutus, so let's back up a bit. In regards to the sculpture itself, stainless offers so many more attributes than other materials might. Plain steel is easy to work with too, and will work just as well structurally, but for aesthetics, longevity and just plain bliss, stainless steel is our best friend. Aluminum on the other hand would be out of the question as the heat generated from the low pressure burners, coupled with the possibility of upwards of 300 lbs.. (136 kg) of hot liquids may very well approach the yielding point of the aluminum structure itself. Also as in any single-tier sculpture with the extremely hot upper surface, aluminum would rapidly conduct the heat throughout the entire frame. As is, the very top surface of Brutus maintains a great guard from heat transfer without worry of melting the rest of Brutus, but even still, I have learned what the surface of the Sun feels like a time or two! Purchasing the raw metal was not hard at all. Most local steel companies will be happy to deal with us one-timers and will order and cut if necessary. Without a doubt, stainless prices are very high at this time. But this was no deterrent for my dream brewery. It will look this way when I pass it on to my sons! Now let's get down to business!

Cut List for Stainless

You will need to cut four each 48" rails, four each 28" legs and ten each 12" cross beams. These can all be cut from the two 20-foot 2" X 2" X 0.120" stainless tubes — or better yet, have your local steel yard cut these beams exactly in half; it is much easier getting four 10' sticks to your shop than two 20'. Save all the scrap from cutting. You will need these stainless droppings to learn how to weld, and for the control panel and the pump mount at the end of the project.



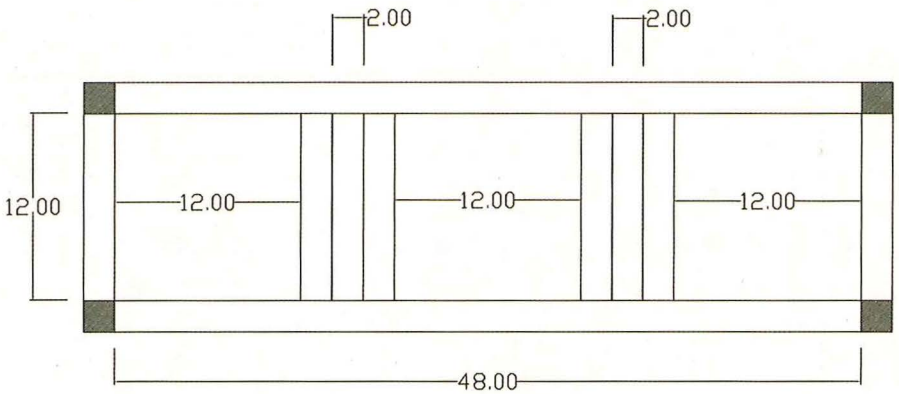


The lower beam on the back of the frame is the "gas beam," which distributes low pressure gas to Brutus's burners. Four ½" NPT Full couplings are welded on the bottom of the beam. The gas beam must be welded airtight and tested. A simpler design, that skips the somewhat difficult welding required for this, would be to construct the gas system from tubing and compression fittings and have it run behind the beam.

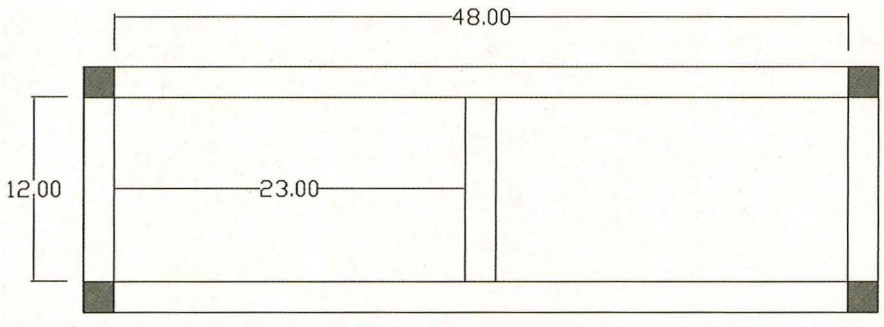
Drilling the Holes

There are many wire chase holes inside the joints in this project as all of the wiring runs inside the tubing. These holes allow the wiring to run down the rails, up the legs, across the cross beams, etc. This is not a necessity, but makes for a very clean wiring installation with the wiring hidden in the lower front rail. Remember NO wiring can run through the gas beam or the upper surface as it gets VERY hot! Unless you are using an automated gas system, employing the ASCO valves and LOVE switches, you may not need wiring chase holes at the joints and exit holes at various locations. Simply affix all wiring to the outside of the tubes.

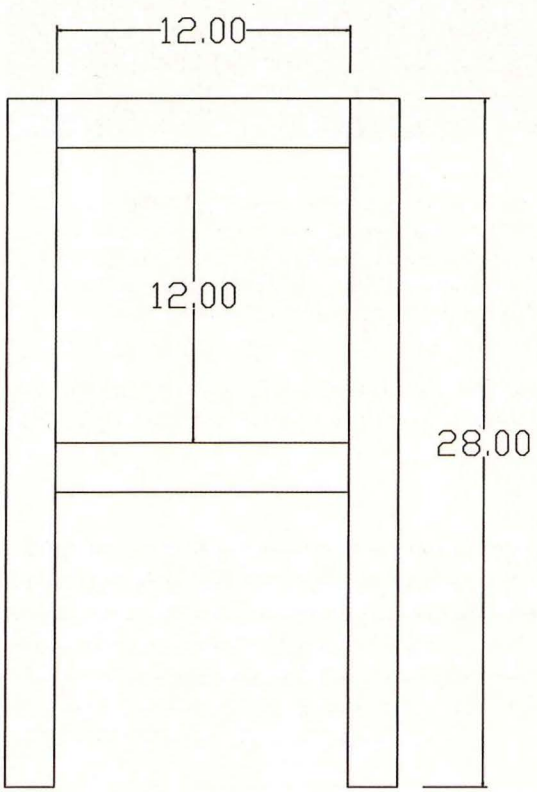
The factors that matter in drilling stainless by hand or any other method are time, pressure, control, lubricant, time and, of course . . . a Unibit step drill! In any case as we know, it is a very slow methodical forearm pain, but purchasing an ingenious little Unibit



Top Frame



Bottom Frame



Sides

The dimensions for the back of the frame can be found on page 47. The front of the frame is the same as the back, except that the lower beam is not a gas beam. The top, bottom and side views shown here complete the information required to assemble the frame.

Before welding, you need to decide where your wiring will go. The simplest solution is to run your wiring along the outside of the frame. However, you may wish to hide the wiring inside the beams of the frame. This will require the drilling of several chase holes. If you chose this option, decide what electronics you will have onboard the frame and drill the holes before welding the frame.

will be the best investment you can make for your arms. For my application, there are a lot of ¾" holes to drill as well as ½" holes for the switches in the control panel. I made short work of this by using the Unibit, or "step" bit as they are also called. These are easy to find, and invaluable in any project of this size that has 17 holes drilled by hand in ⅛" stainless. The trick to saving energy and saving your Unibit is to use a quality stainless cutting oil. Let the tool do its job while you save your back and elbow.

Let's Weld!

After cutting your steel, it is time to find a VERY level place to perform your welding. Keeping everything level is the key to any great project. Remember that each cut should be as dead square as you can possibly keep it, free of burrs, oil, chips and such. Any deformities will show through in your welding as a flaw, and in general, you will be working with this tubing for quite a while. It is best to keep things very clean. Enjoy the cleaning process, and have a homebrew handy!

I am assuming you will be welding the frame yourself; nothing is more rewarding. I learned how to MIG weld using my new Hobart 180 and a few Brutus cuttings before the task of putting real wire to metal even began. I studied great Internet boards like hobartwelders.com/mboard/ beforehand. I read everything I could just like I did when it was my very first all-grain brew day. By following the simple instructions on the welder door itself, it was nothing at all to lay down a great weld with a small amount of time, patience and practice. I would say that if you wanted to tackle the task of welding up your own rig then go for it; it is a most rewarding combination of learning a new craft, and then reaping the brewing rewards. The new welders today are much lower in amperage. Most all the hobby Metal Inert Gas (MIG) welders can easily and safely run on house current as they are meant to do. It did cost much more to purchase a good welding unit, especially one that would tackle this ⅛" stainless tubing. I also purchased several other items required to weld stainless. A gas bottle of 100% argon and regulator, a welding hood (actually two, one for my helper as well), gloves for everyone, plenty of 308 welding wire, spare tips and so

on. All the welding items needed will become very apparent with a little knowledge of the welding process.

With the exception of the gas beam that you will fully weld and pressure test up front, you are going to tack weld this entire frame together (see page 51). Tack welds are very easy to remove, if necessary, with a grinder. You can also move things around with a rubber mallet to get things square as tack welds are very small welds intended simply to barely hold things together. I would concentrate on keeping everything square up front on this project, and keep your angle grinder very handy! You will need a good framing square, plenty of clamps, or in my case, I used the little 1" ratchet straps that you can buy at any Wally World. Clamp and tack weld as necessary. Once the frame is strong enough to stand up on its own, stand it up! Keep everything VERY square and then re-square again if necessary. If need be, the ratchet straps are great for helping to keep a square day with Brutus. You can strap two opposing legs at a diagonal and ratchet the frame into position. Once the frame is standing on its own free will, you can apply more small tacks as you see fit. Make the whole frame square and make the whole frame strong before final weld-out. Welding is funny that way. Welding moves metal. It moves a lot. This is where good strong tack welding and the ratchet straps come in handy. As with any good project, the final product will only be as good as the hard work up front.

Full Weld-out

Weld the frame fully only when all of your up-front preparations are complete. You should have the gas beam fully welded and everything else completely and strongly tacked in place, keeping everything square. Weld every joint 100%. I started at the face of the frame and welded all the front joints. Then I flipped it over and started again on the back. I went back and forth, top to bottom, side to side until every joint was complete. The idea is to not let any one area of the frame to get too much heat at one time. This is where metal moves. If you start at one end and systematically move to the other, the frame will be impossible to keep square in the end. Hot metal will move that much due to the very heat of the welding

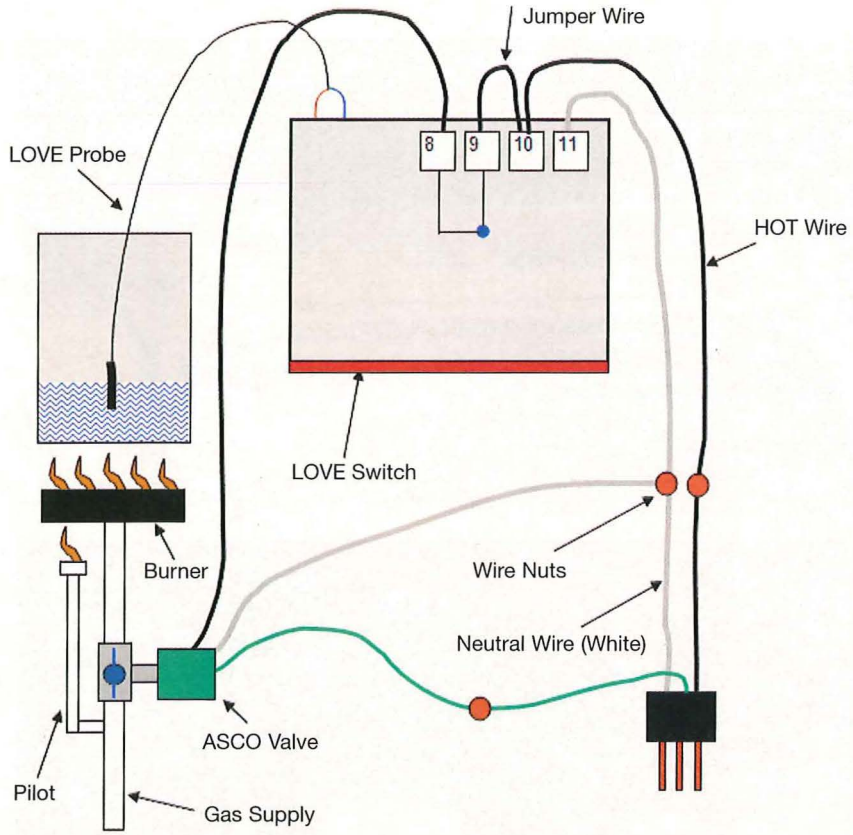






Keep everything square as you assemble the frame. Clamping sub-assemblies as you go will help. Start with the back of the frame, then add the cross beams. Begin by tack welding frame pieces in place, then fully weld the frame when everything is squared away. Welds can be ground down for a better appearance.

TYPICAL LOVE SWITCH WIRING



Pilot light is lit throughout the whole brewday. ASCO valve only comes on when the LOVE switch tells it to open. It closes when the LOVE Switch tells it to close. System shown energized and open.

to the rule. Each pump is controlled with its own master power switch at the control panel, and is operated manually. Coupling these with the high temperature silicone hoses, quick disconnects at every possible location, and you will never return to vinyl!

The real art I think are the returns that are affixed to the lids instead of welded fittings at the top edge of each pot. Fittings at the top edge of each pot require hose changes in the midst of high temperature brewing. Having all the returns in the lids only requires moving the lids about from pot to pot. These bulkhead fittings are most simple to install into the lids and are widely available.

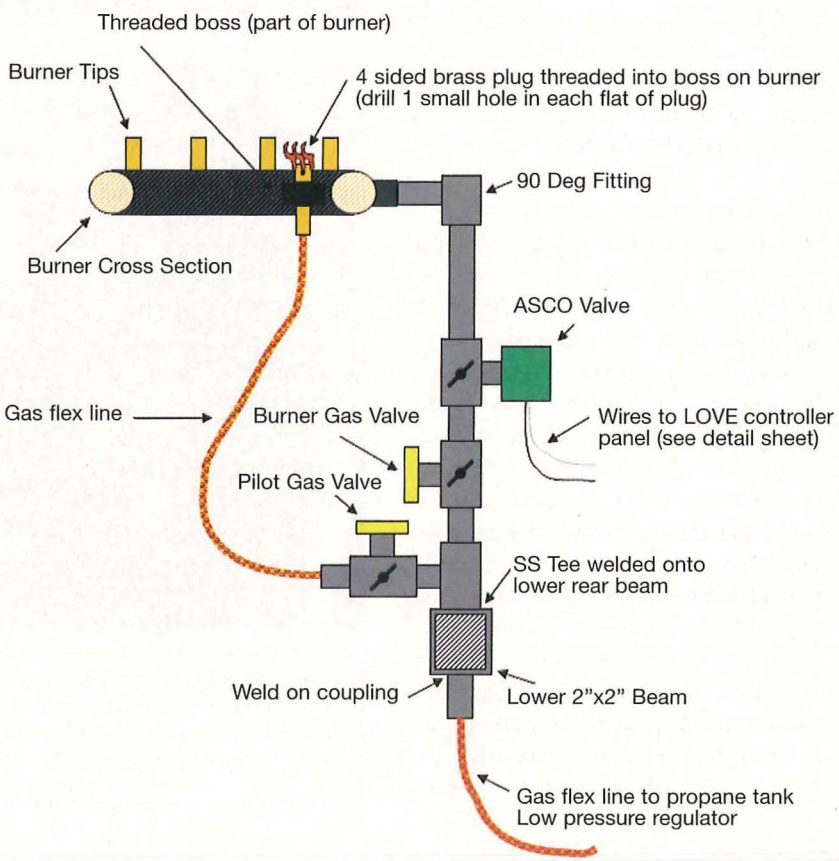
For the return tubes themselves, a curved piece of copper is affixed to these bulkhead fittings, and when the lid is installed onto the pot, the copper tube is actually touching the inside side of the pot. These tubes are simply a means to return the scorching wort, the freezing chill water or sparge water to their respective pots. These returns can be used to set up a whirlpool in the kettle, sparge as I do or return the hot wort to the kettle as I do during the sparge. (See pages 54 and 55 for a summary of my brewday procedures.)

process itself. After welding, I elected to grind flush the welds on the top of the frame. I didn't want to drag my nice brewing pots over these welds and scratch the bottoms. I also decided to grind flush the welds on the front of the frame as well to look great. I used an angle grinder with 40 grit paper to knock them down first, then I polished them off with a little air powered angle grinder and some 80 grit sanding wheels. After the whole weld job was complete, I took an orbital sander to the whole frame with some 120 grit sand paper. This gave the whole frame a very professional and finished look. With all the welding complete, it is time to turn to other tasks.

The Pumps

The pumps are mounted directly to the frame by way of drilling and taping the holes, and bolting the pumps in place. As with all single-tier systems, fluid dynamics make brewing possible without all the heavy lifting, and a well laid out fluid scheme can make a great brew day in any case. Brutus has a lot going for it in this regard; two March pumps are no exception

PILOT DETAIL CROSS SECTION

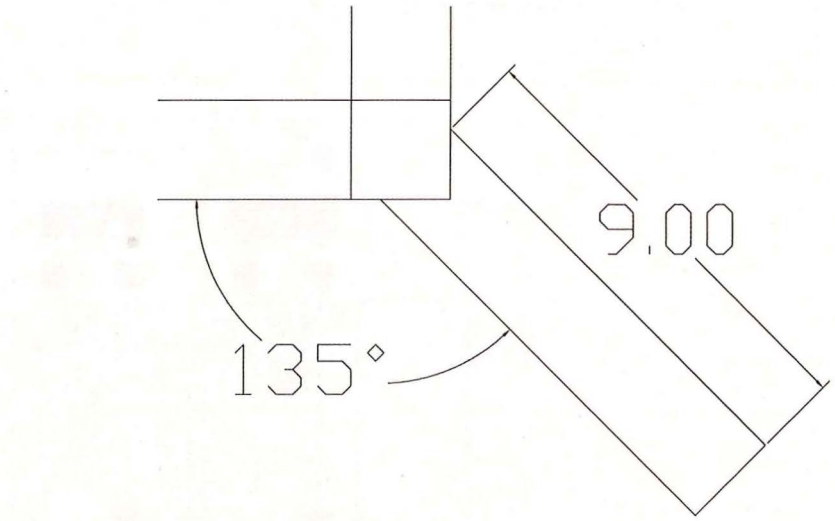


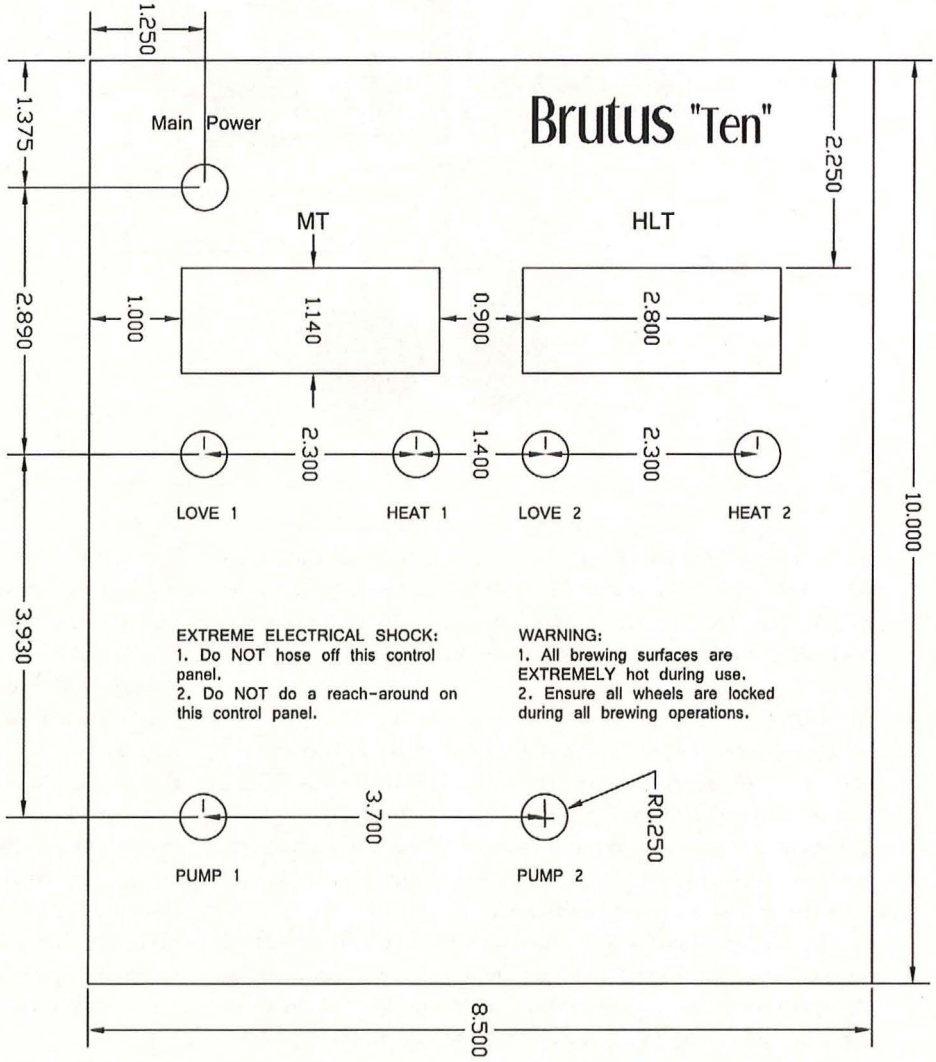
Electrical

Electrification! You know really way down inside, we all want to plug something in. There are six electrified elements on Brutus. Basically the control panel is made up of two control sections: Mash section (middle pot) and the HLT section (right pot); each is wired from a main power bus. There is one ASCO gas valve, a LOVE temperature switch and a March pump for each half of the control panel. It takes two of everything to keep things moving from the sparge to the mash, from the mash to the kettle, cooling, whirlpooling, etc. Wiring Brutus was relatively easy as everything is basically a simple switch allowing one component to turn on and power up another; a master switch at each device ensures a systematic brew day. Though the temperature of the sparge water and the mash are fully controlled by the LOVE set points, the pumps themselves and the kettle burner are fully manual. As with any electrified brewing gadget, safety is in order. Always power up through a GFCI outlet. Another safety note: as built, the wiring is exposed under the panel. Enclosing the electronics in a NEMA 12 enclosure guards against direct contact and liquid splashes.

Fire!

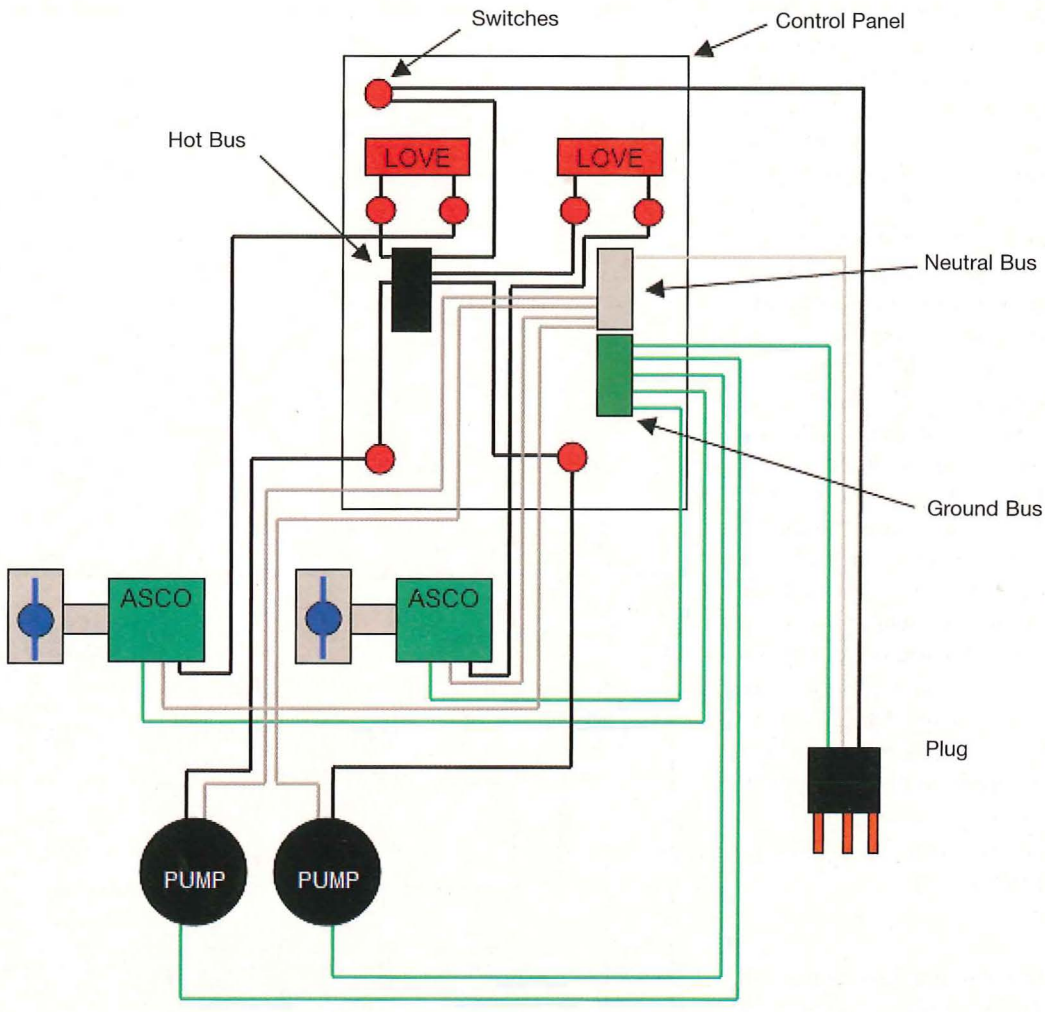
The three 100,000 BTU low pressure burners are fed by way of what I like to call a gas beam. This gas beam is the lower rear support and has to be welded air-tight to be safe to use. Stainless fittings are welded to this beam and from these fittings; the low pressure burners are attached. This gas beam is really nothing more than a fancy gas pipe! The gas beam is pressurized from the tank to only 0.4 PSI by way of a low pressure regulator from MoreBeer! This is required when using the low pressure burners like this system employs. This beam has three ½" NPT Full couplings welded onto the top of its centerline and one ½" NPT Full coupling on the bottom. These couplings have the gas plumbing attached to it and support the burners. The bottom (fourth) coupling is the throughput from the low pressure regulator attached to the propane tank. I found it very important to weld the gas beam fully at this point so I could be assured that I would have no leaks in the end. It is also important to pressure test this beam at I





As built, the wiring underneath the panel is exposed and there is a potential for the brewer to accidentally reach behind the panel or for water from the nearby HLT to come in contact with the wires, causing an electrical shock hazard. Enclosing the electronics in a NEMA 12 enclosure would guard against direct contact and small splashes of liquid.

BASIC WIRING DETAIL



or 2 PSI using your Argon, or CO_2 from your bar and soap it up good. It is critical every leak be repaired at this stage for your safety. A simpler alternative to this gas beam is to use tubing and compression fittings running behind the beam to deliver gas.

Chilling

When the time comes to chill out, I wanted an all-in-one unit, small and something that would knock down this Texas heat. I wanted a mountable unit, gorgeous looks and something that I didn't have to pick up and put in my wort. Again, I wanted an all-in-one brewery. The Therminator — a plate chiller — fits the bill perfectly and sits cozy in its little nook.

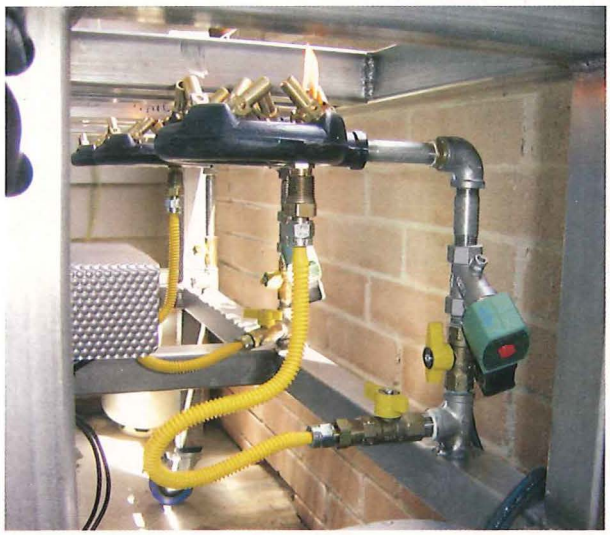
As with any Texas rig, ice is your friend. I have a great method for the chill using the HLT as an ice chilling tank recirculating the chill water through the cold site of the Therminator and back to the HLT, while recirculating the hot wort through the hot side and back to the kettle! Want to knock a batch back to the Arctic, this method works like a charm!

Test Run and Brewday!

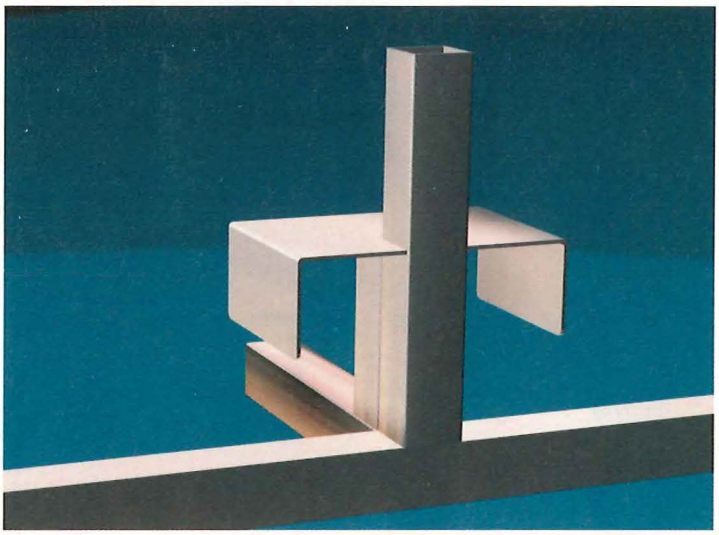
Nothing will be more peaceful than the day you put flame to Brutus. A first dry-run will only prove that it is already brew-worthy, and you should have brewed real beer instead of a mock water-run! My wife Moonbeam and I have brewed some 50-odd batches to date on Brutus, and with each batch, I am already planning the next! It is still a pleasure to brew even though some elements of an otherwise busy brew day are taken over by automation. I think the tasks that remain are really the tasks that make my brew day enjoyable, and leave me feeling really in control of my medal wall! The diagrams on the last two pages of this article show how I use Brutus, although you of course will develop your own procedures for your own rig. My website, www.alenuts.com, has more more pictures of the build, and photos of Brutus in action. If you build a Brutus of your own, send BYO a picture!

Lonnie McAllister is an aircraft engineer in Houston, Texas and host of the brewing podcast Alenuts (found at www.alenuts.com).

Turn to pages 54 and 55 for a rundown of how to use Brutus for a recirculation mash, sparge, chilling and fermentation.



A close up of one of the burners and associated plumbing. The flexible yellow line leads to the pilot light for that burner. The hard piping is opened and closed by the ASCO switch. See page 50 for a diagram of the assembly.



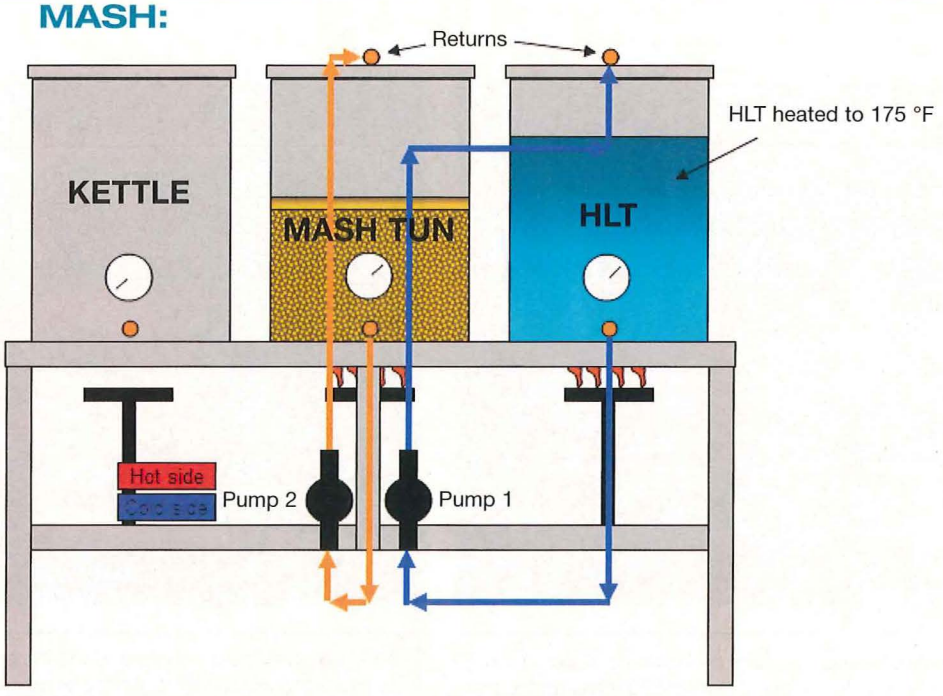
The two pumps are attached to the front center post (and a 5" piece of frame material welded directly behind the post). Mark the location of the holes for the pump mounting bolts and drill the holes before assembling the frame. The overhead shield guards against spills.



The completed frame, resting on locking casters. This makes it easy to take Brutus "on the road." After this picture was taken, a plate chiller was attached on the lower front beam, on the side opposite the control panel. (See the picture on page 44.) Note that the burner under the kettle position is manually controlled and lacks the ASCO switch and plumbing of the other two burners. Utilizing a "gas beam" and hiding the wiring in Brutus's frame gives the rig a clean, uncluttered look, but gas lines could be run outside as well.

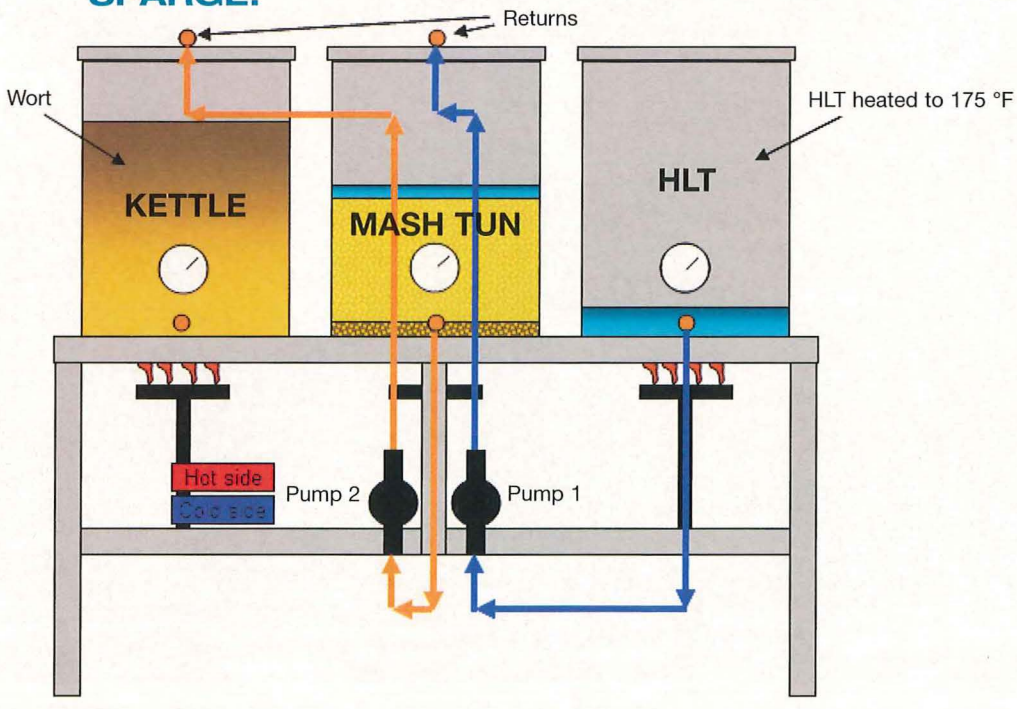
USING BRUTUS: HOT SIDE

MASH:



Recirculation Mash: After dough-in, a very slow recirculation is set up using the pump on the left. Mash heat is maintained with the temperature controller set at the desired mash temperature. This will control the ASCO valve. Very low flame should be used during the recirculation phase to avoid scorching of the wort. Utilizing a full false bottom is imperative during heat recirculation. The HLT can be heated to the desired sparge temperature during the mash, and its flow set to the desired sparge flow rate. This will ensure that things are ready to go for sparge.

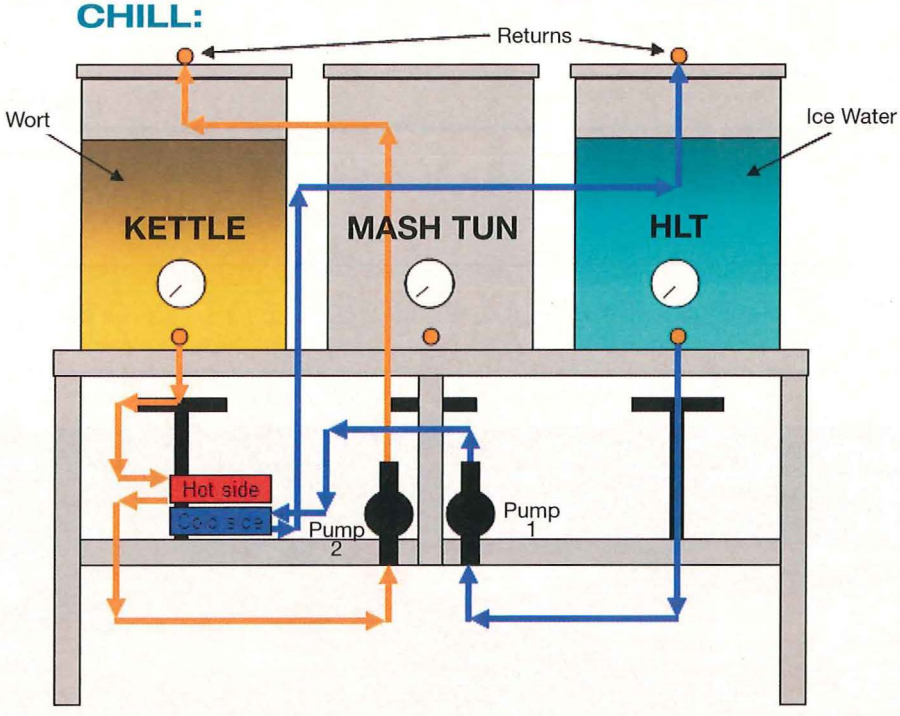
SPARGE:



Sparge: After mash-out and flow rates matched, i.e. the rate in the mash tun flowing VERY slowly back to itself, and the rate in the HLT flowing VERY slowly back to itself, you can simply begin sparging by moving the lid from the mash tun to the kettle and the lid from the HLT to the mash tun.

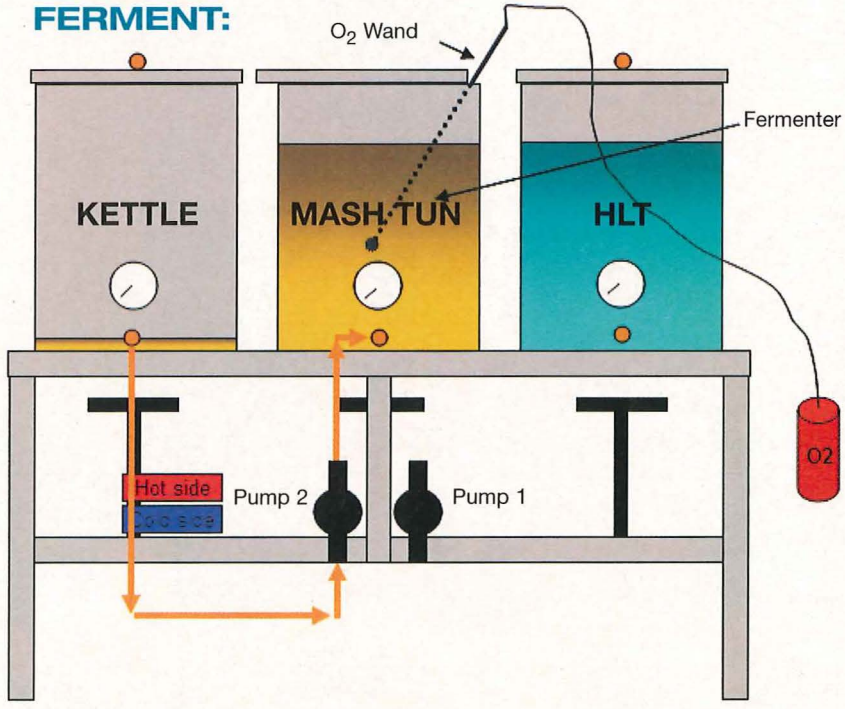
USING BRUTUS: COLD SIDE

CHILL:



Chilling: Hook up kettle to Therminator as shown. Using a garden hose, knock the wort temperature down below 110 ° F (43 ° C) The HLT will be filled with 5 gallons of water and four 7 lb. bags of ice beforehand. Remove garden hose and hook the ice tank up to the Therminator as shown. Run pumps wide open to recirculate the hot wort and the ice water through the Therminator. You can easily add more ice and bring your wort all the way down to lager temperatures in no time!

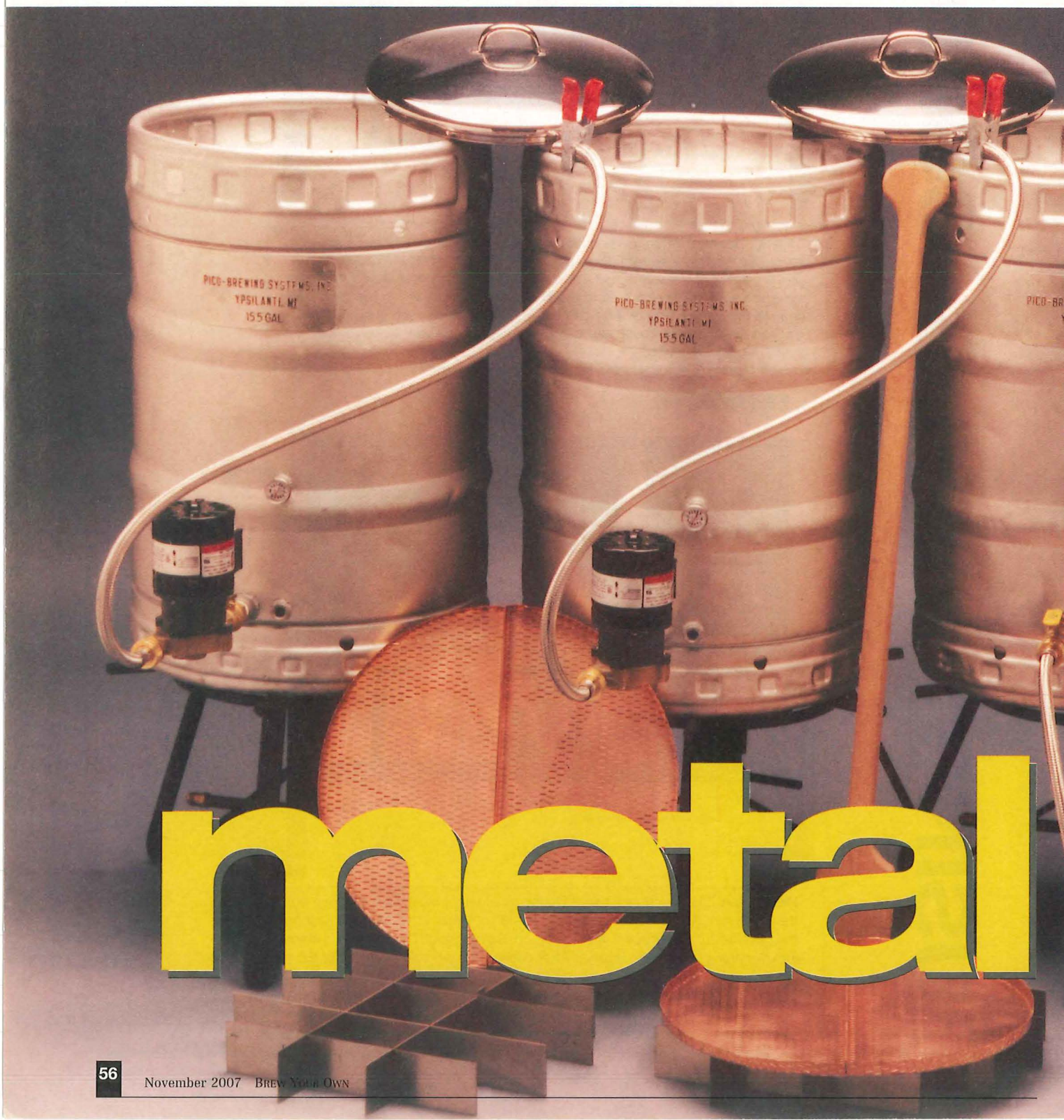
FERMENT:



Fermenter! It is the coolest thing! During all of this, I make time to clean out the mash tun. Scrub it well! Then fill it with 3" of water at some point (without the false bottom) and boil it with the lid on. Boil it good! The steam will sterilize everything in its path. Drain it. After cooling the wort simply transfer the chilled wort into the freshly sterilized fermenter! Add yeast and O_2 at this point. I then remove this fermenter into my chilling fridge at 62 °F (17 ° C). No more carboys!

by **John Palmer**

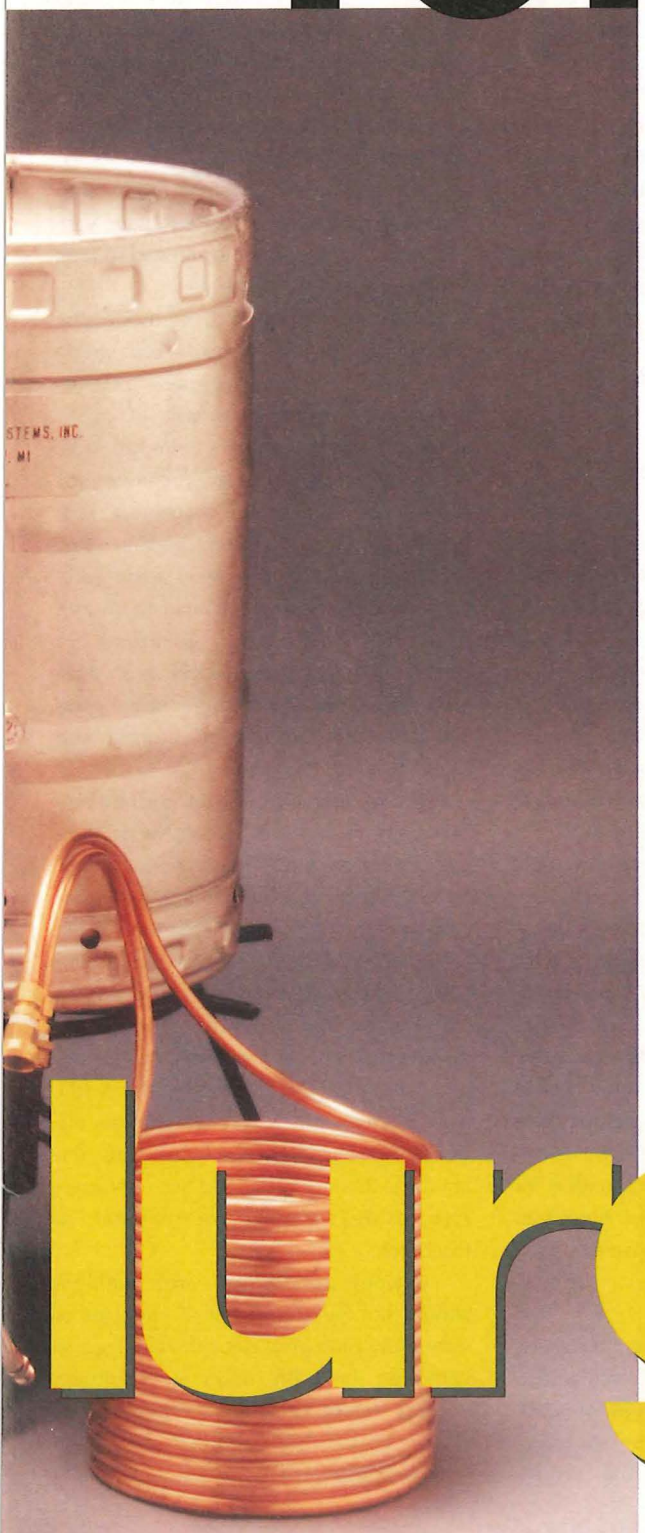
choose the right metal for your gear



metal

for HOMEBREWERS

lurgy



Every homebrewer is faced with equipment choices, whether they make it themselves or buy it from a shop. That decision usually involves determining the best combination of cost, performance and anticipated maintenance for that item. There are brewers that live by the mantra, "simpler is better." There are other brewers that live by, "cheaper is better." And there are a few that unequivocally state, "only the best will do."

But which is which? How can you decide? First you need to have a basic knowledge of the available materials, and then you can apply the strengths and weaknesses of those materials to the requirements of the application.

Corrosion

All corrosion is basically galvanic (that is, related to electrical currents that are induced when two metals are in contact with an electrolyte). While this statement may be an overgeneralization, it helps explain how and why corrosion occurs. The electrochemical difference between two adjacent metals creates a battery. If there is an electrolyte present, such as water or beer, then an electric current will flow and the more active of the two metals will ionize. These metal ions will readily combine with oxygen to form oxides or other corrosion products. Corrosion can also occur between

two adjacent areas on the same piece of metal, if the presence of dirt, a chemical or a scratch can make the two areas seem electrically different from each other.

The relative surface area of the two metals also affects the corrosion rate. If the more passive metal has a larger surface area than the active metal, the corrosion of the active metal will be increased (and vice versa).

All metals are electrochemically different from one another, covering the spectrum from very active (e.g. magnesium, zinc, aluminum) to very passive (e.g. titanium, gold). The more active metal will corrode in preference to the more passive. This property is often used for corrosion protection. Anodic protection is where an active metal (e.g. zinc) is plated onto a more passive metal (e.g. steel) part to protect it. The zinc corrodes instead of the steel. The problem with anodic protection in brewing is that the active metal is released to the environment (i.e., our beer).

Cathodic protection is where a more passive metal is plated onto a more active, such as gold plating onto a steel part. The problem with cathodic protection is that a breach in the plating will cause the more active metal underneath to corrode rapidly. Nickel and chromium platings are often used on brass to protect the brass from corrosion and provide a more aesthetic appearance. Brass, copper, stainless steel, and silver solder are close enough together on the galvanic series that there is not much potential for corrosion between them.

Metals can also be protected from corrosion by building up a uniform oxide film. The efficacy of the oxide film varies and may not be proof against all corrosion. Some oxides are very passive and inhibit almost all corrosion, such as the chromium oxides that protect stainless steel. Other oxides are more reactive, like red rust and heat tint on stainless steel, and do not inhibit further corrosion at all.

Stainless steel is referred to as being "passivated" when the protective chromium oxide surface layer is unbroken. If this oxide layer is breached by iron (from a wire brush or drill bit) or dissolved by chemical action (like bleach) or compositionally altered by heat (brazing or welding), it will rust. The problem with stainless steel corrosion is usually not an off-flavor, but more often a hole in a valuable piece of equipment.

Most other oxides are somewhere in between, and can be used to protect the metal from specific environments. The oxides of copper, brass and aluminum fall in this category. Copper and brass will develop a dull stable oxide over time that is resistant to corrosion in wort, but scouring the metal shiny bright will remove the passive film. To encourage a passive film on aluminum, copper and brass, wash the item thoroughly, dry it thoroughly, and then put it in your oven (dry) at 350 °F (177 °C) for about 10 minutes. This will help the anhydrous oxide layer to thicken.

The passive oxides that prevent corrosion also interfere with metal joining and need to be removed before soldering, brazing or welding.

SPECIFIC METALS

Aluminum

Aluminum is easy to form, machine and can be welded with the proper equipment. The thermal conductivity of aluminum is good, about half that of copper. The aluminum alloys most commonly used for cookware are alloys 3003 and 3004, which have very good corrosion resistance. Under normal brewing conditions, aluminum (by itself) will not corrode and should not contribute any metallic flavor to your beer. Do not clean the metal shiny bright between uses or you will increase your chance of getting a metallic off-flavor.

Aluminum will corrode if placed adjacent to another metal like copper in wort or beer, but the short contact time during a typical brewday is not a problem. Aluminum and copper/brass couples should not be used for long term storage of beer. Percarbonate-based cleaners like Straight A and PBW, or unscented dish-washing detergent, are recommended for general cleaning. Do not use bleach or caustic because these will cause pitting.

Copper

Copper has the highest heat conductivity, is easy to form and was traditionally used for making the brewing kettles or "coppers." Copper can be readily soldered, brazed and welded with the proper equipment. Soldering and brazing should be more than adequate for most brewery uses.



Copper is relatively inert to both wort and beer. With regular use, it will build up a stable oxide layer (dull copper color) that will protect it from any further interaction with the wort. Only minimal cleaning to remove surface grime, hop bits and wort protein is necessary. There is no need to clean copper shiny-bright after every use or before contact with your wort. It is better if the copper is allowed to form a dull copper finish with use.

However, you need to be aware that copper can develop a toxic blue-green oxide called verdigris. Verdigris includes several chemical compounds — cupric acetate, copper sulfate, cupric chloride, etc. — and these blue-green compounds should not be allowed to contact your beer or any other food item because they are readily soluble in weakly acidic solutions (like beer), and can lead to copper poisoning (i.e., nausea, vomiting). To clean heavy oxidation (black) and verdigris, use vinegar or oxalic acid-based cleansers like Revereware Copper and Stainless Steel cleanser.

For regular cleaning of copper and brass, unscented dish detergent or sodium percarbonate-based cleaners are preferred. Cleaning and sanitizing copper wort chillers with bleach solutions is not recommended. Oxidizers like bleach and hydrogen peroxide quickly cause copper and brass to blacken; these oxides do not protect the surface from further corrosion, and are quickly dissolved by the acidic wort. Copper and other trace metals are beneficial nutrients for yeast, but the amounts that are dissolved from non-passive oxides can be detrimental to the batch.

Copper counterflow wort chillers should not be stored full of sanitizer or water. Any biological deposits can lead to corrosion in both water or sanitizer. Copper should be rinsed thoroughly with clean water and allowed to drain before storage.

Brass

Brass is a group of alloys made from copper and zinc, with some lead thrown in for machinability. The lead percentage varies, but for the alloys used in plumbing fittings, it is 3% or less. It is this lead that can be dissolved off by the wort. While this teeny, tiny amount of lead is not a health concern, most homebrewers would be happier if wasn't there at all. (See the sidebar on page 61 for a method to remove surface lead from brass)

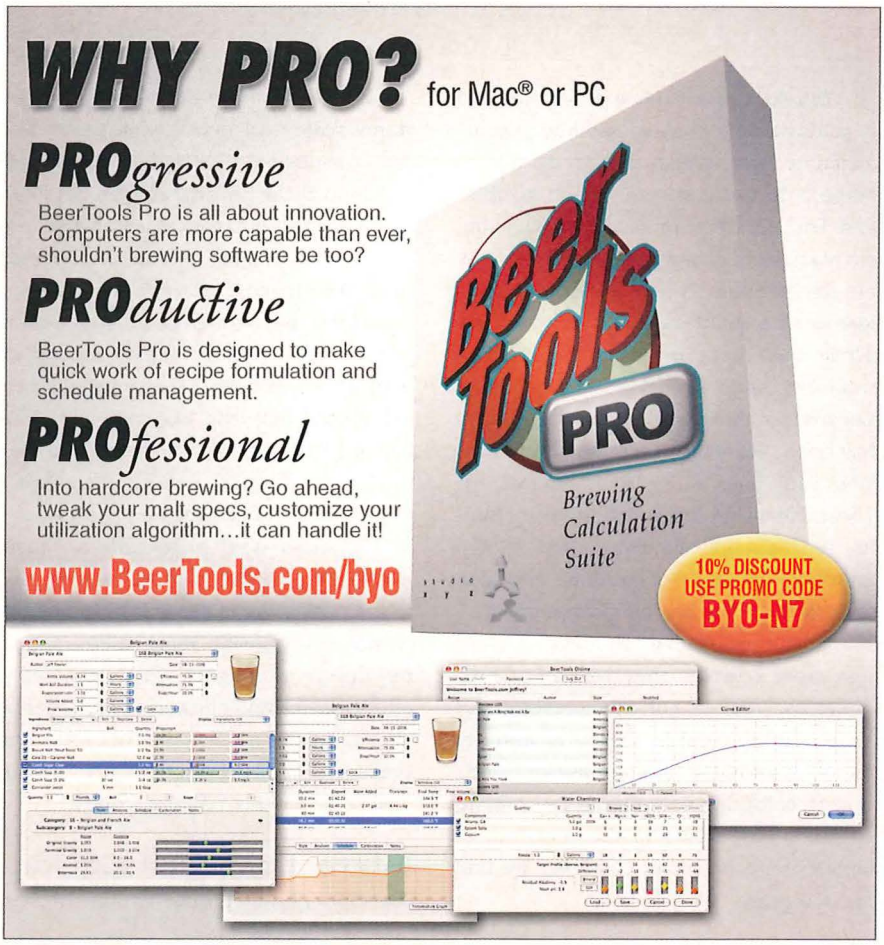
Brass can be readily soldered and brazed to copper and stainless steel. The thermal conductivity of brass is similar to aluminum, but the corrosion resistance of brass is more similar to copper. The reason that brass fittings are not commonly used in commercial breweries is that the clean-in-place (CIP) systems and chemicals that are commonly used with stainless steel are too corrosive to copper and brass. As homebrewers, we don't have to use such strong chemicals, nor are our parts in service 24/7, so corrosion is greatly reduced.

Stainless Steel



Stainless steels are iron alloys containing chromium and nickel. The most common type of stainless steels used in the food and beverage industry are the 300 series, typically containing 18% chromium and 8% nickel. The specific alloys that are most often used are AISI 304 and 316, which are very corrosion resistant and are basically inert to beer. The 200 series alloys use manganese instead of nickel and cost much less than the 300 series. They have similar corrosion resistance and machinability, but are not weldable.

Stainless steels are the most durable of brewing metals, but also the most expensive. Stainless steel can be readily formed, but is more difficult to machine than the other metals. The thermal conductivity of stainless steel is about 10 times less than aluminum.





The key to achieving a passive surface is getting the steel clean and free of contaminants. The easiest way to do this at home is to use a sponge or soft scrubby and kitchen cleanser made for cleaning stainless steel cookware. Three examples are Bar Keepers Friend, Kleen King and Revereware Stainless Steel cleansers. The active ingredient in these cleansers is oxalic acid and it serves the same cleaning purpose as nitric acid. Once the surface has been cleaned to bare metal, the passive oxide layer will reform immediately. These cleansers are an effective method for repassivating stainless after cutting, grinding, soldering or welding, and also work very well for cleaning copper.

Do not use steel wool or even a stainless steel scrubby; they will cause rust. Stainless steel is not invulnerable, any breach in the oxide layer by another metal, or formation of non-passive oxides due to soldering or welding, can initiate corrosion, especially in the presence of chlorides. To be blunt, chlorides are bad for all metals.

Bio-fouling (trub deposits) and beerstone scale (calcium oxylate) can also cause corrosion. The metal underneath the deposit can become oxygen depleted via biological or chemical action and lose passivity, becoming pitted. A two step procedure is most effective for removing beerstone. Beerstone is a combination of protein buildup and mineral deposit, so removal works best if the protein is broken up with a caustic, like sodium hydroxide or PBW, and then the remaining lime can be dissolved by an acidic cleaner like CLR (Calcium Lime Rust Remover).

Stainless steel plate chillers should not be stored full of water or sanitizer due to the possibility of galvanic or biologically-induced corrosion. Plate chillers should be rinsed thoroughly with clean water after cleaning and allowed to drain before storage. Blowing the chiller dry with compressed air will surely help prevent any chance of corrosion during storage.

Interactions with Liquids

The more pertinent question that brewers probably want answered is, "How do these metals affect my beer?" As noted earlier, many metals are necessary nutrients or co-factors for good fermentation but some metal interactions can be a problem. First is the well-known blood-like flavor from iron. The source of the iron can be well-water, rust on stainless steel or from exposed carbon steel in a chipped porcelain-enameled brewpot.

The role of aluminum in Alzheimer's has been thoroughly discounted, but concerns still come up occasionally when homebrewers consider getting an aluminum brewpot or a turkey fryer setup to brew bigger batches. However, a metallic off-flavor would be noticed long before a toxic level of aluminum could be ingested. Don't clean your aluminum shiny bright, let it turn dull and you will not have any metallic off-flavors.

Copper is a double-edged sword in brewing. It is beneficial before fermentation, but detrimental afterwards. Copper ions react with the hydrogen sulfide produced during fermentation and reduce it

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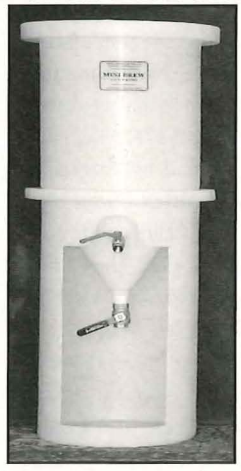
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to insoluble copper sulfide, which is left behind with the trub and yeast cake. Switching to all stainless steel brewing equipment can lead to noticeable quantities of hydrogen sulfide and sulfur off-flavors and aromas in the beer. The use of copper wort chillers will provide all the copper necessary, as will including a short piece (1 inch) of copper tubing in the boil.

Copper is a problem post-fermentation because it catalyzes staling reactions, including the production of hydrogen peroxide and can oxidize the alcohols to aldehydes. Finished beer should not be stored in contact with copper, although serving beer with copper tubing in a jockey box should not be a problem, because of the short contact time immediately before serving.

Copper pennies will also work in the boil to supply necessary copper, as will brass, but the caveat with both pennies and brass is the zinc. While zinc is an important nutrient for yeast growth, it can be too much of a good thing. Corrosion of brass can cause increased acetaldehyde and fusel alcohol production due to high yeast growth when zinc concentrations exceed 5 ppm. Excess zinc can also cause soapy or goaty flavors. But like copper, brass is usually stable in wort and will turn dull with regular use as it builds up a passive oxide layer. Brass should be treated like copper for normal cleaning.

Equipment Issues

Now let's turn our attention to specific brewery equipment. What material characteristics should you look for in a brewing pot, fluid fittings and tubing? Some of the considerations might be heat conductivity, ease of cleaning, cost and customization. Some brewers might consider cost to be the biggest concern, but short term cost may need to be weighed against long term durability or adaptability. Each material choice should be considered to the application, and how that application may change over time.

In terms of cost, porcelain-enameled steel may seem like the best option, but finding 8-gallon (30-L) or larger pots may

De-leading Brass

The surface lead on brass is easily removed by soaking the parts in a solution of vinegar and hydrogen peroxide. You can get these at the grocery store or drug store. You can use white distilled vinegar or cider vinegar; just check the label to be sure it is 5% acid by volume. The hydrogen peroxide should be 3% by volume. To make the solution, mix them at a 2-to-1 volume ratio of vinegar to peroxide. Simply immerse the parts in the solution and watch for the color of the parts to change. The process takes just a couple minutes to clean and brighten the surface. The color of the brass will change to buttery yellow-gold when the lead is removed. The vinegar-peroxide solution should remain clear and colorless. If the solution starts to turn blue or green and/or the brass turns dark, it means that the parts have been soaking too long, the copper is dissolving and subsurface lead is being exposed. Make up a fresh solution and soak the parts again. This treatment only needs to be done once before the first use of the parts.

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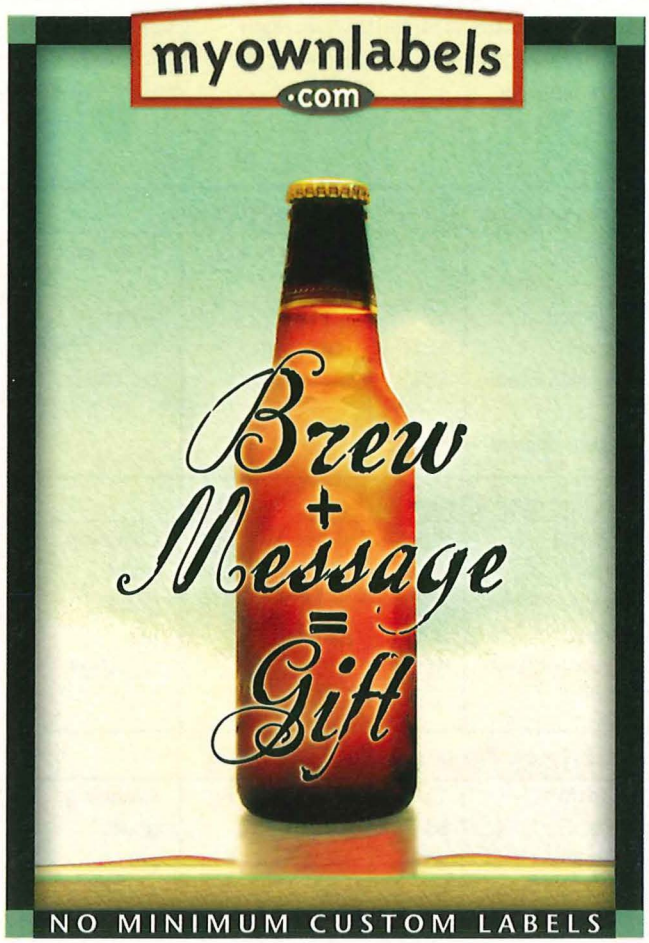
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be difficult, and the life expectancy due to chipping of the porcelain is often just a couple years. It is nearly impossible to drill holes in porcelain steel for weldless fittings without chipping the coating. Porcelain steel also has poor conductivity and tends to develop hot spots that can scorch the wort.

Aluminum is the next most expensive material after porcelain steel. It has good conductivity and good cleanability. Aluminum is difficult to solder or braze, but can be welded by an experienced welder. However, aluminum is so easy to machine that it is often easiest to add a ball valve by simply drilling a hole and using a weldless bulkhead fitting. A large thick-walled aluminum pot will last forever with gentle cleaning (no caustic) and is typically half the cost of stainless steel.

Stainless steel does not have the conductivity that copper or aluminum has. Still the scorching of wort as a result of this is rarely a problem, and its cleanability is excellent. The 300 series of stainless steel can be readily welded and machined. Large stainless steel pots can be quite expensive, especially if they have aluminum clad bottoms for better heat distribution. A good stainless steel brewing pot will last forever.

One very useful feature on large brewpots is a ball valve, allowing easy transfer of hot liquid to a chiller or another vessel. Ball valves are available in brass, nickel-plated brass and stainless steel. A plain brass valve will last a very long time with proper maintenance. If regular cleaning and maintenance are somewhat difficult, then nickel-plated or stainless steel valves are much more maintenance-free.

Nickel-plated valves and fittings are about twice the cost of plain brass, but 304 stainless steel valves and fittings can be three times the cost of the plain brass. The 200 series alloys cost less than the 300 series and are being increasingly used where weldability is not needed. Stainless steel fittings may buy peace of mind, but honestly a little attention to the recommended cleaning of brass will buy nearly the same performance.

With the cost of copper skyrocketing right now, copper tubing is now more expensive than stainless steel tubing, but copper is easier to find at your local hardware store. Brass is usually only available as rigid pipe or pipe nipples, not tubing. Copper tubing for wort chillers is still the best choice for overall performance, but if you are building a jockey box or similar, you may want to trade the slower thermal conductivity for better corrosion and staling resistance by adding a few more coils of the stainless steel.

Summary

Each material has its advantages and disadvantages depending on the product form and where you want to use it in the brewery. Aluminum and brass are often the most economical choices, but require more attention and gentler cleaning regimens. Copper has long been a clear favorite for do-it-yourselfers because of its easy fabrication, high thermal conductivity and expense, but the cost has now increased to the point where stainless steel is often more economical. Stainless steel has always been the gold standard for brewing equipment due to its excellent corrosion resistance and durability, but the cost of an all-stainless setup used to be prohibitive. The availability of less expensive stainless alloys for valves and fittings is changing that. Weigh your wants and needs and use the information in this article to build a brewery that works best for you.

John Palmer is a frequent contributor to Brew Your Own *magazine.*

Brewpot Considerations

Material	Cost	Conductivity	Cleaning	Corrosion Resistance	Joining	Machining
Porcelain Steel	$	poor	poor	excellent*	N/A	poor
Aluminum	$$	good	good	good	fair	good
Copper	$$$$	excellent	fair	good	excellent	excellent
Stainless Steel	$$$	fair	excellent	excellent	good	fair

* unless chipped

Fittings Considerations

Material	Cost	Conductivity	Cleaning	Corrosion Resistance	Joining	Machining
Brass	$$	good	good	good	fair	good
Ni-Plated Brass	$$	good	good	excellent	(mechanical)	good
Copper	$	excellent	fair	good	excellent	excellent
Stainless Steel	$$$	fair	excellent	excellent	good	fair

Tubing Considerations

Material	Cost	Conductivity	Cleaning	Corrosion Resistance	Joining	Beer Interaction
Brass	$$	good	good	good	fair	fair
Copper	$$$	excellent	fair	good	excellent	poor
Stainless Steel	$	fair	excellent	excellent	good	excellent

Harvesting Yeast

How to collect, store and repitch from batch to batch

by Jon Stika

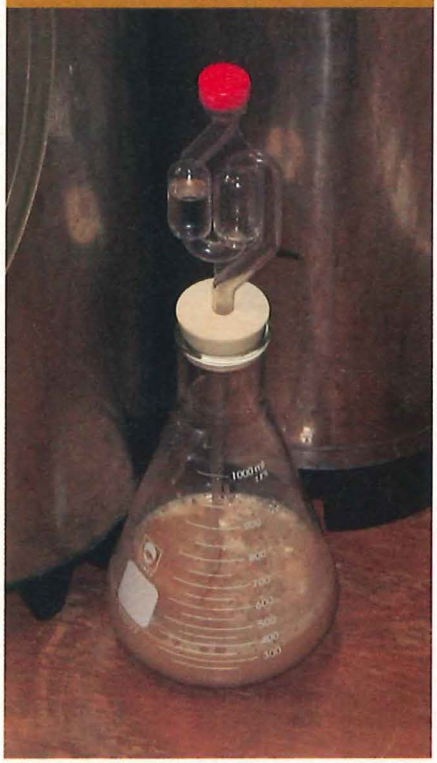
Harvesting and reusing yeast is a fairly simple and cost effective technique homebrewers can use to brew like a pro. Professional brewers routinely harvest and reuse (repitch) yeast and take advantage of the fresh, healthy, bountiful supply of yeast from a previous batch. Each time we brew beer we strive to use healthy yeast at an adequate pitching rate. By harvesting yeast from a freshly fermented batch of beer we have the perfect combination of both quality and quantity of yeast ready to inhabit a new fermenter of wort.

Collecting, storing, and repitching yeast from batch to batch is not complicated; it just requires a little planning and special attention to sanitation. Each and every vessel, spoon, funnel, tube, or other implement that touches the yeast you plan to repitch must be absolutely clean and sanitized before use. Clean means no crud or other unwanted residue attached to your equipment. Sanitizing means killing any unwanted microorganisms in or on your equipment.

There are several cleaners available for use on brewing equipment, such as powdered brewery wash, and several sanitizers, such as StarSan, Iodophor, household bleach and alcohol. A solution of one fluid ounce of bleach per gallon of water is great for glass or plastic. Using a non-bleach sanitizer is your best bet for stainless steel. (With long contact times, or in a lower pH solution, some pitting of the metal can result.)

At least a ten-minute soak in bleach solution is necessary to do the job, and should be followed by rinsing to remove residual chlorine. If your tap water is sanitary for use in rinsing all should be well. If the sanitation of your water is questionable, either boil the water for a half hour before use or employ a sanitizer, other than bleach, that does not necessitate rinsing. Alcohol (like cheap vodka) sanitizes on contact and dries quickly so it is handy for sanitizing small items or vessels. As with any cleaning or sanitizing product, proceed with caution and follow the directions for use and storage.

"Each and every vessel, spoon, funnel, tube, or other implement that touches the yeast you plan to repitch must be absolutely clean and sanitized before use."



Store harvested yeast in a container with a loose-fitting lid or airlock like this flask. Keep it in the refrigerator in a spot that maintains a constant temperature for up to two weeks.

How you collect yeast from your fermenter will depend on the type of yeast to be collected and your fermenting equipment. If you have a fermenter that is easily accessed from the top (such as a plastic bucket) and are using ale yeast, simply skim some yeast off of the surface of the beer during active primary fermentation. An alternative method would be to wait for the primary fermentation to subside and rinse some of the trub layer away with sterile water before collecting a sample of yeast. Then deposit the harvested yeast into a sanitized container, attach a loose fitting lid or airlock and place it in the refrigerator.

If you are fermenting your ale in a carboy or other vessel that is not readily accessible from the top, you will need to wait until primary fermentation is complete to harvest your yeast. In this case, rack the ale into a secondary fermenter soon after primary fermentation begins to subside and harvest the sedimented yeast from your primary fermenter. Although yeast harvested after a secondary fermentation will have less trub associated with it, the yeast from a primary fermentation will be healthier. To transfer the yeast to bottles or a keg, carefully swirl the yeast in the bottom of the fermenter and decant between a cup and a pint (8 fluid ounces or 237 mL to 16 fluid ounces or 473 mL) into a sanitized container. Attach a loose fitting lid or airlock to the container and place it in the refrigerator. If you wish to collect yeast from a lager fermentation, follow this same procedure of collecting yeast from the bottom of the secondary fermenter.

If you are fortunate enough to have a cylindrical-conical fermenter equipped with an outlet on the bottom and a removable lid on the top, you can either harvest ale yeast from the top during active fermentation or draw off ale or lager yeast from the bottom after primary fermentation subsides. When accessing yeast from the bottom of a fermenter do your best to collect the middle yeast. The sediment at

Tips For Harvesting

- Everything your yeast touches needs to be both thoroughly clean and properly sanitized.
- Store your harvested yeast at a constant temperature of 32 °F (0°C).
- Don't use harvested yeast that has been stored for more than two weeks, or if you're unsure of the storage conditions.
- Avoid harvesting yeasts from beers that had unusual or sluggish fermentations.
- Yeasts harvested from "high generation" strains, or those that have been harvested more than a few times, are at higher risk for mutation and may lose some of its original brewing characteristics.
- Don't store yeast in an airtight container. Use a stopper with an air lock to prevent carbon dioxide from building up and causing an explosion.

the very bottom often contains dead yeast and trub, and the middle layer contains the best yeast for repitching. The bottom layer of dead yeast and trub can be distinguished by its darker color, while the preferred layer of yeast will appear more yellow and putty-like. Harvest the yeast as soon as fermentation is complete and the yeast has settled.

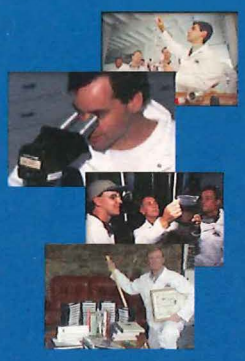
Now that you have a sample of yeast collected, it must be stored properly to assure continued viability. Store the yeast in the refrigerator as close to 32 °F (0 °C) as practical to keep it dormant. This will reduce both the risk of spoilage and of autolysis. Autolysis is when a (yeast) cell goes into self-destruct mode and essentially digests itself. This process often produces a rubbery stench that, needless to say, is undesirable in beer. As mentioned earlier, the yeast should be stored in a container with a loose fitting lid or an airlock. After you collect the yeast and put it in the refrigerator it will not immediately go dormant as most refrigerators are not very cold and the temperature fluctuates considerably over time. Because of this, yeast stored in a refrigerator may produce some carbon dioxide that could cause problems. To store the yeast at a lower, more stable temperature, place the yeast container in a small cooler (or a box with baggies of ice in it). It is important to vent the container daily, for the first three days, because excessive CO_2 will damage yeast quickly. Likewise, some containers may rupture under excess CO_2 pressure. Yeast should be used in a batch of beer within two weeks of being collected from a previous batch. Yeast that is not actively fermenting can lose its viability rather quickly when stored using the simple methods and conditions outlined here. This is where scheduling to brew successive batches of beer is important if you wish to collect and repitch yeast.

When you are ready to retrieve your stored yeast from the fridge and pitch it into a new batch of wort it is important to give the yeast a wake up call before putting them to work. Remove the container with the stored yeast from the



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refrigerator and allow it to slowly warm up to the temperature of the wort it will be pitched into. You may want to give the yeast a shot of oxygen to help them become active. This can be accomplished by simply stirring the yeast up with a sanitized spoon or whisk to develop a bit of froth. If you have a magnetic stir plate you can sanitize the stir bar, slide it into the yeast vessel and place it on the stir plate and fire it up. If you have an aquarium pump with an inline sanitary air filter, you could also pump air into your yeast in addition to giving it a stir to provide aeration. If your wort is adequately aerated, however, you don't need to worry too much about aerating the yeast sample. Once the yeast has been stirred and had a chance to warm, it can be pitched directly into the waiting wort.

A few final considerations for harvesting and reusing yeast relate to beer style. It is best to brew successive batches of beer that are within a fairly narrow style range of original gravity and bitterness if you plan to reuse yeast. Therefore plan your batches accordingly so the yeast will be appropriate for each style without any undesirable flavor carryover. If you would like to use harvested yeast for a particularly dark or bitter style of beer, make that beer the last batch in the series so you can dead-end the yeast and not have to be concerned with any carryover of flavors.

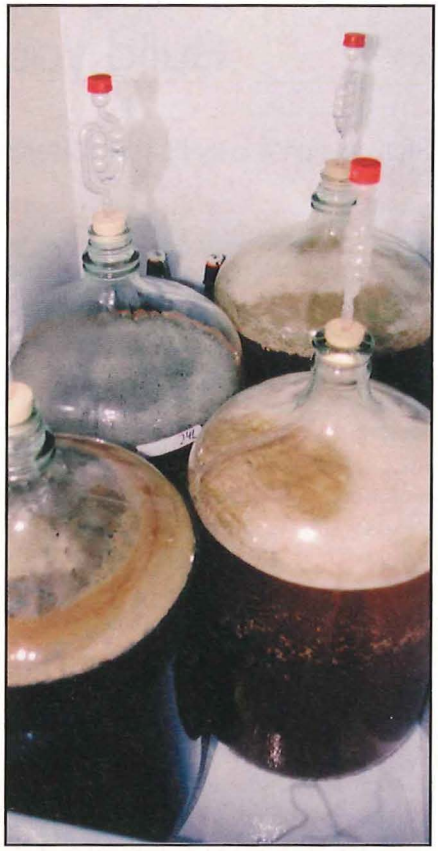
With a little planning and preparation you can stretch your homebrewing dollar and achieve a quick start to fermentation by harvesting and repitching yeast from batch to batch. Pay special attention to both sanitation and beer style, and you too can brew like a pro!

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

Web extra:



Check out BYO's homebrew yeast strains chart at:
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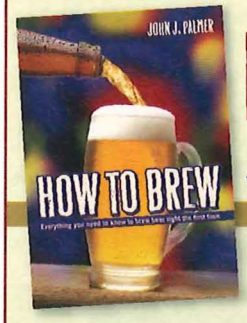
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Projects

Homestyle Hopback

Build your own French press hybrid

Story and photos by Forrest Whitesides

The concept of a hopback — a device containing hops through which you pump your still-hot wort before it is chilled — is certainly nothing new. It's a technique both pros and homebrewers have been using for years. In professional brewing applications, a hopback (also sometimes called a hopjack or simply a hop separator) has traditionally been used to remove cone hops from the wort post-boil. The process of loading the hopback with fresh hops — as a means to add flavor and aroma to the wort as it is pumped to the chiller — was a subsequent innovation in commercial settings. But homebrewers can use the basic concepts behind a hopback to add a new dimension of hop kick to their beers.

While the designs for hopbacks are as varied as the brewers who use them, this article outlines the procedure for building a hopback that somewhat resembles the operation of a French press coffee maker. It offers superior filtering and maximum wort-to-hops contact surface area. For this hopback (and most other hopbacks I've seen) to work properly, you should use whole hops instead of pellets. Hop pellets break down into particles too fine to be strained out and thus are not suitable for hopback use.



2 You will need a false bottom that fits in your cooking pot. Try bringing the false bottom along when finding your pot to ensure a good fit.

Design and parts list

A lot of hopbacks are made from a CPVC or metal cylinder and often use a pump to push the wort through. The wort goes into one end of the cylinder, which is loaded with fresh leaf hops, and flows through the other end into a counterflow chiller. Instead of that, we're going to gravity-flow (or optionally pump) hot wort into a small pot with hops held under a false bottom and then let the beer flow up through the hops and out of a ball valve into a counterflow or plate chiller. Our design here works in a very different way mechanically from many other hopbacks, but yields the same result: a big, fat post-boil addition of fresh hops to add more depth to the hop aroma and flavor of your beer.

Our hopback is built from three main critical components: a 8-quart (or larger, depending on your needs) common cooking pot, (Figure 1) a false bottom (Figure 2), and a ball valve with bulkhead fitting (Figure 3). You'll also need a ½-inch male NPT-threaded hose barb and some high-temp tubing.



1 To build this hopback project, you will need a large, common cooking pot that can hold at least eight quarts.

The most important thing in selecting a pot is to make sure the diameter is very close to the diameter of the false bottom you're going to use. I chose a Northern Brewer 9-inch diameter false bottom commonly used in lautering, but you can also go with a 10-inch (23 cm) or 12-inch (30.5 cm) false bottom. Whatever you choose, make sure that it fits the pot you intend to use and that it is safe for use with near-boil-

PARTS LIST

- 8-quart (or larger) cooking pot
- false bottom that fits into the pot
- ball valve with bulkhead fitting
- ½-inch male NPT-threaded hose barb
- high-temperature tubing



3 After properly drilling the hole in the pot, you can install the bulkhead portion of the valve and screw on the ball valve.

ing liquid. (Hint: I took my false bottom into a department store and tested the fit in several pots before making a purchase. You might get a few funny looks, but it'll save you a big headache down the road.) Either stainless steel or aluminum pots are fine for this, but I recommend stainless. There are many inexpensive and widely available stainless pots in this smaller size.

I recommend a ½-inch ball valve to allow for an outflow that will be close to matching the inflow from the kettle. I used a spare weldless kettle conversion kit from Zymico from another project, but you don't necessarily need something that fancy.

Drilling the pot

This is probably the trickiest part of the project, and the one step you want to get right the first time. There are no do-overs when drilling a hole. For an in-depth look at proper drilling techniques for both stainless steel and aluminum, see page 55 of the March-April 2007 issue of BYO. I recommend using a step-drill bit for drilling, especially for stainless steel. With aluminum, you can get the job done with a spade/paddle bit.

Drill a ⅞-inch hole approximately 1.5 inches (4 cm) up from the bottom of your pot. What is critical here is to put the hole high enough so that when the ball valve and bulkhead are installed there is enough clearance for the false bottom to be easily inserted and removed. I highly recommend doing a few test placements of the bulkhead — before you drill — to make sure it's high enough (you'll need an extra set of hands to help you do this). The horizontal placement of the hole is up to you, but I personally prefer to have it about 90 degrees from the handles.

Installing the valve and false bottom

Install the bulkhead portion of the valve and then screw on the ball valve itself (Figure 3). Do not over-tighten, as you could possibly damage the gaskets.

The false bottom comes with a 90-degree barbed elbow fitted in the center of the screen. Unscrew the top nut holding in the elbow and remove the fitting. In its place, screw in a ½-inch male NPT-threaded hose barb and replace the top nut to secure it (Figure 4).

Now simply slide the false bottom in under the bulkhead fitting and you're done (Figure 5). If you used a Zymico weldless bulkhead (or made your own with similar parts), you can use the barbed elbow that you removed from the false bottom as a pickup tube to minimize the wort lost to the dead space in the hopback. Just screw it into the bulkhead and push the barb down against the false bottom (Figure 6).

Using the hopback

The operation of this hopback is fairly straightforward:

- Put some hops in the bottom of the hopback
- Slide in the false bottom (above the hops)
- connect the hopback's hose barb to your kettle's ball valve via high-temp tubing
- open the outlet valve on the hopback, and then
- open the valve on your kettle.

The hopback's outlet valve, of course, will be connected to the "wort in" side of your counterflow chiller, also with high-temperature tubing.



4 Replace the 90-degree barbed elbow fitted in the center of the screen with a ½-inch male NPT-threaded hose barb.

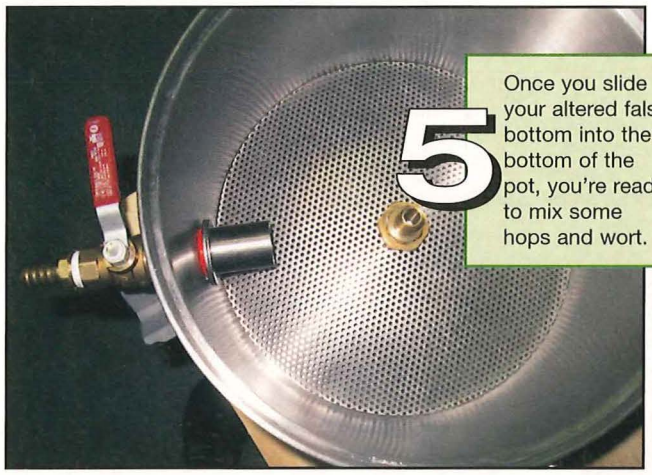
Some things to consider

If you intend to use the barbed elbow as a dip tube, be aware that it will somewhat restrict the outlet flow of your wort. In this case, your kettle valve should only be opened between half and two-thirds of maximum flow to make sure the hopback valve can keep up with the inflow of wort.

Also, because of the nature of the design, if you intend to use a pump with this hopback, be sure you can restrict the flow rate enough to avoid an overflow of the hopback reservoir (the pot).

Another consideration is that since the flow into your chiller will likely be at a lower rate than you are used to, you should adjust your cooling water flow rate accordingly.

With the hopback pictured ((9-in./23 cm) false bottom in a 8-quart/7.6 L pot), I find that 1–3 ounces (28–85 g) of whole leaf hops



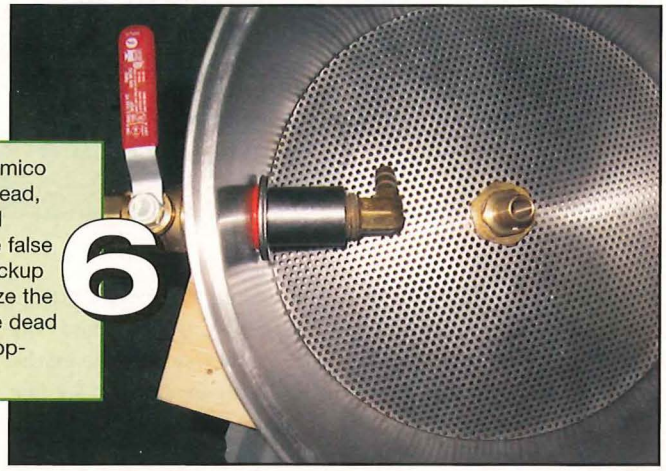
5 Once you slide your altered false bottom into the bottom of the pot, you're ready to mix some hops and wort.

works best. More than three ounces (28 g) is a tight fit once the hops are fully hydrated, but it can be done. If you're going to try to cram a whole lot of hops in there, I recommend not breaking up the hops after taking them out of their vacuum-packed bags. Using too much, however, may cause the false bottom to lift up and allow hops to get pulled into the valve and into your chiller (possibly causing a frustrating clog).

Using a larger false bottom will more easily accommodate larger quantities of hops. Stepping up the size of the false bottom and pot may be a good option if you plan to brew 10-gallon (38-L) batches.

The point of a hopback is to add hop aroma (and some hop flavor) to your beer, but not so much for bitterness. Therefore, you may want to select more aromatic hop varieties for your hopback. But as always, feel free to disregard "conventional wisdom" and experiment to your taste buds content.

Forrest Whitesides writes the "Projects" column in every issue of Brew Your Own *and has admitted to using a salad spinner to retrieve wort from post-boil hop cones.*



6 If you use a Zymico weldless bulkhead, use the barbed elbow from the false bottom as a pickup tube to minimize the wort lost to the dead space in the hopback.

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All About Conicals

A great single vessel for fermentation

Advanced Brewing

by Chris Colby

I fermented my first homebrews in a bucket. And, I still use bucket fermenters for my sour beers, fruit beers and the occasional quick turnaround ale. After my first few batches, I picked up a glass carboy and over the years I've assembled a small fleet of them. Last year, after thinking about it for a couple years, I broke down and bought a stainless steel cylindroconical fermenter.

A cylindroconical fermenter is a scaled-down version of what commercial brewers call a uni-tank. The "uni" refers to the fact that the beer can undergo primary fermentation and conditioning in the same tank. With flat-bottomed fermenters, the beer needs to pumped from the fermenter to a conditioning tank. Unitanks are very popular in brewpubs and microbreweries — and a few years ago, homebrew-sized conicals started appearing on the market.



Photo courtesy of Blichmann Engineering

The shape of a cylindroconical fermenter is a cylinder with a cone attached on the bottom. A port at the bottom of the cone lets you dump the yeast (and any other sediment) from the bottom of the vessel. Another port is found a little higher on the cone. This one allows you to draw of samples of beer or transfer the beer to another container.

There are many advantages to a stainless conical fermenter. The primary reason I bought mine was the ease of separating the yeast from the beer. With a bucket or carboy, you need to clean and sanitize a secondary fermenter and a racking cane. With a conical, you just open the dump valve for a second or two. Likewise, taking hydrometer samples is as easy as opening the transfer valve.

Another advantage is that most conicals are made from stainless steel. Plastic bucket fermenters eventually get scratches and stains to the point that normal homebrew cleaning and sanitation practices may not render them sanitary. In addition, bucket fermenters may also start to retain some smells that won't wash off. As such, bucket fermenters need to be replaced every so often. A stainless conical should remain re-usable "forever," won't absorb odors and can be cleaned completely — leaving an inert surface that won't react with or taint wort or beer. Finally, unlike stainless steel, the plastic in buckets is slightly permeable to oxygen, making them a poor choice for long-term conditioning (unless you're making sour beers).

Like stainless steel, glass is inert. It can be cleaned and reused endlessly and won't ever absorb any smells. It is also impermeable to oxygen (although the rubber stopper, plastic airlock and the water filling it are not.) However, glass is also breakable. This can not only cause some big, disappointing messes from lost batches, it can also be a source of injury.

Glass has a history in commercial brewing — remember "the glass-lined tanks of Old Latrobe." These days, though, almost every brewery on the commercial side is a farm of bright, shiny, stainless steel tanks. Conicals also usually have handles welded on, making them much easier to transport than trying to lift and hang onto a breakable cylinder — that may be slippery when wet.

A final advantage is that with some conicals, you can do pressure transfers. When it comes time to rack the beer to keg, you can apply a little CO_2 pressure to the airlock vent and push the beer out the transfer port, through some Tygon tubing to your keg — and not expose the beer to oxygen to boot.

The biggest disadvantage of conicals is the cost. Even the most bare-bones conical model costs over $400. Buckets and carboys cost about ⅒ of this. Given the price differential, many homebrewers will choose to just clean the racking cane and second carboy when it comes time to separate the yeast from their beer. But, for those thinking about making the move up to a conical, here's a quick rundown of what you can do with them.

How to use

When you get your conical, save the assembly instructions because you will need to disassemble your fermenter every time you clean and sanitize it. Fortunately, assembly and disassembly is easy — removing the two ports is all you are doing — and this allows you direct access to every surface that your beer will touch. My procedure for cleaning is to dis-

assemble the tank, clean the small parts and remove any visible gunk from inside the tank with a sponge. Then I reassemble it, fill it with a hot (160 °F/ 71 °C) PBW solution, let it sit for 15 minutes, then run the solution out of both ports. The heat of the solution will do some sanitizing along with the cleaning. (I save the hot PBW solution and clean other stuff.) Next, I fill the fermenter with a sanitizing solution. After the required contact time, I drain this out (often into another carboy or bucket I need sanitized).

Filling

When filling your fermenter with chilled wort, you want to leave enough room for the kräusen to rise. (You also want to make sure the valves on your ports are closed before you start transferring the wort.) Once the fermenter is filled, close and seal the lid and affix a fermentation lock or blowoff tube. The latter will often save you a couple inches in height, and this can be important if your fermenter needs to fit in a chest freezer. To use the blowoff tube option, connect an "L" tube fitting to your drilled stopper, then connect Tygon tubing to the "L." Run the tubing to a glass of water and submerge the end under the liquid level. A benefit of using a blowoff tube instead of a fermentation lock is it will prevent airlock "suck back" if the fermenter is being cooled.

Once fermentation starts, you have a couple options. Most homebrewers will simply want to keep the blowoff tube attached and conduct a closed fermentation. However, you can also do an open fermentation in a conical (as you can with any homebrew fermenter). Anecdotal evidence suggests that a lot of the popular Belgian strains of yeast perform noticeably different in closed and open fermentation, and some homebrewers are experimenting along these lines. Once fermentation slows and the kräusen starts to fall, put the lid back on the fermenter and attach the blowoff tube.

If you are using a true top-cropping yeast, you can have easy access to it whether or not you're doing an open fermentation. Just open the top, as you would with a bucket, and harvest the yeast with a sanitized measuring cup.

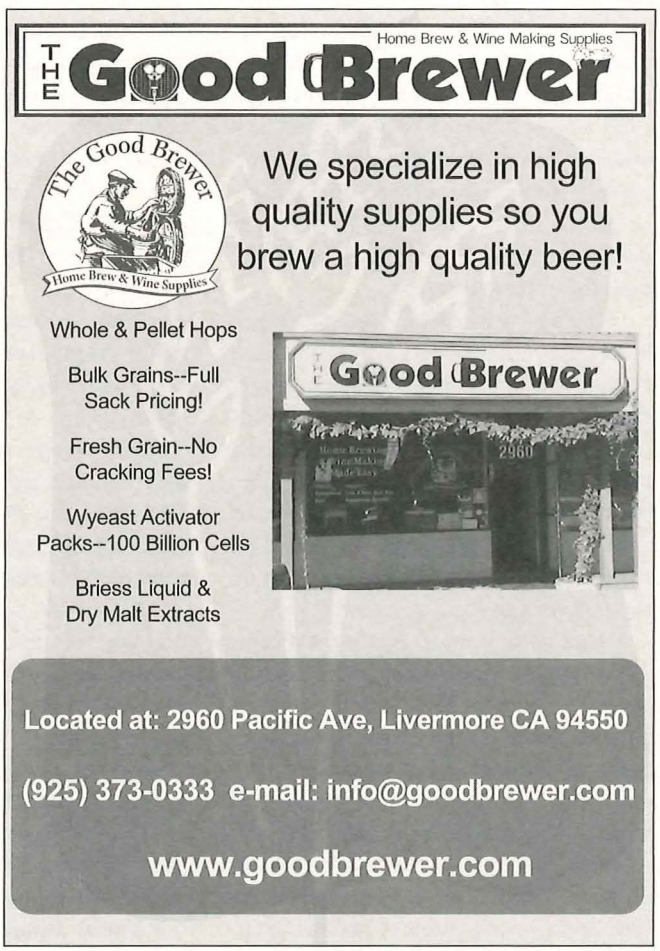
Dumping yeast

OK, so primary fermentation is done, a day or two has passed for the yeast to settle and now it's time to dump your yeast. This is what you bought the thing for — do you just open the bottom valve and let 'er rip? Before you do, there are two considerations.

The first thing you need to consider is that the fermenter is a sealed environment. If you open the bottom valve and material moves out of the fermenter, the pressure in the headspace is going to drop. If you have an airlock attached, the liquid is going to get sucked back into your fermenter. If you have a blowoff tube attached, water is going to climb up the tube.

The solution to this problem is easy — either remove the airlock or take the end of the blowoff tube out of the liquid. In both cases, you'll be sucking a little air





into your fermenter, but — at this stage of the fermentation — there are still plenty of yeast cells in suspension to take in the oxygen once the fermenter is sealed again. And, if you had racked from a bucket or carboy to secondary, you'd have exposed the beer to a lot more oxygen.

The second thing you may need to consider is that the yeast doesn't always slide down to the bottom of the fermenter as it should. Some strains seem to cling to the sides of the cone. Opening the dump valve pushes a small plug of yeast out, but then beer just rushes by the ring of yeast clinging to the cone. There are a variety of ways to get cleaner separation of your yeast and beer.

First off, don't ever think that you'll open the valve and get a plug of pure yeast, leaving behind nothing but beer. When you open the dump valve, you'll always get a mixture of yeast and beer — and you'll always leave some yeast behind. One simple solution to getting better separation is to dump your yeast a few times over a couple days. Open the valve and get a small bit of yeast. Then, let the beer sit and more yeast slide down to the bottom of the cone. Repeat two to four times. Remember, though, that a little yeast left behind isn't going to hurt anything. Don't drain half your batch because a little yeast comes out every time you open the valve.

You can also help the yeast get into position by "bringing the hammer down." A few hours before you plan to harvest the yeast, gently tap the cone of your fermenter with a soft mallet (not a metal hammer). Tap the cone just enough to spur a little "yeast avalanche" inside the fermenter. Since you can't see inside, you'll have to develop a feel for this over a few batches. Do not pound on the fermenter so hard you dent it. Likewise, be aware that overly aggressive tapping can cause carbon dioxide to break out of solution, especially in lagers (which have more dissolved CO_2 due to being fermented at colder temperatures).

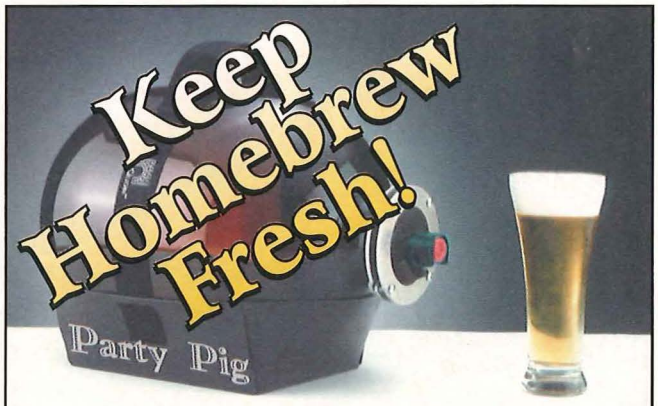
Once your airlock or blowoff tube is disabled, simply place a large measuring cup or bowl under the fermenter and attach a length of clean tubing to the port. Quickly open the dump valve all the way and . . . be prepared to wait a couple seconds. Depending on the yeast strain and fermentation temperature, it may take a second for the yeast plug to start sliding. You'll see it when it enters the clear tubing. Let the plug slide out and quickly close the valve.

The first bit of the plug will be almost solid yeast and appear that distinctive beige yeast color. But following right behind that, you'll see a mixture of yeast and beer that get's more "beery" the longer you leave the valve open. I usually aim to collect about 1 quart (~1 L) of yeast and sediment the first time I dump the yeast. The second time, I collect about half that much. If I collect a third time — which I usually don't — I would half that volume again.

Sampling beer

If you want to take a hydrometer sample, all you need to do is attach some

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clean tubing to the transfer port, open the valve and run some beer off. As with the dump valve, you'll need to ensure you don't suck water into your beer through your airlock or blowoff tube.

Transferring beer to keg

At some time your beer — conditioned and (mostly) separated from the yeast — will be ready to rack to a keg. There are two ways you can accomplish this transfer, gravity or pressure. For a gravity transfer, lift your conical to a surface such that the transfer port is higher than the top of your carboy. Clean and sanitize a length of tubing long enough to run from the transfer port to the bottom of the keg. Remove the airlock or blowoff tube and open the valve. That's it.

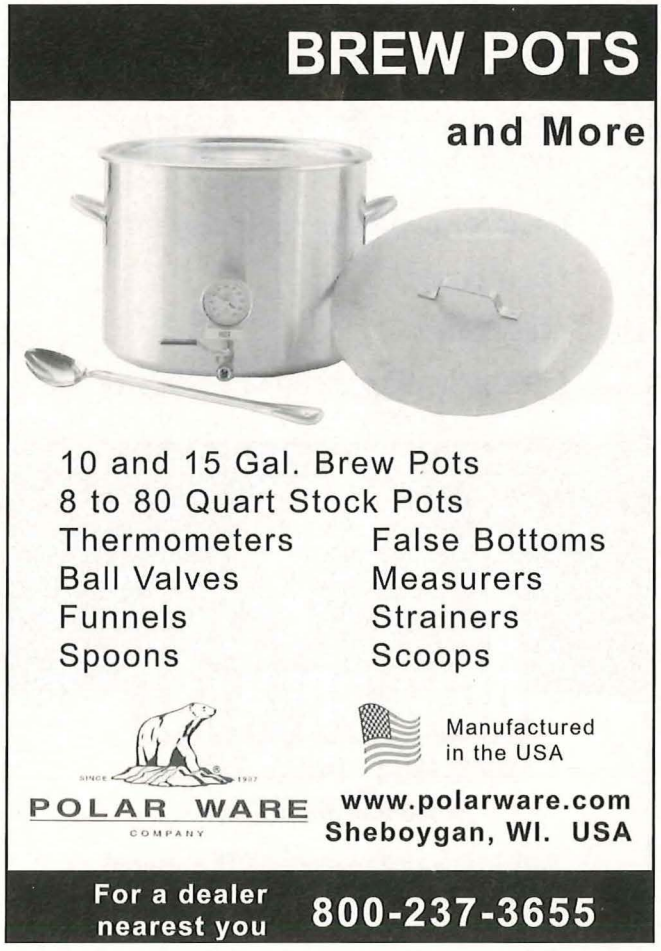
Some conicals will allow you to do a pressure transfer. If yours allows for this, it will say so explicitly in the directions. There will also be a pressure relief valve on the lid of the fermenter. The idea behind a pressure transfer is that you hook your CO_2 tank up to the "L" tube that ran to your blowoff tube. Applying a small amount of pressure, you open the transfer port valve and push the beer to your keg. There are two benefits to this. First, you do not need to lift your conical. It can stay where it is — perhaps inside a chest freezer — and your keg does not need to be below the fermenter. Secondly, your beer is not exposed to any air during the transfer. There are a couple ways you can perform a pressure transfer.

Remove the blowoff tube from your fermenter and attach a length of tubing from your CO_2 tank to your fermenter. Make sure the gas is not on and pressure on your regulator is dialed down to zero. Attach sanitized tubing to the transfer port and run it to the bottom of the receiving keg. Or, have the tube run from the fermenter transfer port to a "beer out" keg connector, attached to the "beer out" post on the keg. (If you fill the keg with water first, then push out that water with CO_2, you'll have an air-free vessel ready to receive your beer.) Turn the gas on and slowly dial up the pressure. Your manual should give the maximum pressure the fermenter can withstand. (On mine, it's 3 PSI.) Once you're a little below the desired pressure, open the transfer valve and you should see beer start to flow. Adjust the pressure, if needed, to regulate the flow of beer. If you're running the beer into a sealed keg via the "beer out" post, you will need to vent the keg so the beer can keep flowing. The simplest way is just to connect a "gas in" connector to the "gas in" post. (Don't worry, the CO_2 won't rush out of your keg and equilibrate with the outside air instantly, it takes time for gases to diffuse.) If you want to get fancier, you can attach some sort of check valve to the "gas in" post, or run a length of tubing from the connector to a glass of water (just like the blowoff tube for your fermenter).

So, if you're looking for a versatile, and professional-looking, piece of equipment for your brewery, a conical fermenter may be just the thing.

Chris Colby is the editor of BYO. *His conical currently contains a conditioned Vienna lager.*





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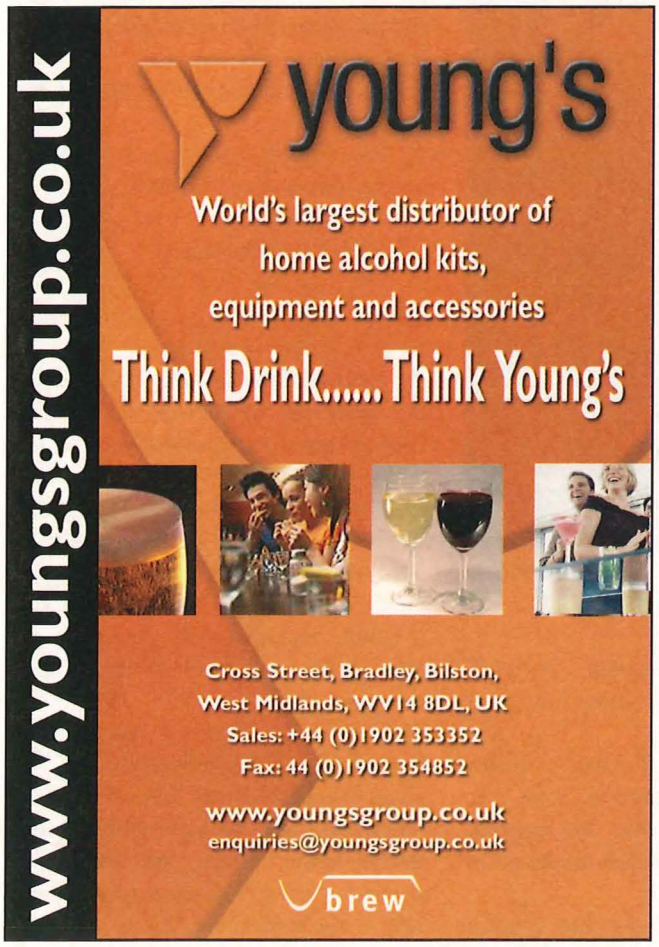
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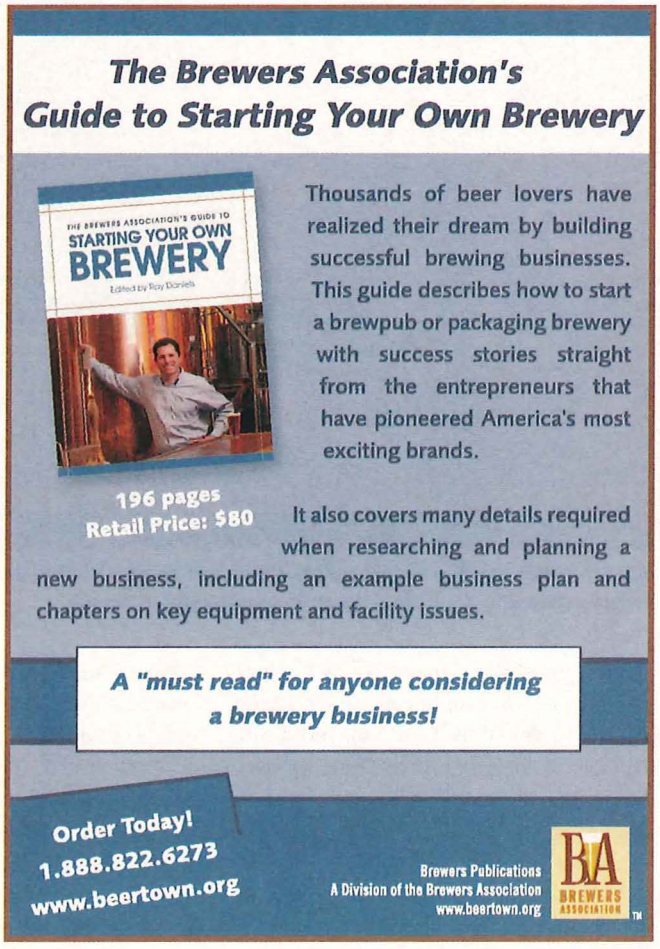
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Love in an Airlock

A tale of brewing up a strong relationship

Sandra A. Miller • Arlington, Massachusetts

It was actually my boyfriend Mark who suggested brewing rather than buying a wedding present for my sister Betsy and her German fiancé Robert. We loved sharing beer with them on our trips to Munich and could always count on Robert for a few bottles of Spaten when he and Betsy came stateside. We also dabbled in homebrewing and hadn't dusted off the carboys in ages.

Scads better than the Cuisinart we'd been considering, we decided to present them with several cases of homebrew to enjoy at their wedding reception on Lake Winnipesaukee in New Hampshire.

Köln, Robert's hometown, gave us the direction we needed to choose our recipe. Kölsch is to Köln as Bordeaux is to, well, Bordeaux. The clear, yellow-hued ale has been brewed there since the 9th century. Served in thin, cylindrical glasses called stange (pole), it is best enjoyed fresh. Though we couldn't pull off fresh, we were determined to bottle a beer to impress the fifty or so Germans — most from Köln — coming over for the wedding.

A month before the big day, we made an outing to The Modern Brewer in Cambridge, Massachusetts for German pilsner, wheat malts plus Hallertauer and Saaz hops. At home, Mark prepped the liquid yeast while I dug out our cache of supplies. Then we boiled up the mixture of malt and hops. It filled the house with a potent smell and filled us with a sense of connection and accomplishment. It was within a minute or so, however, that I wished we'd gone for the Cuisinart. Here's how I remember the conversation.

"So, Honey, next we pitch the yeast?" I asked, standing over two full carboys. "Isn't that right?"

"Um, right," Mark answered, his mind lost in a recipe for one of our next homebrewing projects.

I dumped the liquid into the carboys and was watching it blend when Mark glanced up from his reading. "What did you just do?" he asked, with a controlled voice of horror.

"What you said to do next," I defensively answered. "I pitched the yeast."

"I said next, not now," he retorted. "The wort isn't cool enough. It's going to kill all the cultures."

I narrowed my eyes and peered through the glass at our failing project. I felt like I could see the cultures dying off in front of me.

"Oops. Sorry," I said.

"Oops. Sorry? That's all you can say? After we spent our whole weekend brewing for nothing?"

"I'm very sorry," I said. "I made a mistake. We can start again. Or try and fix it. Can't we?"

He glared at me, nowhere near forgiveness, and as I glared back I thought maybe I'd made two mistakes, the yeast and the relationship. I mean, if a couple can't brew together, worts and all, how are they going to deal with life's real issues?

I turned away from the carboys and Mark. I didn't want him to see my tears. I suddenly had a vision of my sister's wedding without him; of drinking a Dinkel Acker alone in the corner; of being alone for the rest of my life. Then, after a long self-pitying moment, I felt Mark's hands on my shoulders.

"Are you crying over pitched yeast?" he asked.

How could I not laugh? I turned around and sank into his chest.

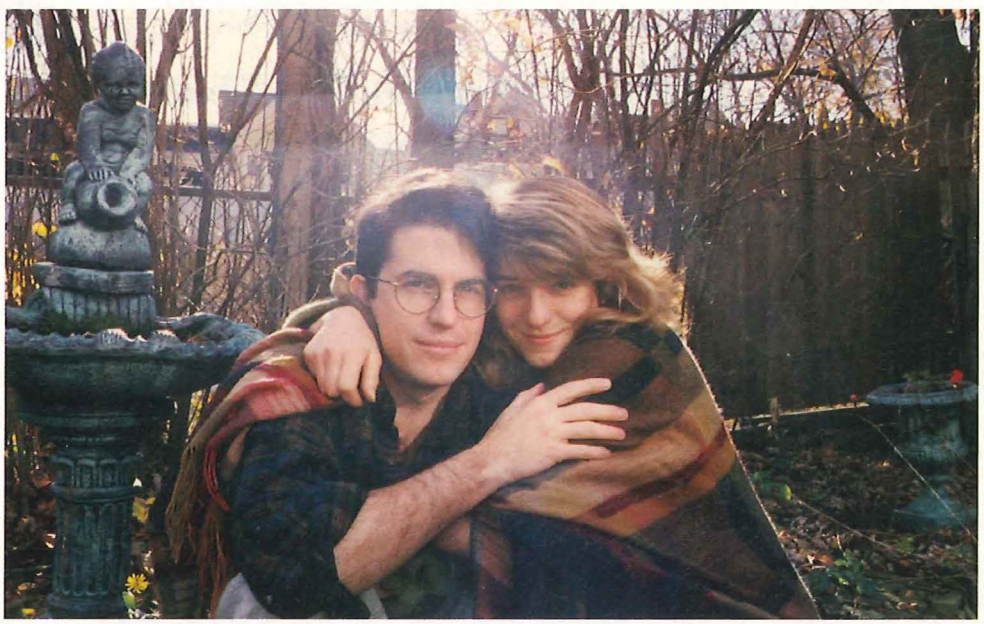
"I really am sorry," I said. "Should we see if the Cuisinart is taken?"

"No way," he said. "We'll just hope enough yeast survive to make this beer happen. It doesn't take much."

After work the next day, I dashed into the basement to check on our brew. As soon as I saw it, I shouted for Mark. "I think it's working! I didn't kill them all!"

Mark came running and kneeled beside me. Together we waited, breaths held for about thirty seconds as the meniscus in the airlock moved. Finally, as a bubble emerged and burped out the top, we let out huge sighs and hugged over the carboys.

One month later, we stood on the shores of Lake Winnipesaukee accepting compliments from the Germans on the "very fine beer" we had labeled Bob & Betsy's Kissin' Kölsch. Later, Mark and I raised our stange glasses of homebrew to love — theirs and ours.



Sandra Miller and her boyfriend Mark learned some valuable lessons about relationships, worts and all, from a homebrewed batch of Kölsch.

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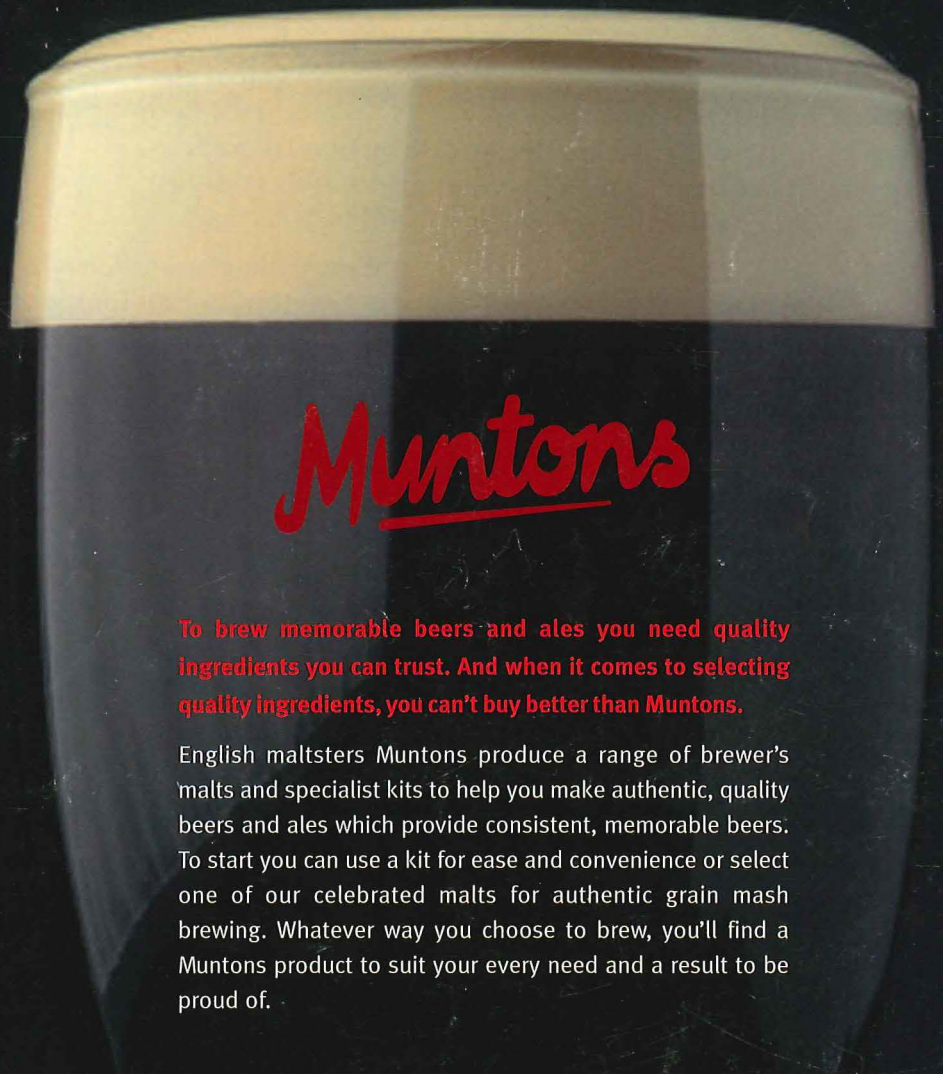
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