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OCTOBER 2005, VOL.11, NO.6

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OCTOBER 2005
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Brew Your Own

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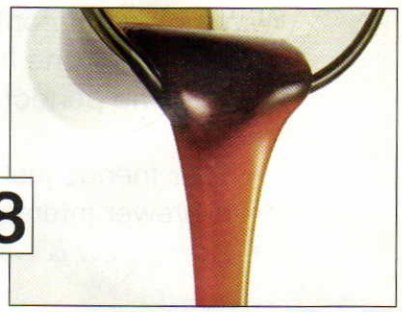

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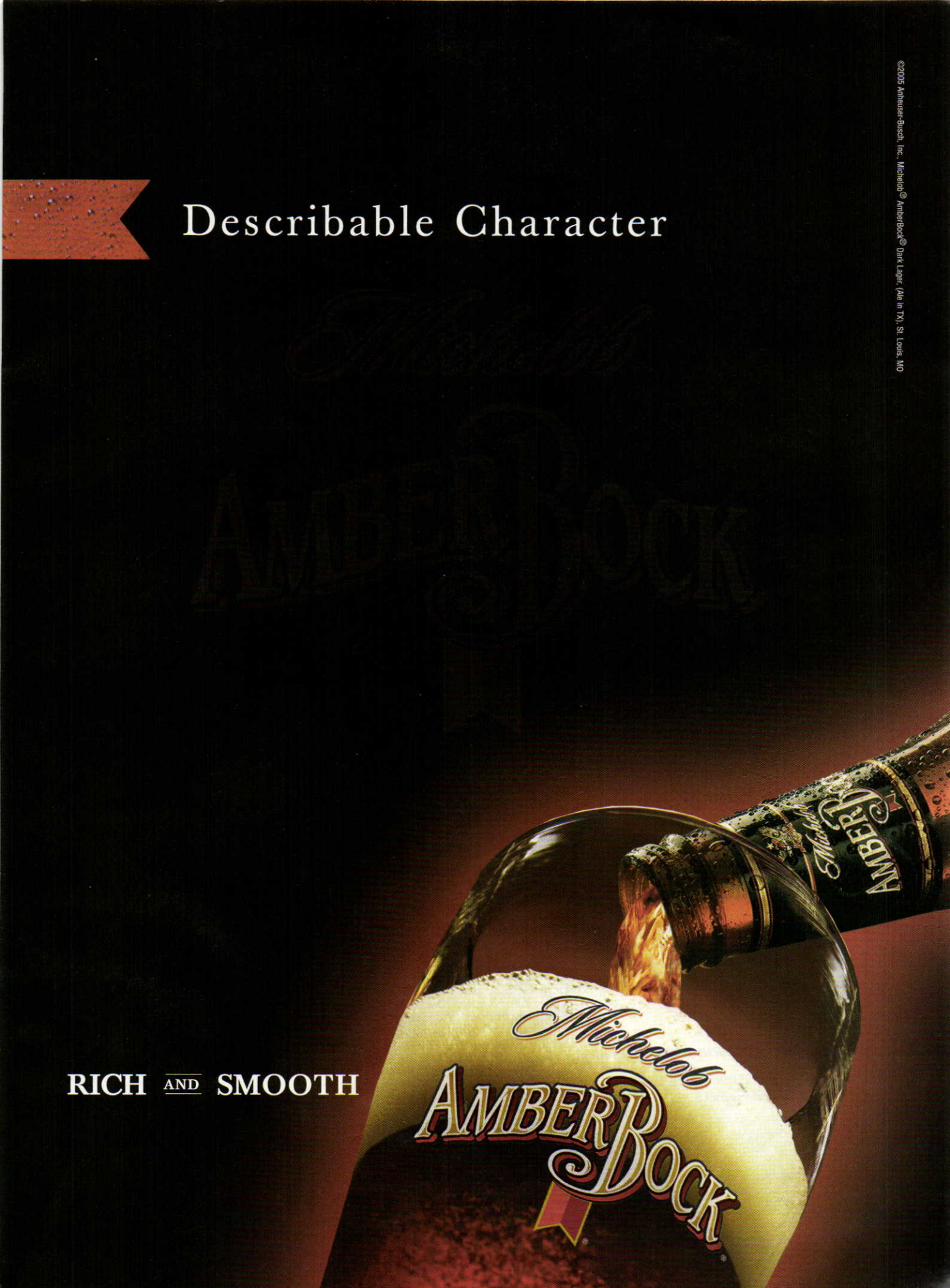
Where to find it

COVER PHOTOGRAPHY: CHARLES A. PARKER/IMAGES PLUS

Describable Character



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Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

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 Volume 11, Number 6: October 2005.

RECIPE INDEX

BYO RECIPE STANDARDIZATION

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

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

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

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

MaiL

Dogfish Mislead

In the Dogfish Head Indian Brown Ale clone in the September 2005 issue, the amount of dry hops listed is incorrect. There should be 0.25 ounces (7 g) of both Goldings and Liberty hops, not the 8 oz. (227 g) of each specified. BYO regrets the error (but — to be honest — we're curious enough that we'll probably brew it this way once just to see how it turns out.)

Also, in our Tips from the Pros column, Todd Ashman's bio is out of date. He is no longer at Titletown Brewing in Green Bay. Instead, he now works for Brewers Supply Group in Shakopee, Minnesota.

Flip that Keg

While reading the Projects article titled "Total Sanitizing Station" (September 2005), I realized that the author may have missed something to greatly simplify the process. Instead of using the bottom of the corny — why not use the top half? The top already has the in/out fittings, all you should have to do is modify the dip tube (bend, replace, whatever) and you are done.

David Wilkes
via email

The Wizard Unveiled

I'm sure you'll get a lot of this, but all these years I had a sneaking suspicion that Ashton Lewis was the Wizard. I sometimes thought he could be long-winded and super technical, but his knowledge is superior and I usually went to the column first. I hope this doesn't mean that he is retiring. Even though all these years of anonymity were fun for his fans (and it may be different now), I would definitely miss the wisdom of the Wizard.

Rick Rocheleau
(10 years homebrewing)
Danielson, Connecticut

Don't worry Rick, Ashton is here to stay. We unveiled the Wiz as a way of giving him some much-deserved recognition for all his years of great writing, not because he's hanging up the robe. You probably aren't the only BYO reader who turns to his "Mr. Wizard" column first. He's been our highest rated columnist since year one. Also, where you say "long-winded and super technical," we say "thorough and detailed."

Congrats

Let me start off by saying congratulations on a great ten years, I look forward to many more great beers with your magazine. I have had a subscription to your magazine since day one.

10 YEAR BrewYour Own ANNIVERSARY

I brewed Al Capone's Prohibition lager along with many other beers, I enjoy the clone recipes and Tips from the Pros. I have read every issue cover to cover and made the counter pressure bottle filler. I like the changes and improvements you've made over the years, however I do miss the "Breweries You've Never Heard Of," but a few more beers and I'll be over it.

Chris Norvell
Portland, Oregon

Counterflow Crud

I recently constructed a counterflow wort chiller, which works great. I have a question, though. Is it OK to leave all the trub produced by the chiller in the fermenter during primary fermentation, or is there a way to

minimize or eliminate it all together? I thought to put my chilled wort in a sanitized six and a half gallon bucket and let it sit at fermentation temperature until the cold break settled down to the bottom and then rack it to the actual fermenter and aerate and finally pitch the yeast. I have hesitated to do this for fear of contamination of the wort. Your advice will be greatly appreciated.

Edward Sherwood
via email

Since counterflow chillers cool hot wort as it passes through the chiller, any cold break formed during the chilling ends up with the wort. Some brewers just leave the trub in the primary fermenter and rack away from it when they rack the beer to secondary. Others do what you suggest — using a bucket as a settling tank. If you practice good cleaning and sanitation, the risk of contamination should be minimal. Counterflow chillers are more efficient than immersion chillers, but you may experience some changes in hop bitterness, flavor and aroma when you switch chiller types — especially in beers with lots of late addition hops.

Twisted Tea for Sweetie

I've been brewing for about five years, and in all that time, my wife has never really enjoyed the homecrafted taste of one of my brews. Of course, I've got a taste that falls on the darker side and she'd rather drink a generic American beer. I've kind of got a thing about never brewing a Coors Light clone, so I think I've found a compromise, but I need your help. Her favorite drink during the summer is Twisted Tea, but I've yet to find a recipe that gets me anywhere close to it. I'd love to finally brew something she likes so that I don't have to feel guilty about neglecting her tastes. Thanks for any help you can give me!

Mike T.
Albany, New York

The way "malternative beverages" are made makes them somewhat hard to duplicate at home. Malt beverage producers brew a light "beer" base then carbon filter it until it's clear and flavorless; then they add whatever flavors, colors and textures they want. (Some other flavored alcoholic drinks are flavored water with hard alcohol added.)

For a Twisted Tea clone, I would try to brew a very light, unhopped beer. I would formulate a beer with an OG around 1.044. Roughly half of the fermentables would come from pale malt (or extra light malt extract) and the other half from corn sugar (or cane sugar) and use a clean ale or lager yeast for fermentation.

To get an iced tea flavor, the best approach might be to use iced tea as your brewing liquor (the water you brew with). Most homebrew shops also carry fruit extracts that can be added in secondary and these would suffice for a Twisted Tea clone.

Steve Piatz is a mild-mannered technical leader for the development of operating system software for Cray supercomputers. By night, he's a homebrewer with a wild streak.

Steve is a member of the Minnesota Home Brewers Association (MHBA). As a BJCP Grand Master, Piatz has graded BJCP exams for a number of years. Steve makes a lot of the "normal" beers — including pale ales, Pilsners, bocks, porters and stouts along with meads, ciders and the occasional wine — but he is most well-known for his unusual brews. For a start, he keeps his nine dedicated lambic fermenters full.

In the October 2004 *BYO*, he wrote "Lambic Brewing" and in this issue (on page 42) he discusses using *Brettanomyces* in brewing. Although "*Brett*" is a component of lambics, it can also be used in other beers — in fact, you can use *Brettanomyces* as your only yeast.

Steve Bader got an early start as a brewer in high school, growing wheat, oats, and rye on the family farm in North Dakota. After tasting

BridgePort's Blue Heron in the late 1980's, his formerly lager-filled world changed forever!

After a 10-year detour into corporate retail management, Steve saw the light and started homebrewing, teaching homebrewing classes, and then opened Bader's Home Beer and Wine shop in 1992.

Since the fall of 2001, Steve has been our Replicator columnist — contacting commercial brewers and providing homebrew clones of homebrew favorites. This month, Steve takes us north to Canada with his clone of Yukon Brewing's Arctic Red.

As authors of the homebrew books, "Clonebrews" (1998, Storey Books) and "Beer Captured" (2001, Maltose Press) as well as the owners of Maltose Express in Monroe, Connecticut, **Tess and Mark Szamatulski** know homebrew recipes. Mark and Tess are also BYO review board members and have contributed feature articles on beer and cooking in the past.

In this issue, on page 34, their recipe for Autumn Apple Spiced Ale kicks off our collection of fall

homebrew recipes from homebrew shop owners across the US. With apple, cinnamon, vanilla and ginger, their recipe will make a great companion to the fall season.

brewer PROFILE

Graham Oldreive • Halifax, Nova Scotia

I'm a relatively new brewer and made my first carboy of lager in 2000. I have brewed many batches mostly from malt extract kits. Being from Halifax, I was raised on Alexander Keith's Indian Pale Ale. It was no surprise when my first brew was a pale ale — it wasn't my greatest attempt at brewing, but was strong in flavor and cloudy in color. I didn't let this stop me though, several batches later I started coming up with much better tasting brews.

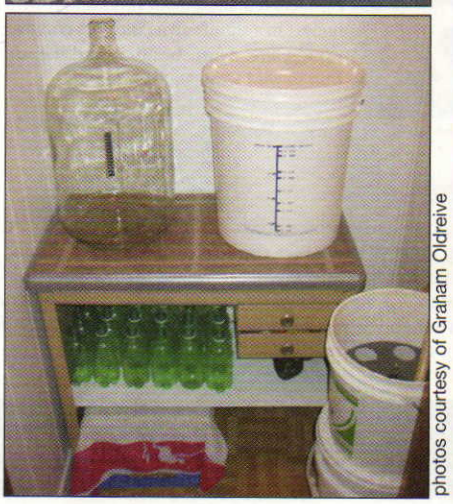
Left: Graham's 4-foot by 4-foot brewery (aka closet). Below: Homemade labels on "uncrooked bottles" and the rest of Graham's equipment.

I used my dishwasher to sanitize my bottles and on my third batch, I forgot to turn the extra hot sanitizer cycle off and all my plastic bottles melted and the necks were bent. But with a batch of beer ready to bottle I had to use them and this is how Crooked Rooster Brewing was founded. The crooked bottles are now gone but the beers keep coming.

In 2001 I brewed a Christmas Special Pale Ale, which did not last very long once my friends came to taste it. I then did some experimenting with red ales and brewed up a Firehouse Red in 2002. In the summer of 2003 I added a lager with the making of a Summer Light Lager. This was a slower year for the brewery due to a lack of financing due to my wife being on strike for 5 months. I did brew one batch of lager and labeled it Strike of 2004 Lager and gave it to the guys and gals on the picket line to enjoy on the hot summer days.

This year I have turned an old closet into a dedicated brewing area. It is only four feet by four feet, but it is more than enough room to store my brewing equipment: 1 glass carboy, a 5-gallon (19-L) plastic bucket as a secondary, and all my bottles, tubes and siphons.

What does 2006 hold for Crooked Rooster Brewing? I hope to brew my first all-grain lager and if that works out, I want to branch out into some Belgian-style brews. I would also like to get a hold of a Kegerator system so I can have Crooked Rooster on tap. I may have to expand my closet into an entire brewing room. That is, if the Chief Financial Officer (aka my wife) will allow the funds for expansion. I may be small, but I think I embody the spirit of all home brewers: An all-consuming love for beer!



photos courtesy of Graham Oldreive

homebrew CALENDAR

October 7
The 22nd Annual Dixie Cup Homebrew Competition
Houston, Texas

Entries for this year's Dixie Cup are due October 7. Entries can be mailed to DeFalco's Home Wine and Beer Supplies located at 8715 Stella Link, Houston, Texas 77025. The Dixie Cup is one of the nation's oldest homebrewing competitions and has one special beer category each year. You won't generally find these categories anywhere in the BJCP guidelines. Past styles have included Beer that gets you Lei'd, Monster Mash, Big and Stupid, and Malt Liquor (in a large bottle and presented to the judges in a brown paper bag).This year's special beer category is Clone Wars. For more information, contact Rob Kolacny via email at dixiecup@foamrangers.com or call DeFalco's at (713) 668-9440.

October 7–8
Northern California Homebrewers' Festival VIII

The NCHF is held at the Lake Francis Resort in Dobbins, California. This year's theme is American brews and clubs from across California and beyond will enter Corny kegs of American Pilsner and American stout in the NCHF Keg Competition. The deadline for entries is 11 a.m. and the competition commences at noon. The NCHF benefits Environmental Alternatives, a non-profit charitable organization that sponsors a camp for under privileged and foster children. Every NCHF registration sends one kid to camp. Along with the competition, the NCHF hosts guest speakers. This year's speakers include John Maier from Rogue and Vince Stern from Two Rivers Cider. For more information visit www.nchfinfo.org.

October 8
Hoppy Halloween Challenge
Fargo, North Dakota

This year's Hoppy Halloween Challenge will be held on October 12. Entries will be accepted between September 26 and October 8. This event is part of the High Plains Brewer of the Year and includes all BJCP categories, including mead and cider. For more information contact Susan Rudd at (701)282-8830 or via email at susan.ruud@ndsu.edu or check out the event Website at http://prairiehomebrewers.org.

homebrew CLUB

Chico Homebrew Club • Chico, California

Starting a home brew club in Chico, California after Sierra Nevada Brewing Company was a commercial success could have been a bit intimidating. Would members be expected to be as good at brewing as Steve Dressler of Sierra Nevada? Would anybody want to make beer at home when Sierra Nevada's pub was so near?

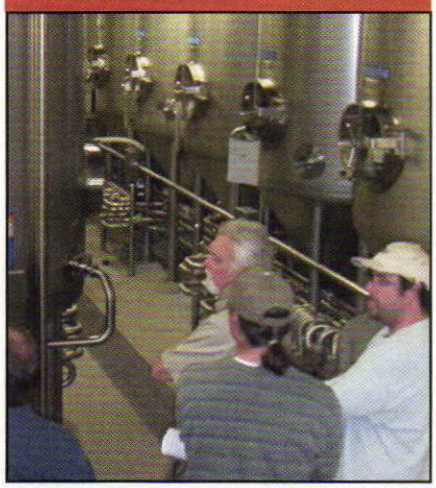
In 1997 a small group of people interested in brewing attended classes taught by a brewer from Sierra Nevada. Upon finding interest and common ground amongst the small group of beginning homebrewers, they decided a club should be formed. They contacted Dawn Letner, owner of The Home Brew Shop in Chico, and got her support. Little did she realize at the time how many questions would be thrown at her and how much time her shop would donate to the club. As it turned out, there had been attempts at brew clubs in Chico before and interest had faded, meeting places were hard to come by, or other problems weren't solved. After some meetings at various homes and a pizza parlor, the loosely organized club contacted Ken Grossman and asked if there was a spot at Sierra Nevada Brewing Company where the club could hold its meetings.

Once Ken Grossman gave the club a place to meet, it really took off. It's still a very loose organization with members (about 60 in number) volunteering to do stints as president, treasurer, style researcher for the month, steward of the month, competition organizer, and so forth. The club owes a special thanks to John Abbot, once our only qualified BJCP judge, for volunteering to train our members. Thanks to him, the club has many BJCP judges at various levels of experience.

To become involved, a prospective member just shows up at Sierra Nevada Brewing Company in the room above the gift shop on the first Thursday of the month at 6 p.m.

Check out our club Website at www.chicohomebrewclub.com. We have a competition every year that follows the BJCP Style Guidelines for beer, mead and cider, with all categories available to enter. We give awards for 1st, 2nd and 3rd place, best of show medals and rosettes. This year (in May) the first place BOS got to brew for a day at Butte Creek Brewing Company with Brewmaster Larry Berlin, received a $50 gift certificate from The Home Brew Shop and a $25 gift certificate from Sierra Nevada Brewing Company.

Another big event for the club is the Northern California Homebrew Fest held at Lake Francis. For more information visit these two Websites: www.lakefrancisrv.com/info and www.nchfinfo.org. We always have a booth set up at the festival and everyone learns a lot about the hobby.



(Top two): Members of the Chico Homebrew Club enjoy BJCP judging. (Bottom): CHC tours Sierra Nevada.

we want you

Do you have a system or some unique brewing gadgets that will make our readers drool? Email a description and some photos to **edit@byo.com** and you too may have a claim to fame in your brewing circle!

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

big winning RECIPE

Joe Formanek
Best of Show
2005 Drunk Monk Challenge
Aurora, Illinois

Old Grandma's Amber Ale

5 gallons (19 L)
Ingredients:

8 lbs. (3.6 kg) Muntons Pale 2-row malt
1 lb. (0.45) Weyermann's Wheat malt
¾ lb. (0.33 kg) Dingemans Caramunich malt
¾ lb. (0.33 kg) Dingemans Carapils
½ lb. (0.23 kg) Cargill Special Pale 2-row malt
½ lb. (0.23 kg) Dingemans Caravienne
½ lb. (0.23 kg) Dingemans Biscuit
½ lb. (0.23 kg) Dingemans Aromatic
⅛ lb. (56 g) Dingemans Special B
½ oz. (14 g) Centennial hops (10% AA) 60 min. boil
½ oz. (14 g) Centennial hops (10% AA) 10 min. finish
1 oz. (28 g) Willamette hop (5% AA) 10 min. finish
1 oz (28 g) American hops (homegrown) (5% AA) 10 min finish
1 oz. (28 g) Centennial hops (10% AA) dry hop in secondary
1 oz. (28 g) Willamette hops (5% AA) dry hop in secondary
White Labs WLP002 (British Ale) yeast
1 tsp. gypsum
1 tsp Irish moss (rehydrated)

Step by Step

This beer was brewed with a standard infusion mash, with 4 gallons (15.2 L) of 173 °F (78 °C)-water. I Added grain at 157 °F (69 °C) and let it sit at 60 minutes until converted, then mashed out at 170 °F (77 °C) for 10 minutes. I sparged with 3 gallons (11.4 L) of 170 °F (77 °C) water then commenced to boil. I boiled for 75 minutes making the hop additions listed above and fined with Irish moss.

homebrew systems that will MAKE YOU DROOL

Andreas Olbring • Gilroy, California

My system is simple and utilizes all gravity flow — no pumps. It was inexpensive, but with most of the parts self-made, it performs exactly how I want it to. I buy the grain in bulk and crack it. This has become very cost effective, and I would much rather spend money on good grain than pumps and heating elements for a slightly higher efficiency.

The Frame

The Frame is three-tiered and has two wheels to make it easier to maneuver. Since I do not use a pump, everything has to flow by gravity from the valves into the next pot.

The Kettles

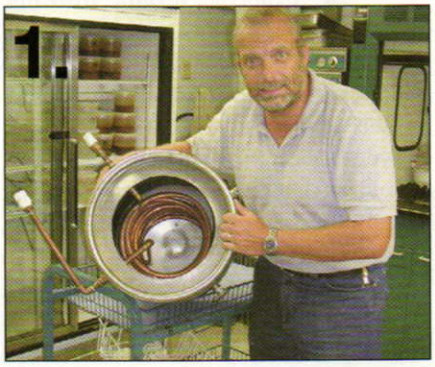
I was able to get 7.5 and 15 gallon stainless steel kettles for mashing, lautering and boiling a 10–15 gallon batch. A large keg is a must.

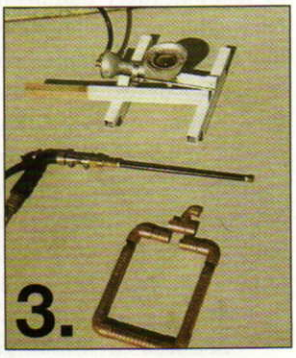
The Lautertun and Mashtun

I use a slotted copper pipe frame to collect the run-off. Copper is able to withstand high temperatures, helps the yeast grow and is easy to clean. I am able to slide the slotted copper-frame into the hole on the inside of the keg. For cleaning purposes the frame can be dissembled into three pieces. So far I have not had a stuck runoff.

Chilling the Wort (no sanitation needed for primary chiller)

With a full mash brew, the total finished amount of boiled beer needs to be chilled fast. I use two cooling systems. One is permanent, with a 15' long coiled copper pipe installed in the boiling pot for the first stage of cooling. It gets sanitized when the wort is boiled. A 25' long ⅜" copper pipe inside of a ¾" garden hose is able to provide the rest of the cooling. I run cold water through both. Chilling 12 gallons usually takes under 30 minutes.

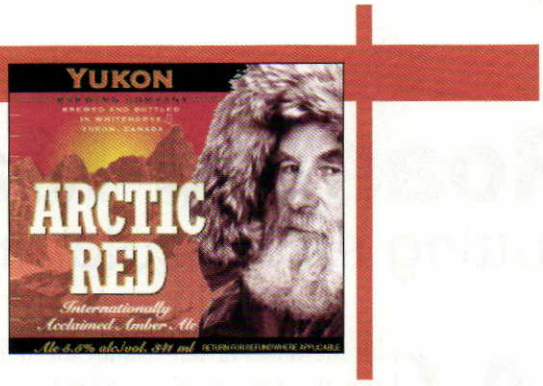




1. Andreas posing with his homemade wort chiller, made of coiled copper tubing.
2. The three-tiered brewing system operates on gravity and requires no pumps.
3. Here is the burner, the high pressure bottle washer and pipes from the mash tun.
4. The second stage counterflow wort chiller takes the temperature down efficiently.

replicator

by **Steve Bader**



Dear Replicator,

Before I began to appreciate beer, before I was a serious homebrewer, I have always known which commercial beer is my favorite. This beer stands alone and is by far the best beer I have ever tasted. I have tried to replicate its flavor with no luck. I will guarantee you will want to replicate it as well once you've tried it. The beer is called Yukon Arctic Red. It is brewed by the Yukon Brewery in Whitehorse, Yukon Territory, Canada. Do you think you can do it? You will be my hero if you can.

Kurt Stenberg
Edmonton, Alberta

A brewery in the Yukon, awesome! It is certainly one of the more northern breweries in North America. Prior to the Yukon Brewing Company opening in 1997, Labatts and Molson were about the only beer choices you had in the Yukon, according to Yukon Brewing's Head brewer Alan Hansen. The Yukon was ripe for a microbrewery making full bodied and tasty beers — and Arctic Red was born.

Arctic Red is one of Yukon Brewing's flagship beers, and its most flavorful. Of course Alan started out as a homebrewer just like all of us, with aspirations of his own brewery. To make the jump a successful one, Alan studied at the Siebel Institute before opening up Yukon Brewing Company.

Alan says that he designed the Arctic Red to be an amber ale with a rich malt base, a bit of residual sugar, and a balanced hop to malt profile. Generous use of Munich and Crystal malts gives Arctic Red the rich maltiness, with a bit of color added from a very small portion of black patent malt.

Alan uses the clean Yukon water to enhance the lovely malt flavors. Arctic Red has a beautiful bronze color, and Alan uses a clean yeast variety to let the range of malt and hop flavors come through.

I'm headed to Canada this week for a holiday, I'm going to look for some Arctic Red. For more information you can visit the Yukon Brewing Website at www.yukonbeer.com or give them a call at (867) 668-4183. Good luck!

Yukon Brewing Company Arctic Red

(5 gallons /19 L, extract with grains)

OG=1.054 FG = 1.012
IBU = 32–35 SRM= 13 ABV = 5.5%

Ingredients

3.3 lbs. (1.5 kg) Muntons Light unhopped liquid malt extract
2.0 lbs. 2 oz. (0.96 kg) Muntons Light unhopped dried malt extract
1.5 lbs. (0.68 kg) crystal malt (10 °L)
1.4 lbs. (0.64 kg) Munich malt (20 °L)
1.0 oz. (28 g) black patent malt
9.3 AAU Goldings hops (60 mins) (1.75 oz./50 g of 5.3% alpha acids)
3.25 AAU Cascade hops (5 mins), (0.5 oz./14 g of 6.5% alpha acids)
1 tsp (5 ml.) Irish moss (boil 60 mins)
White Labs WLP007 (Dry English Ale) or Wyeast 1335 (British Ale II) yeast
0.75 cup of corn sugar (for priming)

Step by Step

Steep the crushed malts in 1.5 gallons (5.7 L) of water at 158 °F (70 °C) for 30 minutes. Remove grains from wort, rinse with 0.5 gallon (~2 L) of water under 170 °F (77 °C) if desired and add water to brewpot to make around 3 gallons (11 L) of wort total. Add the malt syrup and dry malt powder and bring to a boil.

Add the Golding bittering hops and Irish moss and boil for 60 minutes. Add the Cascade hops for the last 5 minutes of the boil.

After the boil, cool the wort, transfer to your fermenter and top off with cool water to 5.5 gallons (21 L). Aerate the wort and pitch your yeast. Allow the owrt to cool over the next few hours to 68 °F (20 °C) and hold at this temperature until the beer has finished fermenting. Then bottle or keg your beer and enjoy!

All-grain option:

This is a single step infusion mash. Replace the malt syrup and dry malt extract with 8.5 lbs. (3.9 kg) of pale 2-row malt, and mix with the rest of your grains in the extract version. Mash the grains together at 158 °F (70 °C) for 60 minutes. Collect approximately 7 gallons (26 L) wort to boil for 60 minutes and have a 5.5-gallon (21-L) yield.

Lower the amount of the Golding hops to 1.5 ounces (43 g) to account for higher hop utilization of a full wort boil. Add the hops and Irish moss as specified in ingredients.

Cool the wort to 75 °F (24 °C), aerate and pitch your yeast. Allow the wort to cool over the next few hours to 68 °F (20 °C) and hold at this temperature until the beer has finished fermenting. Rack to secondary and condition for 1 week, then bottle or keg your beer and enjoy!

Roasted Malt

Putting some color in your fall brews

by **Garrett Heaney**

With the onset of fall and the turning of the leaves, brew recipes too begin to gain color. With each recipe, the word "roasted malt" begins to creep into the mix in place of the pale and lager malts of your lawnmower beers. Whereas hops dictate the taste of your summer beers, specialty grains make up the majority of the flavor, body and color profiles of autumn's brews. Learning to include roasted malts in a partial mash can add colorful dimensions to your fall brewing experience.

Prost! — A toast to the roast

Roasted malts are everyday base malts (most commonly barley) that are heated to the point where enzymes become inactive and the starch and sugars are chemically altered so they do not convert to fermentable sugars. Roasted malts, therefore, have nothing to do with the brewing science involved in fermentation (which make them that much more attractive to beginners). They do, however, have everything to do with a beer's flavor and color. Depending on the duration and temperature of the roast, malt can achieve a variety of flavor and color characteristics. In general, the longer and higher temperature that a malt is roasted, the more pronounced the flavor becomes and the darker the color deepens.

Often, malt is classified by type (e.g. amber, brown, chocolate) and further characterized with a color rating. The most common color scale used in brewing is the Lovibond scale — expressed in degrees Lovibond (° L). Pale malts typically register in the single digits while roasted malts venture into the mid-hundreds — the darkest can surpass even 800 °L!

Most of the roasts

Within the umbrella of roasted malts, there are a range of malt types that are classified by the temperature of their roast and their resultant color rating.

The lightest of roasted malts is known as **biscuit**. Popular in Belgian beers, biscuit malt is only roasted for a short period of time at a relatively low temperature range between 300 and 320 °F (149–160 °C). With this, a maltster — or ambitious homebrewer — will produce a roasted malt of about 25 °L (±2 °L). Biscuit malts contribute a toastiness and nuttiness to a brew's profile and are found in an array of brown ales.

A little darker are **amber** and **brown** malts. These roasted malts, prevalent in the darker British ales, creep a little further up the Lovibond scale due to a longer roasting duration, usually in the same 300–320 °F (149–160 °C) temperature range. These roasted malts, ranging from 50–75 °L, lend a flavor similar to the toastiness of the biscuit malt and can enhance a brew's color profile efficiently, without overpowering the flavor.

Much further down the color scale is the ever-popular **chocolate** malt. Both very dark (between 350–500 °L) and rich in flavor, chocolate malts are roasted for a relatively long period of time, at temperatures that regularly surpass 350 °F (177 °C). Chocolate malt is one of the most pronounced malts in any grain bill, and as such, should be used judiciously. In the hopes to put that little extra oomph in a stout or robust porter, you may end up assaulting your palate if you add too much. If amber and brown malts were coffees, they would be your run of the mill breakfast blends; chocolate malt is more like espresso (actually, coffee and espresso are terms often used as flavor descriptors for chocolate malts).

The darkest of the roasted malts is known as — and rightly so — black malt (or commonly "**black patent** malt"). This malt pushes the roasting boundaries, progressively stepping up the heat until it becomes necessary to spray the grain with water to prevent it from catching fire (a process known as "quelching" sometimes used in other roasted grains as well).

Thrown into the drum at about 300 °F (149 °C), the grain roasts for a period of time before the heat is turned up to about 375 °F (191 °C), then finally upwards of 400 °F (204 °C). The resulting malt falls between 500 and 600 °L and is only added in extremely small amounts. The flavor of this malt is very bitter, so the primary use of black malt is for color.

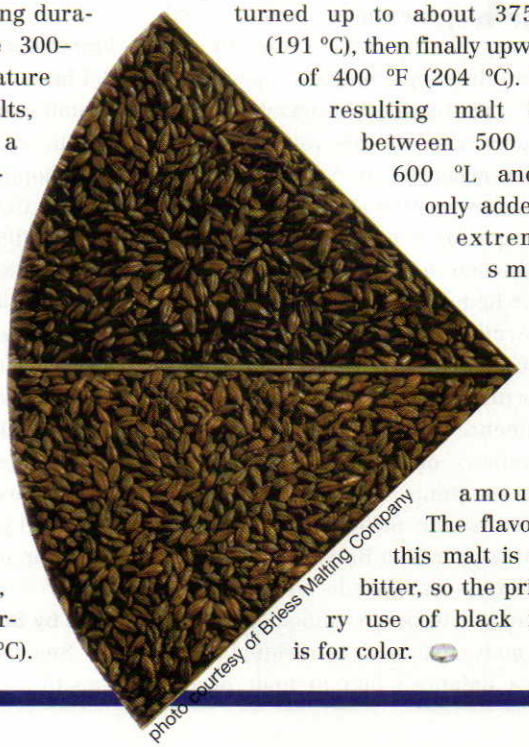


photo courtesy of Briess Malting Company

Sour Beers

Where things are allowed to get funky

by Thomas J. Miller

"This is my first batch of homebrew, Johnny. I think it's a real humdinger, sure to win me a prize," Frank says. Johnny takes a sip. His lips pucker. "So what do you think?"

"Umm, it's alright. Kinda . . . sour." We can almost imagine the fledging homebrewer's screams echoing down his lonely street, for surely he had failed. Or had he? Sour beers, when done correctly, are a true brewer's masterpiece.

Brewer: Ted Miller is co-owner and brewer at the recently opened Brugge Brasserie in Indianapolis, Indiana. He was also Director of Brewing Operations at South China Brewing Company in Hong Kong and worked at several other breweries across Asia.

If we start at the beginning, I guess the question to answer is: What's the best grain bill for a brewer to work with when making sour beers? This depends on whether you are targeting an old bruin or a lambic. I like a touch of crystal malt, Special B and chocolate malts in my bruins. My lambic bill, though, is nothing but a Pilsner malt and wheat.

As for hops, I would recommend that home brewers stay away from any high alpha variety (such as Simcoe, Chinook and the likes) and any hop with extremely identifiable characteristics (like Cascade and Amarillo). I use Tettnanger almost exclusively. Also, using whole, aged hops that are well past the "organic rot" aroma stage can also make a big impact. It takes planning to make one of these sour gems.

A brewer can do one of two things depending on time: Put hops into a breathable container somewhere out of the way for two years, or bake them at very low temperatures (200 °F or 93 °C) for several hours (at least 4–6). Personally, I like to let nature run its course. This will give your beer the aged-hop flavor I find preferable in my sour beer.

As for the souring process, the hobbyist needs to acquire the pure cultures. It would be futile to culture from a bottle, and in most cases you would simply be culturing *Saccharomyces* anyway. The beer in that bottle is so far removed from the source bacteria that it would be nearly impossible to achieve the stage of becoming "ill." The ill (or sour) stage has been my entire battle with these brews. It is easy to achieve if you've got a 400 year-old barrel, teaming with all the required beasts, but to do it in the middle of say, Taiwan or China, where I was for the past several years, or now here in Indiana, it proves more of a challenge.

After a gentle primary (2 months), you will need to inoculate with *Pediococcus cerevisiae*. This will create a high level of lactic acid. This can take a long while, so consistent monitoring of the fermentation is necessary. It can be extremely disappointing to break out the old barrel thief only to find your lambic isn't lambic at all — but rather an extremely nasty cesspool of *Brettanomyces*.

Speaking of *Brettanomyces*, I inoculate with *Brettanomyces lambicus* after six months. *Brettanomyces lambicus* produces the immediately identifiable "horse blanket" characteristic. At what levels to inoculate is a matter of debate. Varying amounts of *Brettanomyces* create a wide spectrum of flavors, so you will need to develop a taste for it and gauge your brewing accordingly.

Brewer: Peter Bouckaert has been the Brewmaster of New Belgium Brewing Co. in Fort Collins, Colorado since 1996. Prior to this he worked for Rodenbach Brewery in Belgium.

Once you have collected the required bacteria for sour beers, it is crucial to store them in a secure manner. I boil up a sugar solution — 10–14% sugar with some egg white and beer (for bitterness) to maintain and propagate the critters in this liquid. At pitch, add this slurry and a sufficient amount of regular yeast. Once you have a good solution of bacteria for your sour beer, limiting acid is key. Do this by increasing alcohol, depleting nutrients and reducing pH.

A sufficient amount of bacteria-free yeast and temperature control, though, are our main weapons. In most cases, I start with a well fermentable, lowly hopped wort (15–20 IBU). Let the fermentation rise to room temperature or higher if possible — as high as 95 °F (35 °C) — to speed up the depletion of sugars. When fermentation is close to completion, cool as fast as you can to capture the desired lactic sour flavor.

Brewer: Tomme Arthur is the Director of Brewery Operations for Port Brewing in California (Solana Beach, San Clemente and Carlsbad). He is a two-time GABF Small Brewpub Brewmaster of the year (2003 and 2004).

When it comes to making Belgian-style sour beers, we employ several different kinds of malts with each malt providing certain foundations. In our Cuveé de Tommé, a Belgian-style dark strong ale, we are looking to support the bourbon barrel character and the strong charred oak flavors by adding a nice caramel malt base. In our Le Woody Blonde Belgian Style Ale, we attempted to brew a beer with a lighter body and therefore chose no crystal malt, opting to use Vienna malt and flaked corn instead.

Hops play an important role in sour beers. There are many compounds that are found in new hops that are not desirable in sour beers. When the hops are aged, those compounds fall to reduced levels. The role of hops in sour ale beers is to provide not bitterness but other acids in a supporting role.

We use a process of adding pure isolated cultures to our brews at specific intervals. It is in this way that we can control and best manipulate the finished beer. Numerous isolated cultures are available to the homebrewer through Wyeast and White Labs. Other homebrewers and some professional brewers are using dregs of yeast cultured from lambic beers. These cultures contain *Pediococcus*, *Lactobacillous* and *Brettanomyces*. The only drawback to using these types of mixed cultures is the inability to separate each type of fermentation.

All of our soured beers start with conventional primary fermentation before proceeding to a barrel where the real magic takes place. We ensure through the primary fermentation that we have hit our target levels of alcohol, bitterness and attenuation before proceeding to the barrel.

For a homebrewer, no extra special equipment is needed. While oak is desired for its oxygen transporting abilities — and widely used in commercial brewing — plastic is an acceptable substitute as it has a permeable membrane allowing oxygen transport as well. If plastic buckets are used, oak chips can be added as a flavoring compound that also provides some tannins.

We add our souring culture (mostly *Pediococcus* and *Brettanomyces*) after a one-month primary fermentation. The goal of this fermentation is to attenuate the beer to the proper level and then settle out as much of the yeast from the primary as possible. This separation of old yeast ensures that we do not develop yeast autolysis, which can produce a burnt rubber smell in the beer.

Controlling Your Malt

"Help Me, Mr. Wizard"

Recycling yeast for generations and brewing with sherry

I tend to like the toastier (or nutty) tasting ambers. I have only brewed one batch so far and I don't intend to mash until I master the art of extract brewing. I was hoping that you could tell me how to achieve this taste. Do I use a toasted malt or is there some additive that I must use?

John Heine
Memphis, Tennessee

I have been brewing with only extracts for three years now. Recently I have added crystal malt to my brews. The last two batches have had a burnt aftertaste to them. I'm sure I'm not burning the extract, so I'm guessing the crystal malt is the culprit. I steeped the grains in a muslin bag at around 160 °F (71 °C) for 30 minutes then removed the grain and brought the water to a boil. I added my extracts and hops according to the recipe. What could be the problem?

Philip Vignola Jr.
Nashua, New Hampshire

These two questions are really quite similar and I wanted to answer both simultaneously. Toasty, nutty and burnt flavors are typically associated with malt selection. In fact, this rather broad range of flavors can be attributed to one type of malt: crystal. I think the wide range of colors and flavors of crystal malt (aka caramel) is underappreciated by many brewers. Most recipes that use crystal malt tend to use only the mid-range types that hover around 50 degrees Lovibond (°L).

Crystal malt starts as damp, green malt following the germination step in malting. The moist grain is typically loaded into a roasting drum and the temperature is increased to about 158 °F (70 °C) for a saccharification (sugar-producing) step. The moisture content stays high during this step and the process is frequently referred to as "stewing." At this temperature, amylase enzymes are active and, like mashing, starch is converted into smaller carbohydrates — some are fermentable and others are not. This step distinguishes crystal malt types from others and sets the stage for color and flavor development later in the process.

One common sensory method used to evaluate malt is to simply nibble on it and assess the flavor.

Once stewing is complete, the roasting drum temperature increases and dry air is introduced to help dry the grain. The process ends with what is called curing — the hottest step in the kilning process that is largely responsible for malt color and flavor.

During the kilning step the importance of stewing becomes evident. When starch is broken down by amylase into smaller carbohydrates, the concentration of reducing sugars increases. Reducing sugars and free amino nitrogen (as well as heat) lend way to the Maillard reaction.

The Maillard reaction and its cohort called Strecker degradation (where intermediate compounds are degraded into other flavor active compounds) are perhaps the most important flavor-related chemical reactions known to occur during cooking. The aroma types formed by these reactions include nutty, meaty, toasty, caramel and burnt. Without the Maillard reaction, many foods (and beers) would be rather bland and boring.

The point is that crystal malt flavor is directly tied to the Maillard reaction and a wide range of flavors can be found by selecting among the various crystal malts available. One common sensory method used to evaluate malt is to simply nibble on it and assess the flavor. The brewer jargon for this is "chewing" and can be used as an indicator of the flavors that may end up in the finished beer. To me, the light crystal malts (10–20 °L) have a very sweet flavor that survives in beer, adding complexity to malty brews. The midrange crystal malts (40–60 °L) have nutty, malty and caramel flavors. This type of crystal malt is essential for pale ales and other amber styles.

Moving up the color scale into the 100+ °L-range, the flavors become more intense. Flavors reminiscent to raisins, sherry, molasses, bitter chocolate and burnt bits off the barbecue grill begin to emerge. So John, if you want to add nutty flavors to your extract brews, I would look at some of the mid-range crystal available on the market. The beauty of crystal malt is that it is perfectly suited for extract brewing as a steeped grain. For the extract brewers who want to add some flavor and color with no worries about starch and steep temperature, crystal is the obvious malt to consider because of its diverse range of flavor and color.

And the burnt flavor Phil is picking up in his brews very well could be coming from the crystal malt selected for those brews. A chew test on the crystal malt used would be a good first start to troubleshooting. If the malt has a burnt flavor, the finished beer may as well. This is easily corrected by simply selecting a different crystal malt from the wide array available from maltsters across the globe.

Regeneration interrogation

I am curious about the best way of going about reusing yeast. I have thought about taking it from my secondary fermenter, but after that I have

no idea how to store it or what I need to do. Could you please advise?

Bruce Jones
Trenton, Michigan

Yeast storage and reuse is one of those topics that strikes fear in many homebrewers because of the importance yeast plays in beer quality and the real possibility of ruining a batch of beer with bad yeast. With that said, there are only a few key things to be mindful of with harvesting and storing yeast for use in subsequent brews.

Commercial brewers routinely harvest, store and reuse yeast because beginning every batch of beer with a new culture is not feasible without considerable investments in both time and equipment for large-scale yeast propagation. Furthermore, the quality of yeast available for harvest following fermentation is excellent in most breweries. The optimal time for harvesting yeast is after primary fermentation has completed, when yeast viability is high and the yeast is easy to crop either from the top of an ale fermentation or the bottom of the fermenter. This technique is most easily accomplished with the use of conical fermenters, which have become the norm.

Sanitation is of the utmost importance when harvesting yeast and all tools must be clean and sanitized prior to use. Since yeast slurries are rich in nutrients, especially as yeast ages, dies and autolyzes, bacteria can grow during storage and the slurry can turn into a source of bacterial contamination. With this being said, good techniques can be easily used to successfully harvest and store yeast.

Once harvested, the yeast slurry should be stored cold to minimize metabolic activity and loss of viability. The general practice in commercial breweries is to maintain the yeast slurry between 32 °F and 38 °F (0–4 °C) for a minimal time period before re-pitching. Most large breweries harvest yeast from the fermenter and store it in an agitated, cooled vessel to minimize hot spots in large volumes of yeast. At home, where much smaller volumes are used, a slurry can be easily maintained at a uniform temperature in the refrigerator. Many small brewers leave their yeast in the bottom of their conical fermenters and remove the yeast for re-use immediately before pitching. This method works well as long as the yeast does not sit in the bottom of the tank for an excessive time period following fermentation. Anything beyond two weeks is getting a bit long based on my experience.

A method I have successfully used in 5-gallon (19-L) batches fermented in carboys is to harvest the yeast after primary has completed and the yeast has settled to the bottom of the fermenter. Moving the carboy into a refrigerator greatly helps with yeast flocculation. The beer can be racked off the yeast into a secondary fermenter, keg or bottling bucket after about a week and the yeast can easily

be recovered by swirling the sediment in the bottom of the carboy with a little beer left behind after racking. This slurry can then be poured out of the fermenter into a clean and sanitized storage container and placed in the refrigerator. I suggest using a glass container fitted with a sterile cotton plug or a plastic container with a screw top because yeast slurries can build up pressure even when stored cold.

When I was a student at UC Davis we used to go on annual trips to Sierra Nevada that were always a great deal of fun. Not only did we get a great tour of a great brewery, we were also given goodies to take back to Davis. On one such trip, we took two glass bottles used to autoclave and store microbiological media — these served as our yeast containers. When we returned to the lab we placed the yeast-filled bottles in a 39 °F (4 °C) cooler for future use. Later the next day, my friend Bill Cherry and I heard a noise from the cooler and discovered a huge mess caused by an exploding bottle in the cooler. We put on face shields and thick gloves to carefully open the remaining bottle. Suffice to say, these bottles with sealing caps were no longer used as little yeast brinks.

The other thing to consider when harvesting yeast for re-use is its history. I do not suggest harvesting yeast from high alcohol beers, beers that had a sluggish or unusual fermentation or from batches of beer brewed from "high generation" yeast. Every time yeast is used in fermentation its generation number increases. First generation yeast comes from a lab propagation. When the fermentation is complete and yeast is harvested, the next batch or batches contain second generation yeast (it is common to harvest enough yeast from one batch to brew two or three batches).

As the generation number increases, so does the likelihood of using yeast that has mutated and lost some of its desirable brewing qualities (such as flocculation characteristics). The potential for contamination also increases with each generation. Most commercial lager breweries do not use yeast older than 10 generations, while some ale brewers reportedly never go back to a lab culture and are always re-pitching yeast from a fermentation.

The huge difference between commercial brewing and homebrewing is frequency. While commercial brewers brew frequently (packaging breweries typically brew 24 hours a day, five to seven days per week), homebrewers are not so active! This makes rules of thumb about the number of generations between buying yeast of little use because the storage time increases. One summer I had a group that I brewed with and we took turns brewing with our chosen strain to minimize the time between fermentations. This worked well since we all took cleaning and sanitation seriously and passed around the culture for several months without incident.

I hope that I gave you some useful

information to address your question. Now for some unsolicited advice.

Bad yeast will wreck a brew, wasting both time and money in addition to creating a shortage in beer! There are several sources of very good homebrewing yeast out there and the price of yeast is relatively inexpensive in the grand scheme of things, especially if one values their free time. There are several reasons to re-use yeast, but if one is in doubt about technique and does not brew relatively often (every couple weeks), I would seriously consider the pitfalls before using this method on a routine basis.

Chipping away at sherry

My buddies and I are thinking about trying to make a Utopia clone. I understand that Sam Adams likes to age their beers in old sherry casks. How can we imitate sherry casks with oak chips? I've seen a variety of toast levels, but no one seems to sell sherry or bourbon cask chips. Can we just soak the oak chips in sherry for a while before we add them to the secondary? Flexibility to try bourbon or sherry chips with other beers would be great.

Joe Dunne
Chicago, Illinois

Popularity of beers aged in a variety of used oak barrels has really blossomed over the last decade and Sam Adams is one of the breweries that has come out with several of such beers. My take on these beers is that the used oak barrel acts as a vector to flavor beer with what was previously in the barrel. Stouts aged in old bourbon barrels taste like stout flavored with bourbon and beers aged in old sherry casks taste like sherry-flavored beer. This is a pretty obvious observation but has a practical implication for homebrewers who do not have access to used oak barrels — or do not brew enough beer to fill a barrel.

Homebrewing is very different from commercial brewing in that homebrew is not taxed and the regulations governing commercial brewing do not apply. At home or in a pilot brewery a brewer can make an oaky bourbon stout by adding oak chips to a stout during aging to get the desired affect from the oak and then blend this beer with bourbon, whisky or scotch to add whatever flavor and intensity is desired from the liquor.

Commercial brewers can use all sorts of approved ingredients and for ingredients that are not on the approved list, a special statement of process must be filed with the Tax and Trade Bureau (TTB), formerly the Bureau of Alcohol, Tobacco and Firearms (ATF). If I were to review a statement of process proposing to add liquor to beer, my suspicions would be raised since the tax rate on beer is lower than that of wine and liquor. I am not suggesting that beer aged in used barrels is done to discretely add liquor to beer, but this method is available to homebrewers and not so easily to commercial brewers.

When I consider making a clone, the first thing I do is carefully taste the beer of interest and develop a flavor profile in my head. The idea here is not to determine how the beer was made, but rather to simply define its flavor as completely as possible. The next question is how to replicate the beer flavor given the tools available. In the case of Sam Adams Utopia, one of the primary flavor descriptors may indeed be "sherry cask." This beer and others brewed by Sam Adams are also very high in alcohol — brewing the base beer is a challenge that goes beyond simply getting the barrel flavors.

"Sherry cask" flavor can be further broken down into oak character and sherry character. If I were brewing this sort of beer I would address the flavors individually. Oak character can be added either by adding oak chips to beer or aging the beer in a barrel. I would lean toward buying a new small oak barrel because oxygen slowly diffuses into a barrel during aging and this probably has an influence on barrel-aged beer. To my palate, many of the strong beers aged in oak have flavors associated with oxidation. This term is almost always a negative connotation in the world of beer, but not all oxidation is necessarily bad when very strong beers are aged. In high alcohol beers, oxidized flavors may remind one of raisins, dates and sherry. In my experience with aging beer in new oak barrels, a couple of months are required before the beer really starts to take on appreciable oak flavor. Tasting throughout the aging process is important and there is no magic timeframe.

The same is true if one chooses to add oak chips to the secondary fermentation. After I got the brew where I wanted it with respect to beer flavor, oak flavor and aged flavors, I would begin to play with adding the wine or spirit component. This type of blending is always best done by preparing several samples of beer with varying levels of blended mixtures so that the flavor impact can be tasted over a range of concentrations. You may find that even a little of the planned flavor additive makes for a vile brew and you can avert a disaster.

This method is probably not for every brewer as it is actually quite unorthodox. For that matter, aging beer in an old bourbon, sherry or whisky barrel is pretty strange in the mind of many brewers. However, if the purpose of homebrewing is to create beer with a certain flavor profile, it seems that the finished product is more important than the method used to make it. If you really wanted to soak oak chips in the wine or spirit of your choice and then add the infused chips to your beer, I think the flavor would be more difficult to control and the method is no more "pure" than adding the two ingredients independently. Good luck in your endeavors!

BYO Technical Editor Ashton Lewis has been answering homebrew questions as his alter ego Mr. Wizard for the last ten years. Do you have a question for him? Send inquiries to *Brew Your Own*, 5053 Main Street, Suite A, Manchester Center, VT 05255 or send your e-mail to wiz@byo.com. If you submit your question by e-mail, please include your full name and hometown. In every issue, the Wizard will select a few questions for publication. Unfortunately, he can't respond personally. Sorry!

Bière de Garde

Forget grapes! This French classic uses malt

by Horst D. Dornbusch

Bière de garde, as the name implies, is a "lagered" ale — *garder* is French for: to keep, to watch, to care for or to reserve. In that respect, it resembles a saison. Bière de garde is at home in the northern French provinces of Nord-Pas de Calais, Artois and Picardie — right across the border from Belgium. It is brewed either from all barley malt or, in the Belgian fashion, with a small amount of sugar added to the brew kettle. Traditionally, it used to be brewed weak or strong at different times of the year. Apparently, the alcohol level of a bière de garde could range anywhere from a weak 2.5% to a mighty 8%. The stronger versions of bière de garde were brewed mostly in the spring, before the start of the working season on the farm. The bières de garde of March were gradually consumed during the summer months well into early fall. Brewing on the farm usually resumed only after the harvest, with the season's new grain. The last drop in a cask of bière de garde, therefore, might have aged for as much as eight months before it was drunk.

Bière de Garde by the numbers

OG	approx. 1.066 (16.5 °P)
FG	1.012 (3 °P)
SRM	10–20 (rarely more)
IBU	25 (often less)
ABV	nowadays approx. 6–8%

Most beer styles from the northwestern lowlands of Continental Europe evolved from murky medieval roots and morphed over time as they became fixed into modern brews. Their historical brewing records are frequently ambiguous, especially prior to the twentieth century. Not surprisingly, it is difficult to know for certain if our contemporary renditions still resemble the ancient brews from which they once sprang, and our modern concepts of them are often broad and hard to pin down numerically. Most Belgian beer styles are classic examples of this dilemma, and the northwestern French farmers ale is no exception either. Nowadays, most commercial bières de garde are bottle-conditoned (though the most commonly available brand in North America, Jenlain from the Duyck Brewery near Valenciennes in Picardie, is not) and laid down for at least three months. They tend to be sold in heavy, cork-stoppered and wire-caged champagne bottles. An unfiltered brand that is often available in North America is the slightly fruity and hop-accented La Choulette Ambrée from Hordain in the province of Nord-Pas de Calais.

The character of bière de garde

The three bière de garde provinces of Nord-Pas de Calais, Artois and Picardie lie roughly half way between the Ardennes in Belgium and the French capital of Paris. In fact, the railroad from Bussels to Paris stops in Lille, the major city of the region. It is this down-to-earth place, the "other" France — the one without the wine and the flamboyance of la gaieté parisienne — that has given bière de garde its character.

Large portions of Nord-Pas de

RECIPE

A Beer to Guard

(5 gallons/19 L, all-grain)
OG = 1.066 FG = 1.012
SRM = 16 IBU = 25 ABV = 7.0%

Ingredients

9 lbs. 9 oz. (4.3 kg) Weyermann Pilsner malt (2 °L)
2.25 lbs. (1 kg) Weyermann Munich Type I malt (6 °L)
1 lbs. (0.45 kg) Dingemans aromatic malt (21 °L)
5.0 oz. (0.14 kg) Dingemans Special B (150 °L)
5.6 AAU Northern Brewer or Mt. Hood hops (bittering) (0.7 oz./20 g of 8% alpha acid)
1 oz. (28 g) Spalt hops (flavor/aroma)
0.5 oz. (14 g) Saaz hops (flavor/aroma)
Wyeast 1214 (Abbey Ale), 1762 (Belgian Abbey II), 1388 (Belgian Strong Ale), 3787 (Trappist Ale) or White Labs WLP500 (Trappist Ale), WLP530 (Abbey Ale) yeast
1 cup brown sugar (in the kettle)
1 cup dry malt extract (for priming)

Step by Step

Use about 4.1 gallons (~16 L) of water to mash in at about 146 °F (63 °C) for a 30-minute rest. Then raise the mash temperature to about 152 °F (67 °C), using a combination of hot-water infusion and direct heat. Let rest for 30 minutes. Start sparging with 180 °F (82 °C) water and let the grain-bed temperature rise to about 168 °F (76 °C). (Cool down sparge water to 168 °F (76 °C) at

continued on page 20

recipes continued

continued from page 19

this temperature.) Sparge slowly, for at least 90 minutes. Discontinue the sparge when the kettle gravity reaches about 1.056 (14 °P). Add the brown sugar to the kettle. Boil for 120 minutes. Add bittering hops 15 minutes into the boil. Add the two flavor/aroma hops about 20 minutes before shut-down. Check the gravity. It should be around 1.066 (16.5 °P) after evaporation losses. Liquor the wort down if necessary. Using a spatula, gently create a whirlpool in the kettle and wait for about 30 minutes to allow the trub to settle. Cool to a pitching temperature of 64 °F (18 °C). Pitch yeast and aerate. Let primary fermentation run its course and the debris to settle out. This may take about three weeks, by which time the beer should be attenuated down to about 1.012 (3 °P). Rack and age for about 2 months at about 50–55 °F (10–13 ° C). Then keg and force carbonate or add priming agent and package in bottles.

A Beer to Guard

(5 gallons/19 L, extract with grains)

OG = 1.066 FG = 1.012

SRM = 16 IBU = 25 ABV = 7.1%

Ingredients

7 lbs. 2 oz. (3.2 kg) Pilsner liquid malt extract (such as Weyermann)

2.25 lbs. (1 kg) Weyermann Munich Type I malt (approx. 6°L)

1 lbs. (0.45 kg) Dingemans aromatic malt (21 °L)

5.0 oz. (0.14 kg) Dingemans Special B (150 °L)

5.6 AAU Northern Brewer or Mt. Hood hops (bittering) (0.7 oz./20 g of 8% alpha acid)

1 oz. (28 g) Spalt hops (flavor/aroma)

0.5 oz. (14 g) Saaz hops (flavor/aroma)

Wyeast 1214 (Abbey Ale), 1762 (Belgian Abbey II), 1388 (Belgian Strong Ale), 3787 (Trappist Ale) or White Labs WLP500 (Trappist Ale), WLP530 (Abbey Ale) yeast

1 cup brown sugar (in the kettle)

1 cup dry malt extract (for priming)

Step by Step

Mill the specialty grains (or have them crushed at your homebrew shop) and divide into three roughly equal portions. Steep the grains in three muslin bags for about half an hour in about 1.75 gallons (6.6 L) of hot water (starting at about 162 °F (72 °C); heat water to this temperature again if it drops below 148 °F or 64 °C).

At the end of the steeping time, raise the bags and rinse with about a gallon (~ 4l L) of cold water. Do not squeeze the bags. Transfer the steeping liquid to the brew kettle, add another gallon or two of brewing liquor and bring to a boil. Turn off the heat. While stirring constantly, pour the LME into the hot liquor and add the brown sugar. Bring to a boil again and add the bittering hops. Add hops at time indicated in recipe. After boil cool wort and then transfer to fermenter. Aerate wort and pitch yeast. Follow remaining all-grain instructions.

Calais, Artois and Picardie used to belong to Flanders, and the Belgian influence on the almost abbey-like ale from this region is clearly evident. However, there is no lactic acidity or herby spiciness in a bière de garde, at least not in its modern commercial interpretations. These flavors are typical of the farmers ale from north of the border, the Belgian bière de saison. As an artisanal country ale, bière de garde obviously started out way back as a brew made strictly from local ingredients. What has emerged from this elusive centuries-old tradition of small-scale beer-making, is not a standard brew that could be easily translated into modern scientifically-inspired specifications, but rather an attitude towards brewing, a way of creating a satisfying drink that was fit for the lifestyle of the hard-working country folk who made it. As a commercial brew, only the stronger versions of bière de garde seem still to be made (and exported to North America).

When I pop the cork of a bière de garde and pour it into a glass (I always use a cognac snifter), the predominant association that the thick, amber brew evokes in me is one of rustic earthiness, bucolic simplicity, and honesty. The brew is not refined, but it is not coarse either. Instead, it is full-bodied and hearty, slightly fruity, unabashedly strong in alcohol and has a medium hoppiness — but with a powerfully malty, almost Port-like, finish. Bière de garde is clearly a sipping, not a quaffing, beer. I simply love bière de garde . . . but when it comes to beer, I'm a hopeless romantic!

Bière de garde goes great with soft, zesty French cheeses such as Camembert, Henri (a soft, white-mold cheese from Picardie), or Maroilles (a soft abbey cheese, also from Picardie). For a wonderful beer and cheese dish pairing, see the recipe for a quiche-like dish from Picardie called Goyère de Valencienne (see page 21).

Brewing a bière de garde

Specifications for bière de garde range widely and there are no stringent brewing rules. Most interpretations of this beer call for a deep amber color,

but many are bright amber. They are either made from all malt or with a small amount of sugar added. They tend to be medium in hop bitterness and mildly fruity, but without notes of diacetyl. Alcohol flavors tend to be noticeable and the finish is slightly dry to faintly sweet — even strongly malty (the beers containing some sugar are usually drier).

To comply with this description, I selected a grain bill of mostly Pils base malt plus three malts for color and body as well as depth of flavor: light Munich malt (from Briess at 10 °L or Weyermann at approx. 6 °L); Dingemans aromatic malt (which is similar to British biscuit malt); and a small amount of a dark crystal malt (Dingemans Special B at ~150 °L).

I used a two-step infusion mash with relatively low rest temperatures — around 146 °F (63 °C) and 152 °F (67°C) — to promote the conversion of starches into fermentable beta-amylase that produce more fermentables from starch than alpha-amylase. I achieved the mash-out temperature of 168 °F (76 °C) through sparging. For hop balance I selected Continental-style hops: Northern Brewer or Mt. Hood for bittering, and Spalt as well as a smidgen of aromatic Saaz to carry some hop flavor and aroma into the finish. To bump up the alcohol and augment the middle flavor, I added one cup of brown sugar to the brew kettle.

For yeast, I yielded to the Belgian influence and used a Belgian abbey yeast. I fermented the beer slowly at a low 64 °F (18 °C) for three weeks to suppress the development of diacetyl. I then racked and aged the brew for two months in a Cornelius keg in my cool basement at about 50–55 °F (10–13° C). As a cellared brew, a bière de garde is best served at that cellar temperature.

Food pairing: Goyère de Valencienne

If you are looking for a perfect culinary union, try to marry the traditional bière de garde farmers ale to a Goyère de Valencienne — a quiche-like flaked-pastry dish filled with soft cheese. The following ingredients make up the pastry: 1.5 cups all-purpose flour, 8 tablespoons chilled butter, 5 tablespoons chilled water and a pinch of salt. The filling is made up of: 2 tablespoons milk, 1 teaspoon salt, 2 eggs, pepper to taste and 1.5 cups grated cheese (cheddar or similar cheese of your choice).

Prepare the pastry shell like you would bread, kneading all ingredients together and letting it rise. Then press into pie plate (about ½-inch thick) and cook at 400 °F (200 °C) for 10 minutes. Then prepare the filling in a bowl: Beat the eggs thoroughly, blend all remaining filling ingredients and pour the filling mixture into the pastry shell. Put the pan back into the oven, pre-heated at 325 °F (160 °C) for about 20 minutes.

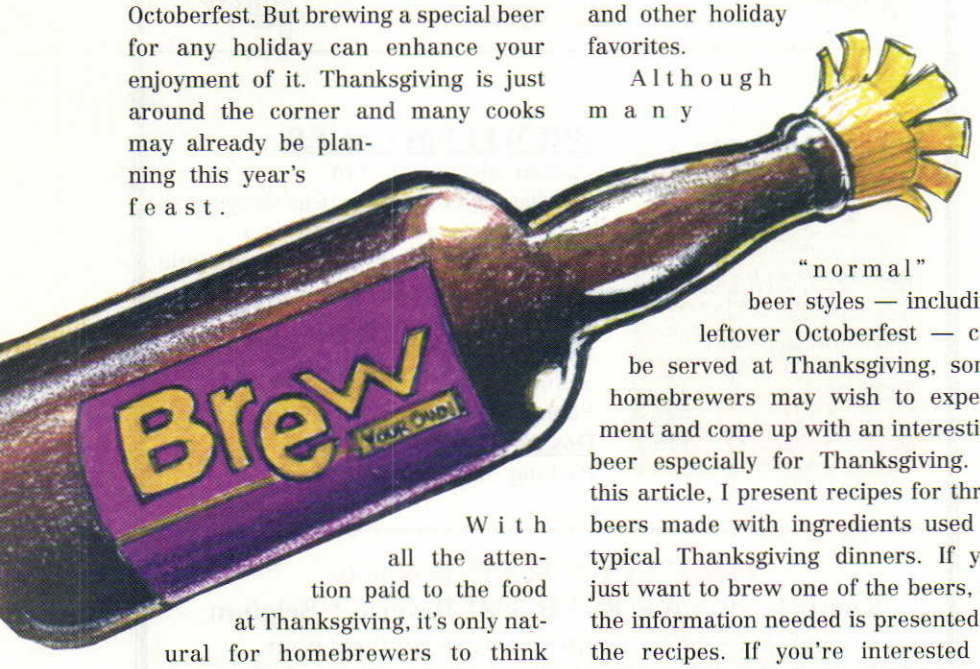
Horst Dornbusch writes "Style Profile" in each issue of BYO.

GIVE THANKS for beer

by Chris Colby

Get Ready For TURKEY DAY Now by Using TRADITIONAL THANKSGIVING INGREDIENTS in Beer

THE BIGGEST BEER HOLIDAY of the year, especially for Germans, is Octoberfest. But brewing a special beer for any holiday can enhance your enjoyment of it. Thanksgiving is just around the corner and many cooks may already be planning this year's feast.



With all the attention paid to the food at Thanksgiving, it's only natural for homebrewers to think about what kind of beer might go well with the turkey, stuffing and other holiday favorites.

Although many "normal" beer styles — including leftover Octoberfest — can be served at Thanksgiving, some homebrewers may wish to experiment and come up with an interesting beer especially for Thanksgiving. In this article, I present recipes for three beers made with ingredients used in typical Thanksgiving dinners. If you just want to brew one of the beers, all the information needed is presented in the recipes. If you're interested in some kitchen chemistry and food science background on the ingredients, the text of the article provides this with biological nerditude thrown in.

Pumpkin Beer

Pumpkin pie is a traditional Thanksgiving dessert. Pumpkins are the fruit of the pumpkin plant (*Cucurbita pepo*), although most people refer to them colloquially as vegetables. Like many fruits from the squash family, — including cucumbers, various types of gourds, various types of squash, zucchini, cantaloupe and watermelon — their starches or sugars can provide extract for brewing.

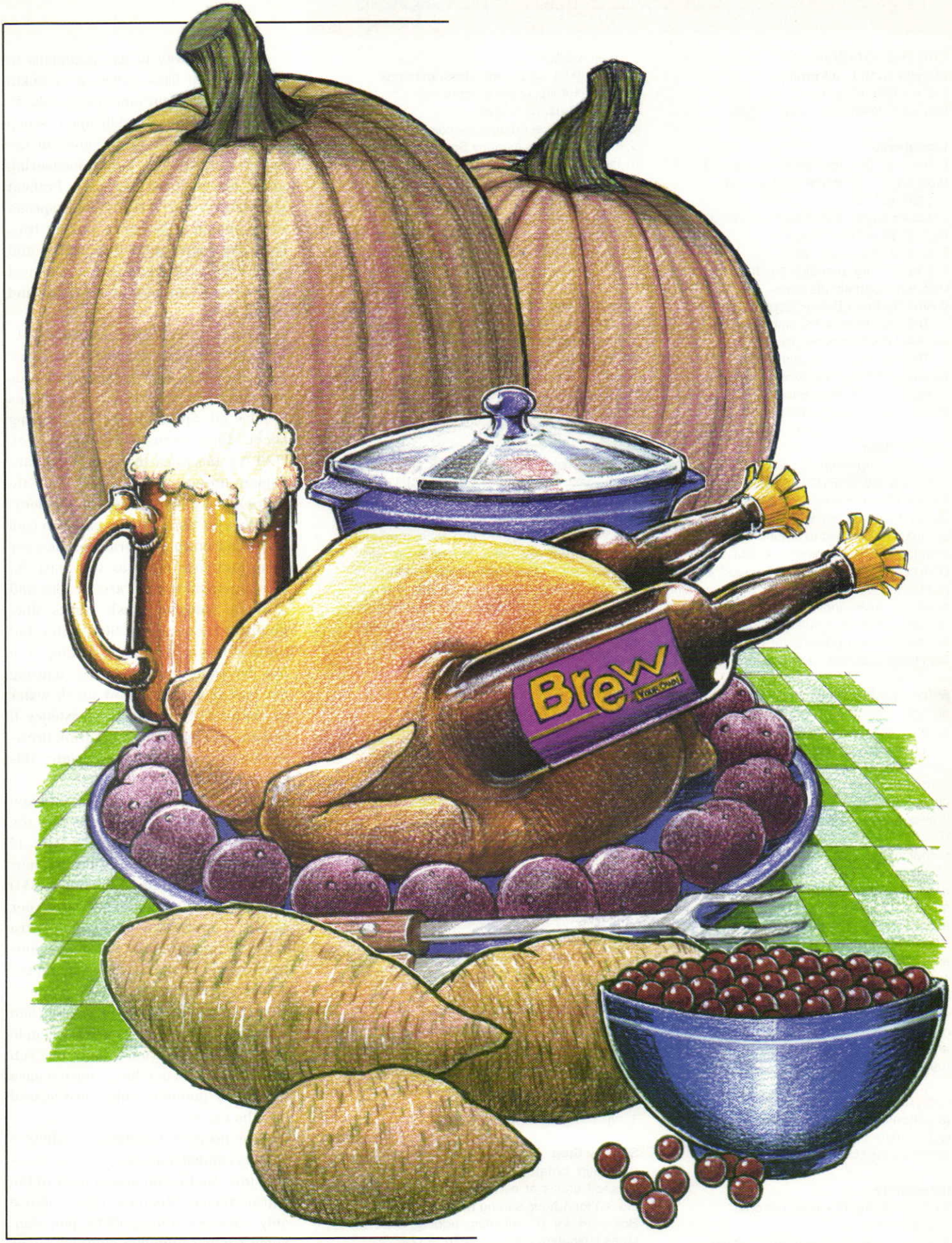


illustration by don martin

Old Pumpculiar

(5 gallons/19 L, all-grain)
OG = 1.058 FG = 1.012
IBU = 27 SRM = 16 ABV = 6.0%

Ingredients
8 lbs. 7 oz. (3.8 kg) pale ale malt (3 °L)
0.66 lbs. (0.30 kg) dark crystal malt (120-150 °L)
1.0 (0.45 kg) torrified wheat (or flaked wheat)
8 oz. (0.23 kg) cane sugar
8 oz. (0.23 kg) molasses
6.0 lbs. (2.7 kg) pumpkin (fresh, cubed)
0.75 tsp. pumpkin pie spice
6 AAU Northern Brewer hops (60 mins) (0.67 oz./19 g of 9% alpha acids)
2.5 AAU Fuggles hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
Wyeast 1028 (London Ale) or White Labs WLP026 (Premium Bitter) yeast
0.75 cups corn sugar (for priming)

Step by Step

Cut pumpkin into 1-inch (2.5 -cm) cubes and bake at 350 °F (177 °C) until brown. Heat 13 qts. (13 L) of water to 164 °F (73 °C) and stir in crushed grains and pumpkin (once pumpkin has cooled to around mash temperature). Mash for 60 minutes at 153 °F (67 °C). Collect about 5 gallons (19 L) of wort, add 1.5 gallons (5.7 L) and boil for 90 minutes, adding hops at times indicated. Add sugar and molasses with 15 minutes left in the boil. Add spices at end of boil and let wort sit 15 minutes before cooling. Ferment at 70 °F (21 °C).

Extract option: Replace pale ale malt, wheat and pumpkin with: 1.0 lb. (0.45 kg) pale ale malt, 1.5 lbs. (0.68 kg) Alexanders pale liquid malt extract, 4.25 lbs. (1.9 kg) Muntons Light dried malt extract and two 29 oz. (0.82 kg) cans of pumpkin. Place crushed pale ale and crystal malts in a large steeping bag. In your brewpot, heat 3 qts. (3 L) of water to 164 °F (73 °C). Submerge grain bag, then add pumpkin to grains. Steep at 153 °F (67 °C) for 45 minutes. After steep, remove bag but do not rinse with water. Add water to brewpot to make 2.75 gallons (10.4 L), add dried malt extract and bring to a boil. (You can heat the extra ~2 gallons (7.5 L) of boil water in a separate pot.) Boil 60 minutes, making hop and sugar additions as described in the all-grain recipe. Add liquid malt extract and spices at end of boil and let steep 15 minutes before cooling wort. Cool wort, transfer to fermenter and top up to 5 gallons (19 L) with water. Aerate wort and ferment at 70 °F (21 °C).

Cranberry Zinger

(5 gallons/19 L, extract with fruit)
OG = 1.044 FG = 1.007
IBU = 11 SRM = 3 ABV = 4.8%

Ingredients
14 oz. (0.40 kg) Briess wheat dried malt extract
3.3 lbs. (1.5 kg) Coopers Wheat liquid malt extract
2.0 lbs. (0.91 kg) orange blossom honey
3.0 lbs. (1.4 kg) whole cranberries (four 12-oz. packages)
2 medium Navel oranges (seedless)
2 medium apples (Granny Smith)
¼ tsp. yeast nutrients
½ tsp. pectic enzyme
½–2 tsp. malic acid or acid blend (optional)
4 AAU Willamette hops (30 mins) (0.8 oz./23 g of 5% alpha acids)
Safale US-56 dried ale yeast (3 packages)
1.2 cups corn sugar (for priming)

Step by Step

Bring 1.5 gallons (5.7 L) of water to a boil and add dried malt extract and hops. Boil for 30 minutes, adding yeast nutrients with 15 minutes remaining in the boil. After boil, shut off heat and stir in liquid malt extract and honey. Put lid on pot and let hot wort sit for 15 minutes (over 160 °F/71 °C) before cooling. Cool wort and transfer to fermenter. Add water to make 5 gallons (19 L), aerate and pitch yeast. Ferment at 68 °F (20 °C). Let ferment until completion. Make "cranberry relish" by combining cranberries, apples (cored) and whole oranges (rind and all) in a grinder or food processor, chop to cranberry relish consistency. Put cranberry relish at bottom of sanitized bucket, rack beer on top of it and add pectic enzyme. After 7–10 days of contact with relish, bottle or keg beer. Adjust acidity with malic acid, if desired. Bottle or keg and carbonate so beer is fizzy.

Sweet Potato ESB

(5 gallons/19 L, all-grain)
OG = 1.048 FG = 1.010
IBU = 42 SRM = 11 ABV = 4.8%

Ingredients
8.0 lbs. (3.6 kg) English 2-row pale malt
5.0 lbs. (2.3 kg) sweet potatoes
0.5 lbs. (0.23 kg) crystal malt (60 °L)
2.0 oz. (57 g) biscuit malt
9 AAU Kent Goldings hops (1.8 oz./51 g of 5% alpha acids)
1.25 AAU First Gold hops (30 mins) (0.25 oz./7 g of 5% alpha acids)
1.25 AAU First Gold hops (20 mins) (0.25 oz./7 g of 5% alpha acids)
1.25 AAU First Gold hops (10 mins) (0.25 oz./7 g of 5% alpha acids)
1.25 AAU First Gold hops (0 mins) (0.25 oz./7 g of 5% alpha acids)
¼ tsp yeast nutrients
1 tsp Irish moss
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast
1 cup corn sugar (for priming)

Step by Step

Whip potatoes, let cool and stir into crushed grains at mash in. Mash at 153 °F (66 °C) for 1 hour, stirring three to four times. Boil wort for 90 minutes, adding hops at times indicated. Ferment at 70 °F (21 °C).

The best way to use pumpkins in brewing is to bake cubes of pumpkin flesh and stir them into your mash. To do this, cut the pumpkin open, scoop out the seeds and "goop" and cut the pumpkin flesh into cubes measuring about one inch on each side. Preheat your oven to 350 °F (177 °C) and spread the pumpkin cubes on a baking tray. Bake the cubes until they soften and their exteriors have browned. This will take between an hour and an hour and a half.

(When you're done, consider baking the pumpkin seeds for a snack treat. Take 2 cups of the pumpkin seeds and coat them with about 3 teaspoons of olive oil. Spread seeds on a baking sheet, turn oven down to 300 °F (149 °C) and roast them until they are golden brown. Season with salt (to taste) and a pinch of cayenne pepper.)

Wait for the pumpkin cubes to cool to around mash temperature, then stir them into your mash as you mash in. Most pumpkin recipes are for ales and a single infusion mash works fine. Pumpkin fruit is about 90% water, but some of this is lost during baking, so it can be somewhat confusing figuring out how to calculate how much water to add for a proper mash consistency. If you are an experienced all-grain brewer, the simplest way to "calculate" this is just to wing it.

If not, try this quickie estimate: take the weight of your grains plus the dried weight of the pumpkin (10% of the wet weight) and multiply by your usual water-to-grain ratio (most BYO recipes use 1.25 quarts water per pound of grain (2.6 L/kg)). The extra water in the pumpkins will make your mash a little thinner than usual, but the difference will be small unless you're adding a pile of pumpkin. Other than perhaps stirring the mash a couple more times than you usually do, you don't need to do anything unusual once the baked pumpkin cubes are stirred into the mash.

For brewers looking for a simpler option, canned pumpkin is also available (and that is the option used in the extract recipe). Read the label and use only cans containing 100% pumpkin. Some canned pumpkin contains sugar

or spices. Libby's 100% Pure Pumpkin does not and is available in 15 oz. (0.43 kg) and 29 oz. (0.82 kg) cans.

Baking the pumpkin develops the flavors of the pumpkin flesh, but what really makes people think of pumpkin pie are the spices. Pumpkin pie is typically spiced with cinnamon (*Cinnamomum zeylanicum*), ginger (*Zingiber officinale*), allspice (*Pimaneta dioica*) and nutmeg (*Myristica sp.*). Some recipes for pumpkin pie spice omit the allspice, which has a cinnamon-like character to it, but may include cloves (*Syzygium aromaticum*), mace (*Myristica sp.*) or other spices. (Mace, incidentally comes from the same plant as nutmeg. Nutmeg is from the seed of the plant; mace from the seed covering.) Most supermarkets carry premixed pumpkin pie spice, especially around Thanksgiving.

. . . what really makes **PEOPLE THINK** of **PUMPKIN PIE** are the **SPICES**.

Keep in mind that a spice mix with more ingredients is not necessarily better than one with the four basic ingredients. A simple mix of 1 tsp cinnamon, ½ tsp ginger, ¼ tsp nutmeg and ¼ tsp allspice works well in either pie or beer — but feel free to use Grandma's double secret background recipe if she's told it to you.

Grinding your own fresh spices will yield the best flavor in your beer, much better than that old pre-mixed pumpkin pie spice that's been sitting in your spice rack for years. However, fresh supermarket mixes aren't as awful as some "spice snobs" would have you believe. If you don't want to go through the hassle of making your own spice mix, a fresh supermarket blend will work fine.

(You'll have more fun baking your own pumpkin and making your own spice mix, and your results will likely be better, but I understand that not everybody has a ton of free time around the holidays.)

Getting the right amount of spice in a beer can be tricky as the strength of spices varies. You can add the spice sometime during the boil, at knockout or in secondary (either as raw spice or as an alcohol extract). In the recipe with this article, the spices are added at knockout. Keep in mind, though, that you can boost the amount in the keg (or bottling bucket), if you desire.

Many pumpkin ales, including the commercial Buffalo Bill's Pumpkin Ale, are American pale ales with pumpkin and spices added. My recipe has pumpkin added to an English old ale and is just a bit bigger and darker.

Relish the Cranberry

Most Thanksgiving dishes — turkey, stuffing, potatoes and gravy — are savory. Providing contrast is the tart cranberry relish. You can also use cranberries (and the other fruits in cranberry relish) to make a tart, sparkling fruit beer.

Cranberry relish is typically made from cranberries (*Vaccinium macrocarpon*), seedless oranges (*Citrus sp.*), apples (*Malus domestica*) and sugar. However, as with pumpkin pie spice, there are numerous variants. Lemon (*Citrus sp.*) and ginger are found in a many recipes. (Incidentally, some sources give different species names to the trees bearing different citrus fruits, but all citrus trees — including orange, lemon, lime and grapefruit — can interbreed with each other.) Sometimes cranberry relish is spiked with an orange-flavored liqueur such as Orange Curaçao or Grand Marnier.

The relish is made by grinding the cranberries, oranges — whole (zest, rind and all) — and cored apples and adding sugar. The result is sweet and tart, with a "bite" from the tannins in the cranberry skins and some bitterness from the orange rind.

Making a fruit beer from a tart, strongly-flavored fruit is much easier than making fruit beer from milder fruits. There's a reason that raspberry wheat is such a popular summer homebrew. To make a cranberry relish beer, brew your base beer and rack it onto cranberry relish. For my base beer, I've chosen a lightly-hopped honey wheat so the color and flavor of the cranberries show through.

Once primary fermentation is finished, make your cranberry relish (minus the sugar) and place it in the bottom of a sanitized bucket then rack your beer onto. Do not add the cranberry relish in the boil to sanitize it; cranberries are rich in pectins and your beer will be very hazy. Cranberry relish has a low pH and cranberries have natural anti-biotic compounds in them. (Cranberries grow in bogs and it's thought the anti-microbial substances are present to help fend off floating bacteria.) Also, the beer you're racking onto the relish has alcohol in it. This combination of factors limits the possibility of contamination.

During the time the beer contacts the fruit, the sugars in the fruit will be fermented. Color, flavor and tannins from the cranberries will dissolve into the beer, as will bitter compounds from the orange rind (all of these are water and/or alcohol soluble). Pectins from

the cranberries and apples will also dissolve, but a dose of pectinase enzyme should degrade them.

The resulting beer should be tart and have a noticeable bitter astringency, just as cranberry juice does. Normally, astringency is something we avoid in beer. However, you expect some astringency along with cranberry flavors. You may want to adjust the acidity by adding malic acid, citric acid or a blend of the two if the beer is not tart enough for you. Malic acid, the type of acid found in apples, is available at home winemaking shops, along with citric acid. Cranberries contain malic, citric and quinic acid, the latter of the three suppresses urinary tract infections. They are also high in benzoic acid, which is used as a preservative in many sweet drinks.

After the contact with the fruit, rack the beer away from the relish. You will be left with soggy relish, which still contains a lot of beer. You may be tempted to want to strain this to yield more beer. However, straining the last bit of relish mush will probably cause too much splashing to be worthwhile, and this isn't good because you don't want oxygen to get into the beer.

Sweet Potato ESB

Sweet potatoes (*Ipomoea batatas*) are not true potatoes — they are from a different species than true potatoes (*Solanum tuberosum*) and the vegetables are storage roots instead of tubers. But, their starch can be used to provide extract to any beer.

I've brewed my sweet potato ESB three times now. It's just an offshoot of my regular ESB with 5.0 lbs. (2.3 kg) of sweet potatoes substituted for 1.0 lb. (0.45 kg) of pale malt. Sweet potatoes are about 80% water, so the dry weight of 5 lbs. (2.3 kg) is comparable to 1 lb. (0.45 kg) of pale malt. You can turn any of your beer recipes into a sweet potato variant by making this swap.

To use the sweet potatoes, I just make whipped potatoes, let them cool and stir them into the mash. Since I don't bake the potatoes, they only contribute starch and an orangish color to the beer. The beer does not have any sweet potato flavor to it. Aside from the color, the only difference between this and my normal ESB is that the sweet potato ESB is a little drier. If you get brewing now, your holiday beer can be fully aged and conditioned in time for Thanksgiving.

Chris Colby is thankful for beer, loud rock & roll and beer.

photo by charles a. parker

10 STEPS

to better extract brewing

by **Chris Colby**

Extract brewing is viewed by some as a streamlined process compared to all-grain brewing. It omits one major step of all-grain brewing (the mash) and the brewday is shorter. However, the differences between extract and all-grain brewing are more extensive than the presence or absence of the mash. In fact, extract brewing has its own set of challenges not faced by all-grain brewers. In this article, I present 10 brewing tips specific to extract brewing.

Know Thyself (and Thine Brewery)

If an extract brewer wishes to brew consistently quality beer, he (or she) should get to know the details of his system and how they effect his brewing. Brew an extract version of a beer brewed by an all-grain friend or an extract clone of a beer you enjoy. Taste your beer side-by-side with the all-grain or commercial beer and note every difference you can. How do the color, bitterness, malt character and yeast qualities stack up? Once you have this information in hand, use the following information to correct or adjust for any of the problems you may be experiencing.

Pump Up the Volume

The biggest improvement most extract brewers can make to their process is to boil their wort in a larger volume. Early homebrewing books instructed brewers to boil the malt extract for a 5-gallon (19-L) batch in as little as 1.5 gallons (5.7 L) of water. Although this is convenient, this convenience comes at a price. Boiling a thick wort is guaranteed to darken it unacceptably and severely limit the amount of hop bitterness. No matter what volume a recipe calls for, always boil your wort at the largest volume you can manage.

These days, most homebrew shops carry relatively inexpensive brewpots. A 16-qt. (4-gallon/15-L) pot will allow you to begin boiling from around 2.75 gallons (10.4 L) down to 2.5 gallons (9.5 L) in an hour, and a little stirring as the wort comes to a boil will prevent boil-overs. At this volume, you will be able to brew light-colored beers with reasonably high levels of hop bitterness — especially if you use the extract late or Texas Two-Step technique. (For more information on these techniques, see the October 2004 issue of *BYO*).

If your situation permits, the best solution is to get a "turkey fryer" propane cooker and a 7-gallon (26-L) or larger pot. This will allow you to boil 6 gallons (23 L) of wort down to five gallons (19 L) in a typical 60 minute boil. With this setup, the lower color limit you can achieve is determined by the color of your extract and your beers can be as hoppy as any all-grain beer.

Sometimes your brewpot isn't the limiting factor. Sometimes your kitchen stove doesn't kick out enough heat to boil much wort vigorously. Two things can help in this regard. First, close the lid on the pot almost all of the way. You should never boil wort in a completely closed pot. However, you really don't need the lid cracked very much to provide an escape for the volatile chemicals you want to boil off.

A second potential helper in this regard is a coil immersion heater. Many travel places sell these devices (for around US $15), which are just a small heating coil that plugs into the wall. The coil is meant to be placed in water, tea or soup to heat them up. On their own, these would be useless for wort boiling as they don't produce enough heat. However, used in conjunction with a stove, they can increase either your boil vigor or the amount of wort you can boil vigorously slightly. Just the movement induced in the wort by having a hot spot inside the kettle can be a good thing. Keep in mind, though, the potential shock hazard of these devices. I wouldn't use one unless it was plugged into an outlet with an interrupt.

Other Dark Forces

Boil volume is not the only factor in wort darkening. Another problem is the potential to caramelize partially dissolved malt extract. When you stir malt extract into hot water, it does not dissolve instantly or evenly. Little "blobs" of extract can remain intact for quite awhile, even when everything looks dissolved. These "blobs" will sink to the bottom of your brewpot

and can caramelize there. So, whenever you stir in extract, turn off the heat and stir until you don't see any undissolved bits of extract — then stir for another minute or so.

Two other factors in wort darkening are heat and time. On a commercial scale, most brewers used to aim to evaporate 10% of their wort in an hour (these days, the target is even lower). When boiling a small amount of wort on a stove, it's easy to evaporate a much higher percentage. If this is happening, turn down the heat or increase the amount of wort you are boiling.

The longer you boil your wort, the darker it gets. So, boil your wort only as long as the longest hop addition requires. And, keep in mind that some liquid extracts have already been boiled (although others have only been evaporated). Liquid malt extract only needs to boil (or steep at temperatures over 160 °F/71 °C) for 15 minutes to sanitize it.

Fresh Extract

This point does not need to be elaborated on, but I can't leave it out, either — always use fresh malt extract.

Got Grains?

In order to get the colors and flavors you want from your specialty grains, without extracting excess tannins, you need to do one of two things — either steep in a small amount of water or in weak wort. A small amount of water means 1–3 qts. of water per pound of grains (2.1–6.3 L/kg). If you steep in a larger volume than that, add malt extract until the specific gravity is over 1.010 before adding the grains. And finally, rinse with a very small amount of water — 0.5–1 qts. of water per pound of grain steeped (1–2 L/kg) works well (see "Steeping," in the May–June 2005 issue of *BYO* for more on this topic).

In extract brewing, the extract manufacturer collects the wort and concentrates it. When the wort is concentrated into extract, some volatile compounds are lost. To brew the best extract beer possible, you need a way to replace at least a portion of them. The simplest way to do this is to make

some wort yourself by doing a partial mash in your brewpot.

To do this, add some 2-row pale malt to your recipe. For every pound (0.45 kg) of pale malt, subtract 0.53 lbs. (0.24 kg) of dried malt extract or 0.73 lbs. (0.33 kg) liquid malt extract. When making a 5-gallon (19-L) extract beer, I usually shoot for "steeping" a total of around 2–2.5 lbs. (0.91–1.1 kg) of grains, including base malt and specialty grains. Steep this liquid in 1.5–2 qts. of water per pound of grain (3.2–4.2 L/kg) at 148–158 °F (64–70 °C) for 45–60 minutes. After increasing your boil volume, I feel that doing small partial mashes — which are really just glorified grain steeps — is the technique that will help extract brewers brew better beer. Note that partial mash wort is also typically more fermentable than that of malt extract, which can help if your beers consistently finish at a high final gravity.

Sugar is Sweet

Another key difference between all-grain and extract brewing is that an all-malt wort made from grains is almost always more fermentable than an all-malt wort made from extract. Early beer kits solved this problem by combining the malt extract with sugar — which is completely fermentable — to yield reasonably dry beers. (And, because sugar is colorless and many of these kits were no-boil kits, the color could actually be fairly light.)

However, because early US homebrewing was largely a negative reaction to pale American lagers, anything that reminded homebrewers of Bud, Miller or Coors was shunned — and this included adding an adjunct like sugar to their beer. Virtually every homebrewing expert told brewers to replace the sugar — all of it, no matter how much or in what style of beer — with darker and less fermentable malt extract. The result? Homebrew that was darker and sweeter than it should have been.

If high final gravities are a problem for you, swapping some sugar (cane or corn) for a portion of the light malt extract in your recipe can help. Swap sugar and dried malt extract on a one-

to-one basis. For liquid malt extract, add 13 oz. (0.37 kg) of sugar for every pound (0.45 kg) of extract deleted from the recipe. If you end up with more than 10% sugar in your recipe, consider adding ¼ tsp yeast nutrients to the beer. You probably won't want to have sugar occupy more than 30% of your grain bill. Also, be aware that the color of your beer may decrease slightly when you add sugar.

Hops

Boiling at a lower wort density does a lot to improve bitterness in extract brews . However, extract brewers should also do everything else they can to get the most from their hops.

Although boiling your hops in a bag is convenient, this decreases the amount of bitter substances (alpha acids) that are extracted from them. Add the hops loose to your brewpot. If you let the wort sit in your brewpot for a half hour after you cool it, the pellet sludge will settle to the bottom and you can siphon clear wort off it. Also, knock down any hop pellet residue clinging to the side of your brewpot as you boil.

Finally, consider "spiking" your wort with a small amount of neutral high-alpha hops to your beer along with your normal hop charge. Magnum hops usually have around 16% alpha acids and don't have a real strong varietal character. If your beers are normally a little less bitter than you'd like, add a quarter ounce (7 g) or more of Magnum, or any other "strong" hops, along with the specified bittering charge. This will boost your bitterness without changing the hop character of the beer.

Cooling

Hot wort carries a lot more heat than you might realize, and the dilution water you add to bring the volume up to 5 gallons (19 L) isn't cooling your wort down as much as you might think. For example, pouring 2 gallons (7.6 L) of just-boiled wort into 3 gallons (11 L) of water at refrigerator temperature (40 °F/4.4 °C) still leaves you with wort over 110 °F (43 °C). (How far over depends on the gravity of the wort.) Stovetop brewers should take advantage of their smaller wort volume and always cool their wort in their brewpot before transferring it to their fermenter. Use a reliable cooling method and measure the temperature of your wort before pitching.

Getting a wort chiller is the best solution, but many beginners don't buy this piece of equipment at first. The next best solution is to cool your wort in your sink or bathtub. By changing the cooling water every 5 minutes, you continually draw heat away from the wort. And, during this time, the hop debris and other sediment can settle to the bottom of your brewpot. Once the brewpot is cool to the touch (i.e. below human body temperature), siphon the wort to your fermenter and add the dilution water. Here, the dilution water can cool your wort down effectively if it

is below fermentation temperature. A little "temperature strip" on the outside of your fermenter will let you read the temperature of your wort.

Water

Malt extract is condensed wort and it contains everything that wort contains, including dissolved minerals. Any minerals in your dilution water are added to the (unknown) amount of minerals in the extract. Unless you have a good reason not to, always use soft water (or even distilled water) for extract brewing. A little bit of calcium in the boil — under ½ tsp of gypsum or calcium chloride — might be a good thing in some circumstances. However, if you're trying to add salts to your brewing water to make "Burton water," you are ending up with "Burton plus" water due to the minerals already found in your malt extract. Carbon filtering city water is advised.

Yeast

Once you've made your wort, the yeast will convert it into beer. To make the best beer possible, you need to give your yeast three things — enough "teammates" to get the job done, a stable and reasonable fermentation temperature and adequate aeration. The first of these is where most extract brewers could improve. Either make a yeast starter or get enough yeast from another source (previous fermentation, brewpub) and pitch with it. You'll want about 1 cup of yeast solids per 5-gallon (19-L) batch.

Conclusion

Some of the best aspects of extract brewing are its simplicity and the fact that you can do it in a relatively short amount of time on your stovetop without a lot of specialized equipment. Improving your beer does not necessarily mean spending much more time brewing it or buying lots of new gadgets. If you follow the advice in this article, you can brew much better homebrew in about the same time as the old, standard method took.

Chris Colby is the editor of Brew Your Own *magazine.*

FALL RECIPES

From **HOMEBREW SHOPS** across the **US TO YOU**, here are **11 DIVERSE RECIPES** for **FALL BREWING** and **DRINKING**.

Autumn Apple Spiced Ale

(5 gallons/19 L, all-grain)

OG = 1.064 FG = 1.018
IBU = 25 SRM = 15 ABV = 5.9%
courtesy of Maltose Express
Monroe, Connecticut

Our Apple Spiced Ale has captured Autumn in a glass. Subtle spices combine with apple flavor in a malty, warming seasonal brew. The addition of maple syrup just adds another layer of flavoring to an already multi-faceted beer. Adding maple syrup will increase original gravity.

Ingredients

11.5 lbs. (5.2 g) British 2-row pale malt
9 oz. (252 g) US crystal malt (40 °L)
1 oz. (28 g) British chocolate malt
5.7 AAU Northern Brewer hops (0.63 oz./18 g of 9% alpha acids) (bittering)
2 vanilla bean splits (½-inch)
1 tsp. ground cinnamon
¼ oz. (7 g) freshly grated ginger root
1 tsp. Irish moss
Wyeast 1098 (British Ale) yeast
1 ¼ cups Muntons extra light dry malt extract for priming
4–6 oz. (112–168 g) pure apple flavoring for priming
*optional 8 oz. (224 g) maple syrup

Step by Step

1. Mash 1 oz. (28 g) British chocolate malt, 9 oz. (252 g) U.S. 40 °L Crystal malt and 11.5 lb.(5.2 kg) British 2-row pale malt at 154 °F (68 °C) for 90 minutes. Mash in 4 gallons (15.2 L) of water, sparge with 5 gallons (19 L) of 168 °F (76 °C) water. There should be 7 gallons (26.6 L) at the start of the boil.
2. Add 5.7 AAU Northern Brewer bittering hops to boil for 60 minutes.
3. Add 1 tsp. Irish moss, ½-inch vanilla bean split, ½ tsp. ground cinnamon, ¼ oz. (7 g) freshly grated ginger peel, 8 oz. (224 g) pure maple syrup (optional) to boil for 15 minutes.
4. Add ½ inch vanilla bean split, ½ tsp. ground cinnamon, and ½ oz. freshly grated ginger peel to boil for 3 minutes.
5. Pitch Wyeast 1098 British Ale to inoculate fermentation at 68-70 °F (20-21 °C).
6. Prime with 1-¼ cups Muntons extra light malt extract that has been boiled for 10 minutes in 2 cups of water and 4-6 oz. (112-168 g) apple flavor and bottle. Age at cellar temperature until brew suits your taste.

Autumn Apple Spiced Ale

(5 gallons/19 L, extract with grains)

Ingredients

7 lbs. (3.2 kg) Muntons Extra Light dried malt extract
9 oz. (252 g) U.S. crystal malt (40 °L)
1 oz. (28 g) British chocolate malt
5 oz. (140 g) Malto dextrin
8 AAU Northern Brewer hops (0.88 oz./25 g of 9% alpha acids) (bittering hop)
1 tsp. Irish Moss
2 vanilla bean split (½-inch)
½ tsp. cinnamon
¼ oz. (7 g) freshly grated ginger
Wyeast 1098 (British Ale) yeast
1-¼ cups Muntons extra light dried malt extract
4–6 oz. (112–168 g) apple flavoring
*optional 8 oz. (224 g) pure maple syrup

Step by Step

1. Heat 1 gallon (3.8 L) of water to 155 °F (68 °C). Add 9 oz. U.S. crystal malt (40 °L) and 1 oz. (28 g) British chocolate malt.

2. Remove the pot from the heat and steep at 150 °F (66 °C) for 30 minutes.

3. Strain the grain water into the brew pot.

4. Sparge (strain) the grains with ½ gallon (1.9 L) of 150 °F (66 °C) water.

5. Bring the water to a boil, remove from the heat and add 7 lbs. (3.2 kg) of Muntons extra-light dried malt extract, 5 oz. (140 g) maltodextrin and 8 AAU Northern Brewer (bittering hop).

6. Add water until the total volume in the brew pot is 2.5 gallons (9.5 L). Boil for 45 minutes. Then add 1 tsp. Irish moss, ½ inch vanilla bean split, ½ tsp. cinnamon, ¼ oz. (7 g) freshly grated ginger and 8 oz. (224 g) pure maple syrup (optional).

7. Boil for 12 minutes, then add ½ inch vanilla bean split, ½ tsp. cinnamon and ½ oz. freshly grated ginger.

8. Boil for 3 minutes. Remove pot from the stove and chill for 20 minutes. Strained the cooled wort into the primary fermenter and add cold water to obtain 5 ⅛ gallons (19.5 L).

9. When the wort temperature is below 70 °F (21 °C) pitch Wyeast 1098 British Ale yeast. (Aerate the wort thoroughly). Ferment in the primary 7 days at 68-70 °F (20-21 °C).

10. After primary completes, siphon into the secondary fermenter, (5-gallon/19-L glass carboy) and ferment at 68–70 (20–21 °C).

11. Bottle when fermentation is complete, target gravity is reached and beer has cleared (approximately 3 weeks). Prime with 1-¼ cups Muntons extra light dried malt extract that has been boiled for 10 minutes in 2 cups of water and 4–6 oz. (112–168 g) apple flavoring.

12. Let prime at 70 °F (21 °C) for approximately 2 weeks until carbonated, then store at cellar temperature until the brew suits your taste.

Fall Alt

(5 gallons/19 L, all-grain)

courtesy of Beer at Home
Englewood, Colorado

Ingredients

7 lbs. (3.2 kg) Durst German Munich malt
3.5 lbs. (1.6 kg) Weyermann Vienna malt
0.5 lbs. (0.23 kg) Weyermann Melanoidin malt
4 AAU Hallertau hops (60 mins) (1 oz./28 g of 4% alpha acids)
3 AAU Tettnang hops (60mins) (0.75 oz./21 g of 4% alpha acids)
0.5 oz. (14 g) Saaz hops (15 mins)
0.25 oz. (7 g) Tettnang Hops (15 mins)
White Labs WLP011 (European Ale)
¾ cup priming sugar

Step by Step

1. Boil for 60 minutes adding hops as defined in ingredients. This is two-step infusion or single decoction mash with a protein rest at 124 °F (51 °C) for 30 minutes and a saccharification rest at 150 °F (66 °C) for 60 minutes.

2. Cool to below 76 °F (24 °C) and pitch White Labs European Ale yeast.

3. Ferment between 65 and 75 °F (16 and 24 °C).

4. When fermentation is complete, bottle or keg as desired or rack to a secondary and age an additional 2 weeks below 60 °F (16 °C) for that authentic alt smoothness.

Fall Alt

(5 gallons/19 L, extract)

Ingredients

7.0 lbs. (3.2 kg) Munich malt extract
0.5 lbs. (0.23 kg) Melanoidin malt
0.5 lbs. (0.23 kg) Vienna malt
0.5 lbs. (0.23 kg) CaraVienne malt
4 AAU Hallertau hops (60 mins) (1 oz./28 g of 4% alpha acids)
3 AAU Tettnang hops (60mins) (0.75 oz./21 g of 4% alpha acids)
0.5 oz. (14 g) Saaz hops (15 mins)
0.25 oz. (7 g) Tettnang Hops (15 mins)
White Labs WLP011 (European Ale) yeast
¾ cups priming sugar

Step by Step

1. Steep the crushed grains in 2–3 gallons (7.2–11.4 L)of water for 35 min at 150 °F (66 °C).

2. Remove grains and stir in the malt

extract. Bring the liquid to a boil and add hops as stated.

3. Mix the hot wort with cold water to reach five gallons.

4. When the wort is below 76 °F (24 °C) pitch White Labs European Ale Yeast. Ferment between 65 and 75 degrees (18 and 24 °C).

5. When fermentation is complete, bottle or keg as usual, or rack to a secondary and age an additional 2 weeks below 60 °F (16 °C) for that authentic alt smoothness.

Fat Bumpkin Pumpkin Ale

(5 gallons/19 L, extract with grains)

courtesy of The Market Basket
Brookfield, Wisconsin

Ingredients

6 lbs. (2.7 kg) light malt extract
1 lbs. (0.45 kg) brown sugar
2 16-oz. (448-g) cans of pumpkin
1 lb. (0.45 kg) crystal malt
1 teaspoon nutmeg
1 teaspoon allspice
4 teaspoons cinnamon
1 oz. (28 g) fresh grated ginger root
¼ tsp. amylase enzyme
5 AAU Cascade hops (60 mins)
(1 oz./28 g of 5% alpha acids)
5 AAU Cascade hops (5 mins)
(1 oz./28 g of 5% alpha acids)
1 teaspoon Irish moss (15 minutes)
Wyeast 1056 (American Ae) or White Labs WLP001 (California Ale) yeast
¾ cup dextrose for priming

1. Mix the two cans of pumpkin, crystal malt, amylase and brown sugar into 2 gallons (7.6 kg) of water and add amylase.

2. Bring the mixture to 155 °F (68 °C) and let stand for 35 minutes.

3. Bring heat up to 170 °F (77 °C), turn off and allow to settle for 45 minutes.

4. Strain the liquid into the brew pot, leaving as much of the pumpkin pulp behind as practical.

5. Add 1 gallon (3.8 L) of water, bittering hops and malt extract and boil for 60 minutes.

6. Add Irish moss during the last 15 minutes of boil.

7. Add finishing hops and all of the spices during the last 5 minutes of boil.

8. Add water to make 5 gallons (19 L), pitch yeast at appropriate temperature. Ferment for approximately 10 days at 66–70 °F (19–21 °C).

9. Prime with dextrose for bottling or force carbonate in the keg. Enjoy!

All-grain option:

Substitute 8 lbs. (3.6 kg) of highly modified American 2-row brewers malt for the extract in above recipe. Mash-in brewers malt, crystal malt and pumpkin with 4 gallons (15.2 L) of 155 °F (68 °C) water add amylase, brown sugar and hold at 155 (68 °C) until conversion (about 45–60 minutes). Batch sparge with 4.5 gallons water at 175 °F (79 °C). Boil to reduce volume to 5 gallons (19 L). Follow hop, Irish moss and spice schedule as in above recipe. Ferment and bottle the same as the extract version.

Coffee & Cream Stout

(5 gallons/19 L, extract with grains)

OG = 1.061 FG = 1.016
IBU'S = 28 SRM = 55 ABV = 5.9%
courtesy of O'Shea Brewing Company
Laguna Niguel, California

Rich, creamy, full-flavored oatmeal stout enhanced by a smooth, mellow coffee flavor derived from Kiln Coffee malt, topped out with a frothy, creamy white head. This is a great beer to enjoy on a cool evening.

Ingredients

6.0 lbs. (2.7 kg) amber liquid malt extract
1.0 lb. (0.45 kg) dark dry malt extract
0.75 lbs. (0.34 kg) crystal malt (120 °L)
0.25 lbs. (112 g) Kiln Coffee malt
6 oz. (168 g) roasted barley
6 oz. (168 g) black malt (black patent)
0.75 lbs. (0.34 kg) chocolate malt
1.0 lb. (0.45 kg) flaked oats
½ tsp. Irish moss
5.7 AAU Northern Brewer hops (bittering hops)
(0.80 oz./23 g of 7.1% alpha acid)
2.2 AAU Fuggle hops (aroma)
(0.50 oz./14 g of 4.30% alpha acid)
White Labs WLP004 (Irish Stout) yeast
0.75 cups corn sugar (for priming)

Step by Step

1. Steep grains in hot water at 151 °F (66 °C) for 30 minutes. Drain tea from grains into boiling kettle, rinse one or two times with hot water (170 °F/77 °C).

2. Add liquid and dried malt extract to kettle, top up with water to desired level and bring to a boil.

3. Add boiling hops and boil for 60 minutes. With 15 minutes remaining, add Irish moss. When 60 minutes has elapsed, shut-off heat, add finishing hops and start to cool.

4. Once cooled, add to fermenter, aerating well then top-off fermenter with cool water until you have 5.25 gallons (20 L) and pitch yeast.

5. After fermentation is done, add priming sugar, bottle, sit back, relax and enjoy the fruits of your labor!

All-grain option:

Substitute 9 lbs. (4 kg) Maris Otter 2-row for the liquid and dried malt extract. Mash grains at 151 °F (66 °F) for 60 minutes. Collect enough wort to fill your kettle to 6.5 gallons. Decrease the boiling hop addition to 0.60 oz. For the remainder of the recipe, follow the extract instructions.

McCellar's Dry Stout

(5 gallons/19 L, extract with grains)

courtesy of The Cellar Homebrew
Seattle, Washington

Ingredients

6 lbs. (2.7 kg) British light extract malt
1 lb. (0.45 kg) extra dark dried malt extract
1 lb. (0.45 kg) roasted barley
1 lb. (0.45 kg) flaked barley

1.5 oz. (42 g) Northern Brewer hops (60 mins)
0.5 oz. (14 g) Fuggle hops (5 mins)
Muntons dry ale yeast or White Labs WLP 004 (Irish Ale) yeast
¾ priming sugar

Step by Step

1. Place the crushed grains and flaked barley into three strainer bags (one for roasted barley and a ½ pound (0.23 kg) each flaked barley in other two). If using leaf hops, place the boiling and finishing hops in separate bags. Pellet hops need not be placed in bags, as they will not be strained out later.
2. Pour 2.5 gallons (9.5 L) of water into the kettle. Add the grain bags to your kettle and bring the water almost to a boil. Remove the kettle from the heat and let it sit for 10 minutes.
3. Carefully remove the grain bags and place them into a strainer over the kettle. Rinse the grain bags with one quart of hot water into the kettle and dispose the spent grains.
4. Add the malt extract to the kettle and stir until it is completely dissolved. Place the kettle back on the burner and bring it to a boil.
5. Once a vigorous boil has been achieved, add the boiling hops. Time the boil for one hour from this point.
6. After 55 minutes of boiling add finishing hops.
7. Let the boil continue for 5 minutes then remove the kettle from the heat. Cover the kettle and let it cool for 20 minutes before continuing.
8. If using leaf hops, carefully remove the hop bags from the kettle and place them in a strainer over the fermenter. Pour 2.5 gallons (9.5 L) of cold water into the fermenter (pour this over any leaf hops to rinse them.)
9. Add the contents of the kettle to the cold water in the fermenter. Top up the fermenter to 1 inch over the 5-gallon mark with cold water.
10. Preparing the yeast: For dry yeast, use ¼ cup warm water (95-105 °F or 35-41 °C). Sprinkle the contents of the yeast packet into the water without stirring and cover while the fermenter cools to 80 °F (27 °C). For liquid yeast, use per manufacturer's instructions.
11. Monitor fermentation and bottle when complete. Use ¾ cup of priming sugar. Enjoy!

All-grain option:

Substitute 8 lbs. (3.6 kg) of British pale malt for the 6 lbs. (2.7 kg) of British light malt extract and the 1 lb. (0.45 kg) extra dark dry malt extract.

Kenny the Eighth

(5 gallons/19 L, all-grain)
OG = 1.099 FG = 1.038
SRM = 60 ABV = 8.1%
courtesy of
Kennywood Brewing Supply
Crown Point, Indiana

Ingredients

13.5 lbs. (6.1 kg) Crisp Maris Otter malt
1.5 lbs. (0.7 kg) Durst caramel malt (120 EBC)
0.75 lbs. (0.34 kg) American Victory malt
1.25 lbs. (0.6 kg) American chocolate malt
0.5 lbs. (0.23 kg) English black roast malt
1.0 lbs. (0.45 kg) Crisp roasted barley
2.5 lbs. (1.1 kg) English brown malt
12 AAU Chinook hops (120 mins) (1 oz./28 g of 12% alpha acids)
4.9 AAU Centennial hops (105 mins) (0.5 oz./14 g of 9.75% alpha acids)
6.75 AAU Liberty hops (30 mins) (1.5 oz./42 g of 4.5% alpha acids)
4 AAU Northern Brewer (30 mins) (0.5 oz./14 g of 8% alpha acids)
1.5 oz. (42 g) Liberty hops (4.5% AA) (dry hopped in secondary)
Danstar DY40 (Nottingham) dried yeast or Wyeast 1084 (Irish Ale) yeast

Step by Step

1. Into 5 gallons (19 L) of 174 °F (79 °C) water slowly add the grains. Stabilize at 160 (71 °C) for 60 minutes.
2. Sparge with 5 gallons (19 L) of 170 °F (77 °C) water, collecting 7 gallons (26.6 L) of wort.
3. Boil down to 5.25 gallons (20 L) or until OG measures 1.093.
4. Ferment in primary 7-8 days then to 60 °F (16 °C) for 2 weeks. Add dry hops and keep at 60 °F (16 °C) for 2 more weeks. Crash cool to 30 °F (-1 °C) and age for 30 days additionally.

Extract with grains option:

Exchange 8 lbs. (3.6 kg) of Briess Gold Malt extract for the 13.5 lbs. (6.1 kg) of base grain (Maris Otter). Steep the specialty grains in 2.5 gallons (9.5 L) of 140–160 °F (60–71 °C) water for 30 minutes (in sparge bags) then remove prior to adding the Briess malt extract. Then use the following 60-minute boil schedule: hop additions of 60 minutes, 45 minutes, 30 minutes and 15 minutes.

Belgian Black Ale

(5 gallons /19 L, extract with grains)
OG = 1.048–1.052 FG = 1.010–1.012
IBU = 10–20 ABV = 4.5–5.0%
courtesy of
Homebrew Pro Shoppe
Olathe, Kansas

Our Belgian Black Ale is a smooth, medium-bodied ale with lots of roasted barley flavor, citrus notes and just a hint of licorice. The Belgian Black Ale is styled after New Belgium Brewing Company's 1554, but with a unique character of its own.

Ingredients

6.6 lbs. (3 kg) Briess Amber malt extract
8 oz. (224 g) Muntons roasted barley
8 oz. (224 g) Briess crystal malt (60 °L)

5 AAU Willamette hops (60 mins) (1 oz./28 g of 5%alpha acids)
1 oz. (28 g) Cascade hops (finishing)
5 oz. (140 g) priming sugar
White Labs WLP550 (Belgian Ale) yeast

Step by Step

1. Sanitize all equipment.

2. Pour 2 gallons (7.6 L) of clean water into a 4-gallon (15.2 L) or larger pot. Put all crushed grains into a steeping bag and tie the end into a knot to close it. Place the grain filled bag into the brew pot water and heat to approximately 160–170 °F (71–77 °C). Do not boil the grains. Carefully remove the grain bag and allow it to drain into the brew pot without squeezing. Discard the grain-filled bag.

3. Heat the brew pot water to boiling. Remove kettle from heat. Add malt extract syrup and dry malt extract. Stir well and return to heat. Stir constantly until it returns to a boil. Add bittering hops. Be careful not to let the pot boil over. Do not use the kettle lid. Boil for 55 minutes, stirring occasionally, and then add finishing hops. Boil for an additional 5 minutes (total boiling time is 60 minutes).

4. Cool the wort rapidly to 70 °F (21 °C). Pour the brew pot contents into a sanitized 6.5-gallon (24.7-L) fermenter. Adhering a liquid crystal thermometer to the outside of the fermenter can monitor temperature.

5. With the cooled wort in the fermenter, add cold water (70 °F/21 °C) until the level reaches the 5-gallon (19-L) mark on the bucket. Sanitize a hydrometer and take the original gravity (OG) reading. Be sure to record this number for future reference.

6. Sprinkle the yeast on top of the wort and stir well. Insert the sanitized airlock into the sanitized lid. Secure the lid on the fermenter with the airlock in place (approximately half filled with clean water).

7. Place the fermenter in a warm area to maintain a temperature of 68–72 °F (20–22 °C). Keep the fermenter away from sunlight and fluorescent lights. You should notice bubbling in the airlock within 24 hours. Bubbling will slow down significantly after one or two days and then stop completely after 7–10 days. When bubbling has stopped completely prepare for bottling or optional secondary fermentation.

*Optional — a process called secondary (or two-stage) fermentation may be used to improve beer clarity and to remove sediment. After primary fermentation completes, siphon the beer into a 5-gallon (19-L) glass carboy, attach the airlock via a rubber stopper and let set for 6-7 days or until clear.

8. Sanitize all equipment used for bottling and kegging and get your beer into its final container.

Thai Spice Brown Ale

(5 gallons/19 L, extract with grains)

OG = 1.048 IBU = 18
courtesy of High Gravity, LLC
Tulsa, Oklahoma

This brew is a sweetish, slightly creamy Northern English style brown ale blended with Thai tea spices. It is not as heavy as a winter warmer and is a great beer to take you through the autumn months.

Ingredients

4.25 lb. (1.9 kg) Muntons light liquid malt extract
1.0 lb. (0.45 kg) Weyermann Vienna malt
0.5 lb. (0.23 kg) Weyermann Munich malt
0.75 lb. (0.34 kg) Dingemans CaraVienne (pale) malt
0.5 lb. (0.23 kg) Muntons crystal malt (80 °L)
0.25 lb. (0.11 kg) Muntons chocolate malt
0.25 lb. (0.11 kg) Briess rolled oats
5 AAU Saaz hops (60 min) (1.25 oz./32 g of 4% alpha acids)
White Labs WLP002 (English Ale) or Wyeast 1084 (Irish Ale) yeast
8 Chinese star anise
1 oz. (28 g) orange peel
1 vanilla bean (split and scraped)
5 whole cloves
2 cinnamon sticks

Step by Step

1. Place 2 gallons (7.6 L) of water into a 4-gallon (15.2-L) or larger pot and heat to 154 °F (68 °C).

2. Place specialty grains in muslin grain bag and steep in the 2 gallons (7.6 L) of water for 30 minutes (the temperature should be 154 °F (68 °C) when the grains are added. If not, add cold water to adjust).

3. Do not boil the grains; carefully remove the grain bag and sparge with enough 160 °F (71 °C) water to bring volume to 3 gallons (11.4 L).

4. Allow it to drain into the brewpot without squeezing. Discard the grain filled bag. Add the liquid malt extract and bring to a boil.

5. Boil for 90 minutes adding 1.25 oz. (35 g) Saaz hops after 30 minutes.

6. Cool rapidly, add to fermenter and bring volume to 5 gallons (19 L).

7. Add yeast and ferment at 67 °F (19 °C) until complete.

8. When fermentation has completed, blend Thai tea spices. Bring about one quart (~1 L) filtered water to a boil, pour over 8 Chinese star anise, 1 oz. (28 g) orange peel, 1 vanilla bean, split and scraped, 5 whole cloves and 2 cinnamon sticks. Cover and let steep for 15 mins, then strain to remove spices.

9. Start with 2 cups, blend and taste. Continue to add and stir until desired flavor is reached.

10. Bottle or keg as desired.

Thai Spice Brown Ale

(5 gallons/19 L, all-grain)

Ingredients

4.0 lbs. (1.8 kg) Crisp Maris Otter malt
2.0 lbs. (0.9 kg) Weyermann Vienna malt

1.0 lb. (0.45) Weyermann Munich malt
0.75 lb. (34 kg) Dingemans CaraVienne (pale) malt
0.50 lb. (0.23 kg) Muntons crystal malt (80 °L)
0.25 lb. (0.11 kg) Muntons chocolate malt
0.25 lb. (0.11 kg) Briess rolled oats
5 AAU Saaz hops (60 min) (1.25 oz./32 g of 4% alpha acids)
White Labs WLP002 (English Ale) or Wyeast 1084 (Irish Ale) yeast
8 Chinese star anise
1 oz orange peel
1 vanilla bean (split and scraped)
5 whole cloves
2 cinnamon sticks

Step by Step

1. Mash at 147 °F (64 °F) for one hour.
2. Mash out at 170 °F (77 °C). Boil 90 minutes adding 1.25 oz. (35 g) Saaz hops after 30 minutes.
3. Pitch yeast when wort has cooled to 67 °F (19 °C).
4. When fermentation has completed, blend Thai spice tea. Bring about one quart filtered water to a boil, pour over 8 Chinese star anise, 1 oz. (28 g) orange peel, 1 vanilla bean, split and scraped, 5 whole cloves and 2 cinnamon sticks. Cover and let steep for 15 minutes, then strain to remove spices.
5. Start with 2 cups, blend and taste. Continue to add and stir until desired flavor is reached.

G&G Steam Beer

(5 gallons /19 L, extract with grains)
OG = 1.051 IBU = 27 SRM = 14
Courtesy of Grape and Granary
Akron, Ohio

This steam beer has a nice piney Northern Brewer and caramel aroma. It starts malty with a good balance of toasted malt and caramel. The flavor is malty and toasty with a long lingering finish.

Ingredients

4.0 lbs. (1.8 kg) Alexander's pale malt syrup
2.0 lbs. (0.9 kg) Briess gold dry malt extract
10 oz. (280 g) crystal malt (40 °L)
8 oz. (224 kg) Munich malt
8 AAU Northern Brewer hops (45 mins)
1.5 oz. (35 g) Northern Brewer hops (aroma)
Wyeast 2112 (California Lager) yeast
¾ cup priming sugar

Step by Step

1. Sanitize primary fermenter, lid, airlock.
2. Pour approximately 2 gallons (7.6 L) dechlorinated water into your boiling kettle. Bring water to 150–160 °F (66–71 °C). Place specialty grains in steeping sock and place sock in water. Allow grains to steep for 20 minutes at 150–160 °F (66–71 °C). Stir well repeatedly throughout the 20 minutes to allow for maximum color, flavor and aroma extraction. After 20 minutes remove grains and bring water to a boil.
3. Turn off heat. Add malt syrup, dry malt extract and bittering hops. Stir well so that ingredients do not stick to the bottom of kettle. Hops may be put directly into kettle, straining bag not required.
4. Bring wort back up to a boil (watch for possible boil over). Allow to boil for 45 minutes. Control heat during boil so boil-over does not occur. 15 minutes before the end of the 45-minute boil add Irish moss (or Whirlfloc tablet) into the boiling wort. Two minutes before the end of the 45-minute boil, add aroma.
5. After 45 minute boil, turn off heat. If possible, place boiling pot into a sink of cold water. Circulate cold water around the outside of the pot for 15–20 minutes. Cool the wort to 110–120 °F (43–49 °C). Pour or siphon wort from boiling kettle to primary fermenter (attempt to leave most of the hop residue and any proteins behind. Add enough cold water (refrigerated with no chlorine) to the wort and bring the volume up to 5 gallons (19 L).
6. Check temperature of wort and obtain 60–75 °F (16–24 °C). If necessary, place primary fermenter into a sink of cold water to achieve this temperature range.
7. Add yeast. If using liquid yeast make sure it has previously been incubated or have yeast starter ready. If dry yeast is being used, rehydrate according to manufacturer's instructions or sprinkle on top of wort. Check starting specific gravity with hydrometer. Fill airlock half full with water and attach to primary fermenter lid. Fermentation will commence within 24 to 72 hours.
8. When airlock stops bubbling (only bubbles 1 time per minute) check specific gravity. If doing a one-stage fermentation go to step 10.
9. Recommended step: Siphon beer off yeast sediment into a 5-gallon glass carboy. Do not splash. Allow beer to sit in carboy until clear, usually 5-7 days. Add a fining agent if desired.
10. Sanitize bottles. Siphon beer from primary or secondary fermenter into priming container. Dissolve ¾ cup priming sugar in 1 cup boiling water. Add this sugar mixture to the beer in the priming container. Stir well but do not splash.
11. Fill bottles to within one inch of the top. Cap bottles and allow to sit at 60-75 °F (16-24 °C) for two weeks. The bottles may then be refrigerated. The beer may be consumed after two weeks but will continue to improve up to 2 months in the bottle. The beer will store well for a year or longer. Chill the beer to 45-55 °F (7-13 °C) and enjoy!

G&G Steam Beer

(5 gallons/19 L, all-grain)
Ingredients

8.5 lbs. (3.8 kg) lager malt
1.0 lb. (0.45 kg) crystal malt (40 °L)
1.0 lb. (0.45 kg) toasted malt (or Munich malt)
0.25 lbs. (112 g) Carapils malt
0.75 oz. (21 g) Northern Brewer hops (boiling)
0.5 oz. (14 g) Northern Brewer (flavor)
1.5 oz. (42 g) Northern Brewer (aroma)
Wyeast 2112 (California Lager) yeast
¾ cup priming sugar

Step by Step

1. Begin by measuring the proper quantity of mash water into your mashing or boil kettle. Be sure that the water has no chlorine. Bring water temperature of mash water to strike water temperature.

2. Make sure grains are milled. Pour grains into mash kettle at strike temperature. Stir well.

3. Allow grains to "stew" at 152 °F (67 °C) for 60 minutes. Stir the mash every 15 minutes or so to ensure even temperature throughout the mash.

4. Fill the 20-quart (~20-L) kettle with 5 gallons (19 L) of brewing water. Bring this water to 170 °F (77 C). Maintain this temperature throughout the mashing process to allow for easy sparging.

5. Optional step: Raise the mash temperature to 168 °F (76 °C). This step is called a mash out. Hold the mash temperature at 168 °F (76 °C) for 5 minutes. This helps to stabilize enzyme activity and warms the sugars so that they can be extracted more efficiently. The temperature of the mash can be raised to 168 °F (76 °C) by adding heat to the bottom of the mashing vessel or by infusing the mash with small quantities of boiling water.

6. Transfer the mash into lauter tun. Open valve on lauter tun and collect first runnings into a pitcher. Slowly pour first running over top of grain bed and allow to drain back through grain bed. Continue recirculation of first runnings until clarity improves.

7. Once clarity improves, begin collecting runnings into boil kettle or other container. The sparging process should take approximately 45–60 minutes. Restrict the flow of the wort exiting the lauter tun so that run off takes 45–60 minutes. Begin pouring 170 °F (77 °C) sparge water over the top of the grain bed one pitcher at a time. Try not to allow grain bed to run dry or compaction of grain bed could occur.

8. Continue sparging until 6.5 gallons (24.7) of wort is collected. Bring 6.5 gallons of wort to a boil. Allow wort to boil for 30 minutes before adding bittering hops. Add the bittering hops 60 minutes before the end of the 90-minute boil. Add flavoring hops 15 minutes before the end of the 90-minute boil. If you are using an immersible wort chiller, place it in the boiling wort with the flavor hops. Irish moss (whirlfloc tablet) should also be added 15 minutes before end of boil. If you have aroma hops, add them 2 minutes before the end of the 90 minute boil. Add bittering hops 60 minutes before end of boil. Add Irish moss and flavoring hops 15 minutes before end of boil (and your immersion chiller if you are using one). Add aroma hops 2 minutes before end of boil.

9. After the boil, cool wort to 60–75 °F (16–24 °C). Siphon or pour wort into primary fermenter. Attempt to leave any trub behind. If you have less than 5 gallons (19 L) of wort in fermenter, cool, clean dechlorinated water may be added to increase volume.

10. Add yeast and ferment between 60 and 75 °F (16–24 °C).

11. When fermentation completes, sanitize all bottling equipment and bottle or keg as desired.

Long Tail Kölsch Ale

(5 gallons/19 L, extract with grains)

OG = 1.046 FG = 1.010
IBU = 25 SRM = 1.9 ABV = 4.6%
courtesy of Brew Your Own Brew and Wine
Tucson, Arizona

Ingredients

5.0 lbs. (2.3 kg) extra light dry malt extract
0.5 lb. (0.23 kg) wheat (grain)
0.5 lb. (0.23 kg) Pilsner malt (grain)
0.25 lb. (112 g) Carapils (grain)
4 AAU Tettnang hops (bitter) (1 oz./28 g of 4% alpha acids)
4 AAU Spalt hops (flavoring) (1 oz./28 g of 4% alpha acids)
ale yeast (brewer's choice)
5 oz. (140 g) priming sugar

Step by Step

1. Thoroughly clean and sanitize all brewing equipment.

2. Add 3 gallons (11.4 L) of water to your pot. Take the bag of grains and empty into the steeping bag. Tie bag and place into pot. Bring temperature of water and grains to 155 °F (68 °C) and steep for 30 minutes.

3. Remove the grain bag from the steeping water, squeeze excess water and discard bag and grains.

4. Bring water to a boil.

5. Remove from heat and add all malt extract.

6. Bring this mixture to a boil and add bittering hops directly into the pot.

7. Allow the wort to boil for 45 minutes. Add the flavoring hops.

8. Boil for an additional 15 minutes.

9. Put 2.5 gallons (9.5 L) of cold water in your 6.5-gallon (24.7-L) primary fermenter and add the hot wort.

10. Put on the lid and airlock. Fill airlock half way with water.

11. Allow the wort to cool to 75 °F (24 °C) or below.

12. When the temperature reaches 75 °F (24 °C) it is time to pitch your yeast. Before the yeast is pitched take your original gravity reading. Never drop the hydrometer directly into the wort, but pull some wort out and test in a tube or large glass.

13. Follow the directions on the package of yeast before pitching.

14. Put the lid and airlock back on fermenter.

15. Keep the fermenter in an area

which will maintain a constant temperature of below 75 °F (24 °C), but no lower than 60 °F (16 °C). Fermentation should start in 8–48 hours.

16. Between 3 and 5 days the fermentation will slow or appears to stop. This is a good time to use your hydrometer to test your specific gravity.

17. After 5 days transfer to your secondary if you are using one. Condition your beer for 7 to 10 days or until it clears, but no longer than 14 days.

18. It is now time to bottle your beer. Wash all bottles in hot soapy water and rinse. Use the sanitizer of your choice to sanitize your bottles.

19. Dissolve 5 oz. (140 g) of priming sugar in 1 cup of water and bring to a boil. Allow to cool to room temperature. Place this in your sanitized bottling bucket.

20. Using the siphon equipment transfer your beer to the bottling bucket.

21. Attach your tubing to the spigot on your bottling bucket and fill your sanitized bottles. Leave at least 1" of air space in each bottle.

22. Using your capper cap all bottles immediately.

23. Store your beer at 70–75 °F (21–24 °C) to carbonate and age in the bottle for at least 10 days. Aging time varies from type and style of beer. Chill and enjoy!

Who Greased the Tuba?
Vienna Lager

(5 gallons/19 L, extract with grains)

OG = 1.055 IBU = 21

courtesy of The Beverage People
Santa Rosa, California

Ingredients

3 lbs. (1.4 kg) light dried malt extract
3 lbs. (1.4 kg) amber dried malt extract
1 lb. (0.45 kg) German Munich malt
1 lb. (0.45 kg) light crystal malt (caramel 20)
1 tsp. gypsum
⅓ tsp. calcium chloride
½ tsp. chalk
1 tsp. Irish moss
8 AAU Hallertau hop (60 mins) (2 oz./56 g of 4% alpha acids)
4 AAU Hallertau hop (2 mins) (1 oz./28 g of 4% alpha acids)
Wyeast 2206 (Bavarian Lager) or White Labs WLP830 (German Lager) yeast
¾ cup corn sugar (for priming)

Step by Step

1. Steep the cracked grains at 155–158 °F (68–70 °C) for 45 minutes.

2. Rinse with 150–160 °F (66–71 °C) water.

3. Add the malt extracts, gypsum, chloride, chalk, Irish moss, and enough water to bring the volume up to about 6 gallons (22.8 L). Heat to boiling.

4. Boil for an hour.

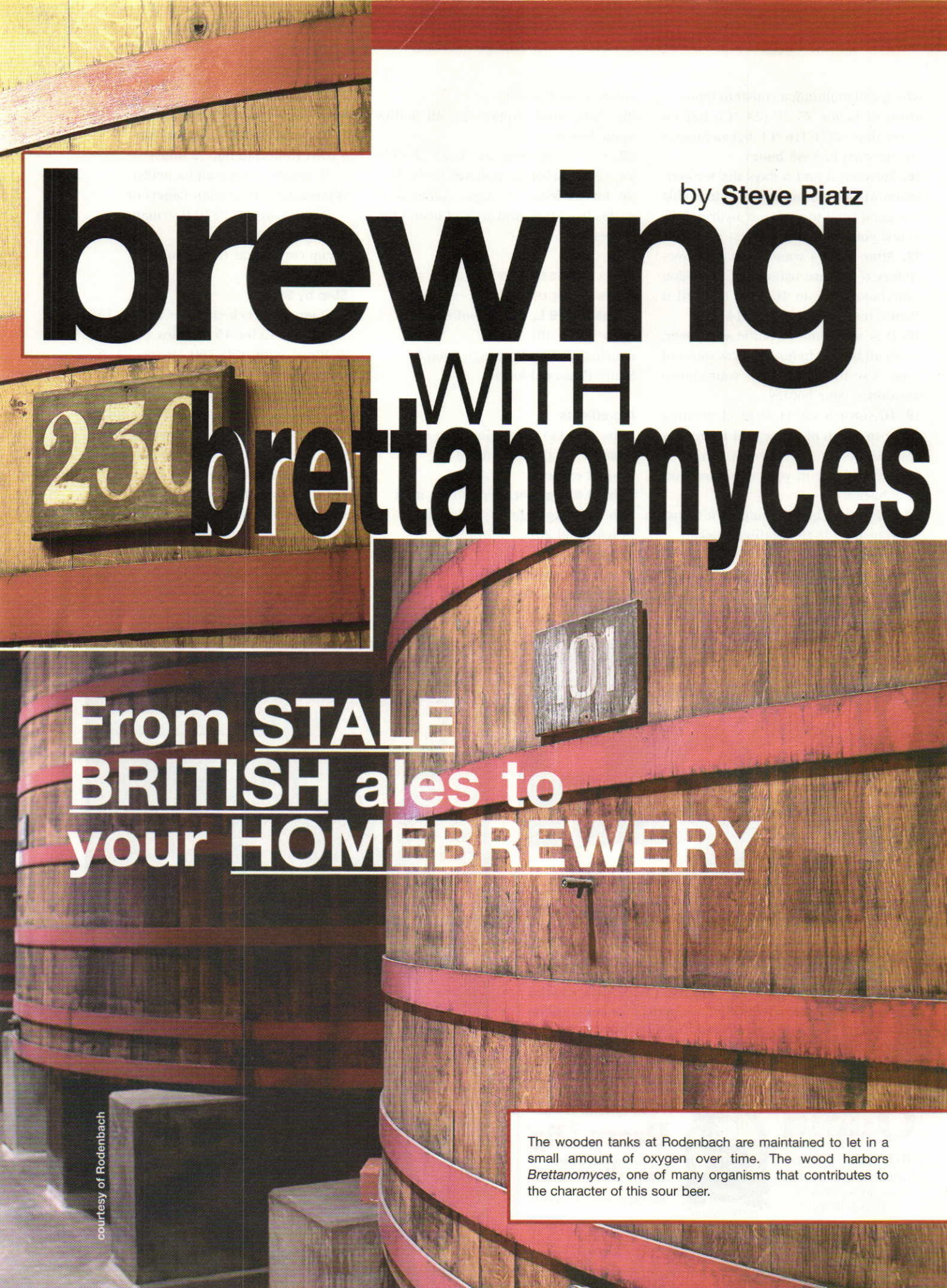
5. Quick chill the wort, move the wort to fermenting vessels, filling them no more than ⅔ full, and add yeast starters.

6. Ferment between 50–60 °F (10–16 °C).

by **Steve Piatz**

brewing WITH brettanomyces

From STALE BRITISH ales to your HOMEBREWERY



courtesy of Rodenbach

The wooden tanks at Rodenbach are maintained to let in a small amount of oxygen over time. The wood harbors *Brettanomyces*, one of many organisms that contributes to the character of this sour beer.

Wild beers

Upon seeing the title to this article, you might say, "Whoa, I'm not into lambic." However, while *Brettanomyces* strains are important to the production of lambics, *Brett* can and is used in the production of other beers, including classic styles and modern creations.

Brettanomyces is yeast; just not our good friend *Saccharomyces cerevisiae* (i.e., brewer's yeast). *Brettanomyces* may also be called *Dekkera*. *Dekkera* is the name for the spore-forming version while *Brettanomyces* is used to refer to the non-spore forming version. There are many different species of *Brett* and in some cases, one species may be referred to by different names in different sources.

Beer or wine fermented in unlined wooden vessels are very likely to be tainted by *Brettanomyces* since *Brett* can survive for extended periods in the wood. There is evidence that at least some strains of *Brett* can slowly eat the sugars in the wood that other organisms can't process.

In the very early part of the 20th Century, *Brettanomyces* was first isolated from wood-aged British strong stock ales by N. Claussen at the Carlsberg Brewery in Denmark. The name *Brettanomyces* means "British brewing industry fungus." (The name *Saccharomyces* means "sugar fungus.")

Porter and *Brettanomyces*

In the glory days of English porter (in the 18th and 19th Centuries), brewers built immense unlined wooden vats for aging their beers. Beers would age for up to a year before blending with younger beers for serving. These aged beers became somewhat sour and were called "stale," a desirable characteristic. The stale porter could be worth two to three times as much as the young beer and aging porter became a capital-intensive business to satisfy the need for large volumes of stale porter needed for blending. Brewers held large dinner parties on the floor of new vats to commission these immense structures. Some of these vessels were as large as 20,000 barrels. The building of larger and larger vats continued through 1814 when a porter vat burst at the Horse Shoe Brewery in London. The ensuing deluge destroyed the

Mo' Betta Bretta clone

(5 gallons/19 L, all-grain)
OG = 1.060 FG = 1.011
IBU = 12 SRM = 7 ABV = 6.3%

Ingredients

9 lbs. 12.5 oz (4.44 kg) 2-row pale malt
15.7 oz. (0.44 kg) CaraPils malt
15.7 oz. (0.44 kg) flaked oats
17.2 oz (0.49 kg) Munich malt (10 °L)
3.2 AAU Magnum hops (60 mins) (0.2 oz/5.7 g of 16% alpha acids)
1 capsule Servomyces (yeast nutrient)
Brettanomyces anomalus cultured from bottle or White Labs WLP645 (*B. claussenii*) yeast (4 qt./4 L starter)
0.66 cups corn sugar (for priming)

Step by Step

Make a 2 qt. (~2 L) yeast starter in a gallon (3.8 L) jug and let ferment. Add another 2 qt. (~2 L) of wort to starter when done. Aerate at each step. Mash at 150 °F (67 °C) for 60 minutes in 4 gallons (15 L) of water. Collect about 6.5 gallons (25 L) of wort and boil for about 2 hours, yielding about 4.5 gallons (17 L) of wort. Add hops for final 60 minutes of boil. Add yeast nutrients for final 15 minutes of boil. Cool wort and transfer to fermenter. Aerate wort and pitch yeast sediment plus half the liquid in the yeast starter to yield 5 gallons (19 L). Ferment beer at 64–75 °F (18–24 °C). Let beer condition for at least 4 weeks before bottling.

Extract option:

Replace all the grains in the all-grain recipe with with 0.5 lbs. (0.23 kg) of 2-row pale malt, 0.5 lbs. (0.23 kg) of CaraPils malt, 0.5 lbs. (0.23 kg) of flaked oats and 0.5 lbs. (0.23 kg) Munich malt. Steep the crushed grains — a total of 2.0 lbs. (0.91 kg) — at 150 °F (66 °C) in 3 qts. (~3 L) of water. Add 2 gallons (7.6 L) of water to "grain tea" and boil with 2.33 lbs. (1.1 kg) of light dried malt extract. (You can heat the 2 gallons (7.6 L) of water separately while grains steep.) Boil wort for 60 minutes, adding the hops at the beginning of boil. Add 4.5 lbs. (2.0 kg) of light liquid malt extract and yeast nutrients with 15 minutes left in the boil. Cool wort and transfer to fermenter. Aerate beer and top up to 4.5 gallons (17 L) with water. Follow remaining all-grain instuctions.

Thanks to Tomme Arthur of Pizza Port for the recipe for Mo' Betta Bretta.

Sanctification clone

(5 gallon/19 L, all-grain)
OG = 1.056 FG = 1.007
IBU = 31 SRM = 6 ABV = 6.3%

Ingredients

9 lbs. 14 oz. (4.5 kg) 2-row pale malt (or Pilsner malt)
13.3 oz. (0.38 kg) Vienna malt
1 lb. 3 oz. (0.54 kg) Weyermann acidulated malt
6.7 AAU Sterling hops (FWH) (1.3 oz./36 g of 5.3% alpha acids)
1.5 AAU Sterling hops (90 mins) (0.28 oz./8.0 g of 5.3% alpha acids)
2.8 AAU Sterling hops (0 mins)
1 capsule Servomyces (yeast nutrient)
Brettanomyces bruxellensis culture, Wyeast 3112 (*B. bruxellensis*) or White Labs WLP650 (*B. bruxellensis*) yeast (3 qt./~3 L starter)
Brettanomyces lambicus culture, Wyeast 3526 (*B. lambicus*) or White Labs WLP653 (*B. lambicus*) yeast (1 qt./~1 L) starter)
Lactobacillus delbrueckii culture or Wyeast 4335 (*L. delbrueckii*) bacteria (3 oz./100 mL starter)
0.66 cups corn sugar (for priming)
ale yeast (for bottle conditioning)

Step by Step

Mash for 60 minutes at 152 °F (67 °C) in 3.75 gallons (14 L) of water. Collect about 6 gallons (23 L) of wort, add 0.5 gallons (~2 L) of water and boil down to 4.5 gallons (17 L), which should take about 2 hours. Pitch "bottom half" of yeast starters. Ferment starting at 72 °F (22 °C), but let temperature rise as high as 80 °F (27 °C) during fermentation, which takes 3–4 weeks at Russian River. Bottle with ale strain for bottle conditioning.

Extract option:

Replace grains with 1 lb. 3.0 oz. (0.54 kg) 2-row pale malt and 13.3 oz. (0.38 kg) Vienna malt. Steep the crushed grains at 150 °F (66 °C) in 3 qts. (~3 L) of water. Add 2 gallons (7.6 L) of water to "grain tea" and boil with 2 lbs. 2 oz. (0.96 kg) of light dried malt extract. Add 4.25 lbs. (1.9 kg) of light liquid malt extract and yeast nutrients with 15 minutes left in boil. Cool wort and top up 4.5 gallons (17 L) with water. For the the remaining steps, follow the all-grain instructions.

Thanks to Vinnie Cilurzo of Russian River Brewing Company for the information used to compile this clone.

brewery and the neighboring housing, resulting in the death of eight people.

It is very likely that *Brettanomyces* played a major role in the souring (staling) of historical porters though there were undoubtedly other organisms present as well.

Classic *Brett* Styles

Historically, Berliner weisse is said to have had *Brettanomyces* notes though the dominant souring agent is *Lactobacillus*. In the traditional process, the wort wasn't boiled so other organisms may have had the opportunity to contaminate the wort.

In Belgium, the traditional farmhouse style saison was likely to have had a *Brett* character and even today the lambic family of beers depends on *Brett* (and many other organisms) for its character. (See my article "Lambic Brewing," in the October 2004 issue of *BYO* for more information.)

Likewise, since the Belgian Flanders red (as typified by Rodenbach Red) is still aged in unlined oak, it has contributions from *Brett* along with other organisms.

And of course, the world classic Trappist ale Orval — from Brasserie de l'Abbaye Notre-Dame d'Orval SA — incorporates *Brett* in its profile. (See the May/June 2005 issue of *BYO* for an Orval clone.)

Modern *Brett* Beers

Two well-known, California-based craft brewers who have done some pioneering work on beers influenced by *Brettanomyces* are Tomme Arthur of Pizza Port Solana Beach and Vinnie Cilurzo of Russian River Brewing.

Pizza Port Solana Beach produces a number of unusual beers including the *Brett*-influenced beer Cuveé de Tommé. Cuveé de Tommé is a fairly big beer, coming in around 11% alcohol though modeled after the Flanders Red style. The beer is aged in wood and at least the first few barrels were bottle conditioned and marked to show which barrel the beer came from.

Pizza Port's Mo' Betta Bretta was collaboratively produced with Peter Bouckaert of New Belgium Brewing Company and was fermented with only

Brettanomyces (i.e. no brewer's yeast). The very effervescent, fairly dry beer has a complex aroma including notes of pineapple and other tropical fruits.

Russian River Brewing Company produces the beers Supplication, Depuration and Temptation. These are all the result of a mixed fermentation with brewer's yeast and *Brettanomyces* and are aged for a year in wine barrels made from French oak. Russian River's Sanctification is fermented with two strains of *Brettanomyces* as the only yeast. A little *Lactobacillus* (lactic acid bacteria) is added to provide added acidity to this dry and spritzy beer.

See the clone recipes for Mo' Betta Bretta and Sanctification on page 43.

New Belgium Brewing Company's La Folie is in the style of a Flemish Red Ale (what we might call a Flanders Red). La Folie (the folly) is aged in wood barrels for one to three years before bottling.

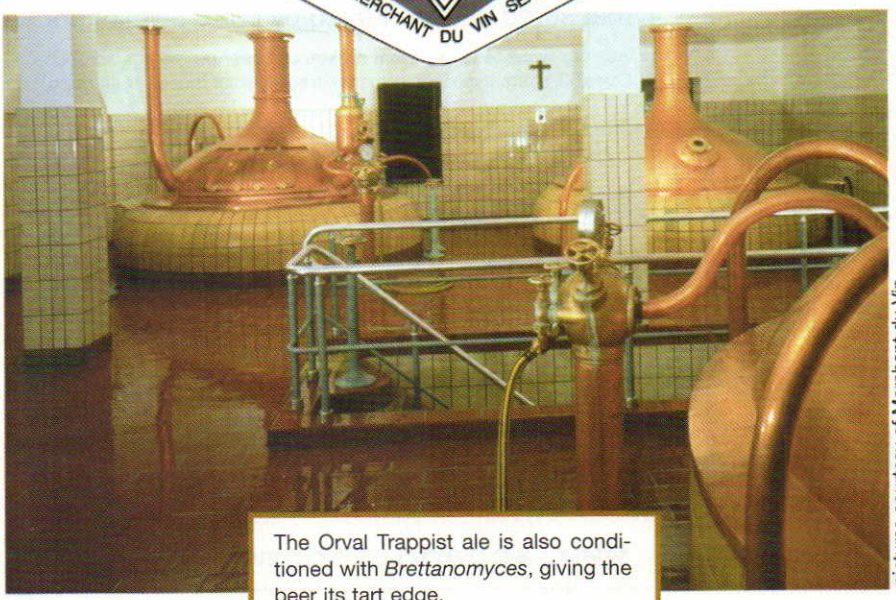
To my palate, the Sour Brown Ale produced by New Glarus Brewing also has a *Brett* characteristic with a sour pie cherry note reminiscent of some strains of *B. bruxellensis*. According to the brewery's webpage the beer has a long lager in their oak casks. Kansas City's Boulevard Brewery has experimented with *Brett*-influenced beers, but haven't released any.

Brett Basics

Brettanomyces is a souring agent and will produce both lactic and acetic acids. It will normally only produce a relatively low level of acetic acid and even then only under aerobic (with oxygen) conditions. Extended aging in wood allows a slow penetration of oxygen, resulting in some acetic acid in the beer. The Rodenbach Brewery has to periodically disassemble their large oak aging vats to scrape the inside of the wood staves to maintain the proper oxygen penetration rate in order to get their desired level of sourness.

Side effects of a *Brettanomyces* fermentation are often characterized by a sweaty horse, horse blanket, leathery, or even wet horse aroma that some people might generalize as barnyard-like aromas. Additional characteristics sometimes produced by *Brett* include spicy, smoky, medicinal, and even cheesy. In some strains there can be a somewhat unpleasant mousy (or mouse-urine like) aroma.

Brettanomyces-influenced fermentation will usually show a pellicle, a coarse off-white mat that floats on the surface. The pellicle tends to protect the beer from oxidation as well as protecting the beer from molds and *Acetobacter* (acetic acid bacteria). A pellicle can even form in a



The Orval Trappist ale is also conditioned with *Brettanomyces*, giving the beer its tart edge.

pictures courtesy of Merchant du Vin

bottle if there is enough food left for the *Brett* to feed on.

Some strains of *Brett* will produce distinct cherry pie-like flavors and aromas. For example, the *B. lambicus* strain Wyeast sells is known for producing the cherry characteristics.

Brettanomyces is a super attenuating yeast — it is able to process sugars and dextrins that normal yeast can't process. Over time, *Brett* will consume almost all the sugars and dextrins in a beer. Most beers with any traces of *Brett* will end up very dry as the yeast can survive for months or even years in the fermenter or bottle.

Brett is capable of producing CO_2 and therefore can be used to bottle condition beers. However, the continued action of *Brett* almost always leads to increasing levels of carbonation over time. If a *Brett*-influenced beer is bottled too soon, you run the risk of making "bottle bombs."

Brettanomyces produces three compounds with high sensory profiles: 4-ethyl phenol, 4-ethyl guaiacol and isovaleric acid. 4-ethyl phenol can be detected by most people at 200–600 parts per million. 4-ethyl phenol gets credit for "band-aid" and barnyard aromas and 4-ethyl guaiacol for the wet, burnt wood, spicy smells. Isovaleric acid and its esters can be downright fruity (it's a component in commercially-prepared blueberry, pineapple and peach aroma enhancers), but can also contribute a rancid character.

Brettanomyces has nutritional requirements similar to brewer's yeast, though some sources indicate that certain strains can't tolerate alcohol levels above 13%. *Brett* doesn't grow well at cool temperatures or at pH values lower than about 3.4. (Most beers have less alcohol and higher pH levels than this, however.)

Brett is a slow growing organism and grows best in a temperature range between 13–30 °C (55–86 °F). At the higher end of the growth range, *Brett* is likely to produce more unpleasant flavors and aromas whereas at the low end it seems the characteristic flavors and aromas are emphasized.

Our brewing knowledge of *Brett* strains is in its infancy and the whole area is ripe for homebrewers that want to experiment. We can, however, learn from those brewers who have used *Brett* before.

Brewing with *Brett*

There are essentially two ways *Brettanomyces* can be used — as a secondary component of a mixed fermentation or as the dominant (or sole) microorganism in a fermentation. Using *Brett* along with other organisms

— as in brewing lambics, Flanders red ales or *Brett*-tainted historical styles — is fairly straightforward compared with brewing *Brett*-dominated beers (including 100% *Brettanomyces* fermented beers).

Brett-influenced Beers

To increase the *Brettanomyces*-derived characteristics in a beer, you should pitch a small amount since it appears many of the characteristic compounds are produced during the growth phase. Pitching one container of commercial *Brett* in a mixed fermentation, or even inoculating a beer in secondary with another *Brett*-influenced beer is sufficient.

Brett characteristics may take a while (as long as few months) to appear, but will increase steadily over time given the right conditions. If you condition your *Brett*-influenced beers at ale temperatures or higher, the "funk" will increase with time and may reach acceptable levels in as little as six months, though many *Brett*-influenced beers must be aged longer than this. Using a plastic bucket, which allows a very small amount of oxygen to reach the beer over time, may accelerate the *Brett* activity.

In bottle-conditioned beers, *Brett* will continue growing slowly, increasing the *Brett* character, but also potentially developing dangerous levels of carbonation if the beer was bottled too young. When bottling *Brett*-influenced beers, use less priming sugar than you normally would and bottle the beer in the thickest bottles you have.

There seems to be some synergy between *Brett* and *Pediococcus* (a lactic acid bacteria found in lambics) that allow the apparent attenuation to approach 100% (yielding an FG near 1.000.)

Brett-dominated Beers

To use *Brettanomyces* for the primary fermentation strain, you need to grow a large cell count with a starter. My *Brett* starters use the same wort as my regular starters — a gravity of 1.020 to 1.030, lightly hopped, with a small addition of yeast nutrients. The proper pitching rates are not well defined for *Brett* when compared to *Saccharomyces*, but Tomme Arthur and Vinnie Cilurzo agree that you should pitch as much yeast as you would in a lager, if not more. For 5-gallon (19 L) batches, a one gallon (~4 L) starter should provide enough yeast. Keep in mind, though, that *Brett* grows slower than *Saccharomyces* in wort, so you will need to give your starter more time to ferment.

Likewise, the proper oxygen level for *Brett*-dominated beers is less well understood. Both Mo' Betta Bretta and Sanctification are produced with aeration rates typical of ales of their respective original gravities. Both Tomme and Vinnie use Servomyces® (a yeast nutrient sold by White Labs) in their 100% *Brett* beers, but they also use it in their normal beers as well. A

little yeast nutrient can provide an "insurance policy" for any beer.

Fermentations with *Brett* may not be as ordered as those with *Saccharomyces*. Vinnie reports that Sanctification exhibited a normal lag time — "we pitched at night and it was fermenting when we arrived at the brewery the next morning" — and 75% of the fermentation was done in 5 days. It took another two weeks for the beer to drop to SG 1.008. In contrast, Tomme Arthur reports getting a "lager-like" fermentation, with the gravity dropping about a half degree Plato (about 2 "gravity points") per day. His fermentation lasted 3 weeks. Some of this difference may stem from the differences in fermentation temperatures — Vinnie started Sanctification at 72 °F (22 °C) and let it rise to around 80 °F (27 °C) as the fermentation peaked. Tomme kept Mo' Betta Bretta fermenting in the 64–75 °F (18–24 °C) range. Chris White (of White Labs) cautions that some *Brett* fermentations "just don't work," especially if an inadequate amount of yeast is used. As Vinnie puts it, "*Brett* has a mind of its own."

Both of the California *Brett* beers showed higher degrees of attenuation than achieved by normal ale strains, although the beer's final gravity did not drop as low as is typical for lambics. *Brett* strains are not very flocculent and you shouldn't expect your *Brett*-dominated beers to fall crystal clear.

Sources of *Brett*

As homebrewers we can easily obtain at least five different strains of *Brettanomyces*. White Labs sells cultures they call *B. bruxellensis*, *B. lambicus* and *B. claussenii*, while Wyeast sells cultures they call *B. bruxellensis* and *B. lambicus*. The characteristics of these yeasts will vary depending on whether you pitch a small amount into a mixed fermentation or grow up a large starter for a mostly or entirely *Brett*-driven fermentation.

White Labs says their *claussenii* strain produces a pineapple-like aroma and shows a "low intensity" of *Brett* character, with their *bruxellensis* and *lambicus* showing progressively more *Brett* character. In a mixed fermentation, their *lambicus* strain produces the typical lambic "funk."

Wyeast says their *bruxellensis* strain produces the classic sweaty horsehair character when used in a lambic fermentation. Their *lambicus* strain has a "pie cherry-like" note.

Keeping it Clean

To prevent cross-contamination, pay close attention to cleaning and sanitation when using *Brettanomyces* in your brewery. You may want to dedicate any tubing and soft equipment that contacts *Brett* to your "wild beers," but there's no need to fear *Brett* if you use some common sense.

Steve Piatz wrote "Lambic Brewing" in the October 2004 issue.

Multiple Bottle Filler

No need to shell out the big bucks, build your own!

Story and photos by **Thom Cannell**

Bottling just takes too long. Wouldn't you like to have a multi-head bottling machine, like the pros? Unfortunately the models at the commercial breweries can cost upwards of $20,000. We believe you can build a multi-head bottling machine for under $50!

Bottling, using the familiar "bottling bucket" just takes too long. That's mostly because we fill bottles singly, and each fill takes 15–25 seconds depending on size of the bottle. What if we could use familiar and inexpensive "bottling wands" to create a multi-head bottling machine?

I know it can be done — when I assisted at the now-defunct Lansing Brewing Company, owner Brad Throop could hand-fill six bottles at a time. How he could hold and manage six bottling wands I didn't understand, but he would bottle cases and cases like this.

For our version of a bottling machine, we will continue to use a bottling bucket. While pumping beer from a fermenter or other container is attractive, it would first have to be degassed of dissolved CO_2 — increasing the risk of oxidation. Our machine will allow you to continue transferring beer gently from fermenter to the bottling bucket and adding priming sugar or sucrose tablets.

There are three portions to the bottling device: the frame or stand, the dispensing manifold with bottling wands and the bottle-centering device. Let's get started!

Tool list:

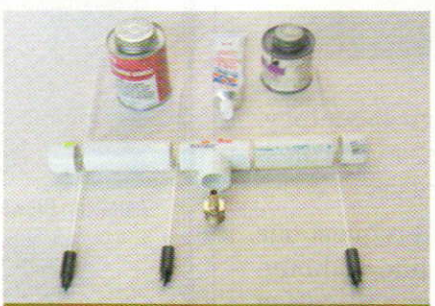
hammer and brads
saber saw and/or table saw
drill motor and drills
C-clamps
hole saws (optional)

Parts List:

Plywood $8.00
½" CPVC water pipe $2.00
2 end caps @ $.025
T fitting @ $1.00
¾" x ½" threaded plug $1.00
½" x ⅜" brass barb fitting $1.75
Glue, brads $1.00
⅜" beer tube (if needed) $3.00

Bottling stand or frame

Our bottling frame is a three-sided structure with a bottom, made of ⅛" birch plywood. Its uprights are secured in homemade wooden angle brackets, and its base is attached with nailers. The nailers also permit a loose fit bottle centering device which can be tailored to fit different bottle diameters.



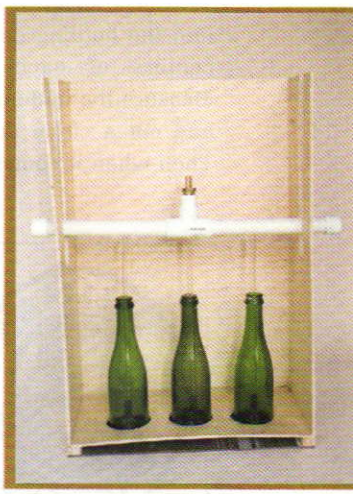
Assembling the manifold requires cutting and drilling this CPVC water pipe and securing its connection with glue.

Manifold

The manifold is nothing more than three bottling wands held in a length of PVC (food grade) pipe. A "T", two pipe lengths, end caps and an inlet fitting are the required materials. It is critical that the bottling heads are aligned, and well sealed.

Heads

The bottling "heads" are three full-length bottling wands. Obviously you could use four, or even six. The question becomes, could you fill the manifold quickly enough? The answer is yes, but only if you change your bottling bucket to dispense through a ½" line (obviously changing the manifold inlet as well.)



The support structure shown here is secured at the bottom with nailer blocks and is tall enough to allow for 12" bottles and wands.

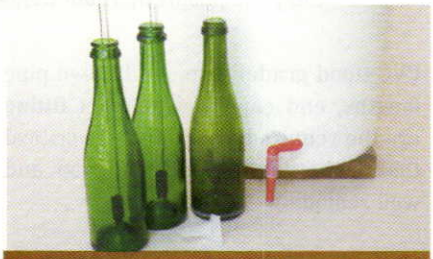
Designing the stand: Bottle height

The tallest bottles that I use, punts (dimpled bottom), are for highly carbonated Belgian-style beers. Those bottles (without their corks and wire tops) are just short of 12" tall and roughly 3.25" in circumference.

This height, then, establishes my distance from the bottom of the bottling wands and the bottle tops, and the distance between the wands (aka heads). That is, approximately 4" on center, and the manifold must rest with the tips more than 12" above the bottom of the support structure (the bottling wands are 12" long).

Bottle centering device

You don't have to, but if production speed is your goal, fooling with placement of bottles every time is just silly. You could draw and paint different sized circles on the bottling stand for placement. Why not cut out one or more centering panels?



Most brewers use different sized bottles and should make room for all of them. The 12" punt bottles here are the largest we used.

Cut a sheet of thin plywood to fit into the bottling device and mark the centers of each of your wands. Measure the bottom of this bottle style and cut a circle around each center. Then when it comes time to bottle, be it Belgian-style with 3 ¼" bases, longnecks for competition (2 ⅜"), or my preferred bail-top bottles (3 1/16" and 3 ⅜"), accurate centering will be almost automatic. Of course having hole saws of the appropriate diameter would be a huge help!

Building the frame

We used 24" panel plywood (to account for the 12" bottle-height and the 12" bottling wand) and arbitrarily picked 8" as a reasonable front-to-back depth.

In order to make a strong support structure, homemade angle brackets can be built to brace the frame at its corners.

Thus you need two side panels 24" tall and 8" wide. The back is 24" tall and 16" wide and the bottom measures 16" x 8". To join the side panels to the back you will need a homemade wooden angle bracket.

Cut two 2" x 2"s to 24" in length, and rip a channel ⅜" deep. You could also use aluminum angle bracket, or build one out of 1" x 2". Later, the section ripped from the 2x2 will then be used as the nailer to secure the bottom to the sides and back.

Once all panels and angle brackets are cut, you'll need to cut out a very narrow and tall "U" just wider than the manifold into each side panel (5" from the rear edge and 12" deep if you're following our directions.) Face the side panels together to insure mirror-image perfection. If you try to assemble and cut, you may be in for a bad experience despite repeated measurements.

Glue the back panel to the angle brackets, then glue and nail the side panels. Leave ⅛" of the homemade

angle bracket exposed so that the bottom can be inset (this is optional.) Once the three panels are assembled, attach nailer blocks to the bottom and attach to the side panels. This completes the support.

Bottle locator

Cut two panels (or more) that will fit inside the bottling frame and rest on the nailer blocks. They'll be approximately 8" x 16". Measure 5" from the back of each panel and draw a line. This is the plane for the bottling heads. Find the center of the panel and mark. Then, with a compass, draw a circle with a diameter equal to your most common bottle. Measure outwards 1" from the outer circumference and mark. Then draw circles to that mark. You will have three points and three circles. You should then use these center points to mark and drill your bottling head outlets on the manifold.

I used a second panel for this, drilling 1/16" holes through the panels, then attaching one panel to the manifold with tape, and drilling pilot holes into the manifold. Now you can cut out the circles for your bottling locator. I used a saber saw and wished for hole saws. Your saber saw-cut circles will probably be a bit ragged. No worries, wrap a piece of sandpaper around a bottle of slightly less diameter and smooth out the imperfections. This is also the easiest way to get perfect sized locator holes without a hole saw of requisite diameter.

Wrap a piece of sandpaper around a bottle of slightly less diameter and smooth out your holes.

Manifold and bottling heads

The manifold consists of a 3/4" T fitting, two 9" lengths of 1/2" pipe and two end caps. You also need a threaded adapter plug and a brass 3/8" x 1/2" barb fitting. The total length must be long enough to extend beyond the bottling frame; it hangs between fillings.

To start, cut two 9" pieces of 1/2" tubing (food grade) with a tube cutter, hacksaw or table saw. Smooth any rough edges with increasingly fine sandpaper. All of the admonitions against using scratched plastic fermenters apply to the all-plastic manifold. As the pieces are all interference (jammed) fit, I found it unnecessary to glue the pieces together. I did use PVC cleaner to remove all traces of process chemicals. You may choose to use glue, as the glue will "melt" many of the surfaces to smoothness, leaving fewer crevices for bacteria to grow. Remember, after use you must rinse and sanitize immediately.

After drilling pilot holes (or using

those holes in the bottle locator panel) to mark the manifold, you'll need to drill a ⅜" hole for each bottling wand. Drill with very light pressure; you want a near-perfect hole to provide a friction-fit for the bottling wand. Being precise is also critical; you need to position the wands so they easily insert into your bottles together, without interference.

Now, drill three ⅜" holes into the manifold. Gently remove any flashing or debris. Coat the end of each bottling wand with a food safe silicone seal (any NSF or aquarium rated sealant should be safe) and insert the wand into a hole in the manifold. While the sealant dries, be sure the wands are straight left-to-right and front-to-back. They must also be at identical heights from the bottle bottoms when the manifold is level. Once the wands are assembled and drying, do a trial fit to be certain you've positioned the wands correctly — you still have time for repositioning.

At bottling, I'd suggest the bottling bucket be positioned several feet higher than normal to provide more pressure, and thus more flow. Keeping the manifold full at all times is important. But don't worry, the total volume of the manifold and wands is only a few lost ounces. Attach a ⅜" sanitary bottling hose to your sanitized manifold and bottle at a speed that rivals some microbreweries!

Being precise is critical; you need to position the wands so they easily insert into your bottles together.

Thom Cannell has written the "Projects" column since May 2000 and has designed over 25 pieces of brewing equipment for BYO *readers.*

For more bottle-related reading and projects, check out these stories in our archives:

Build a Bottle/Carboy/Hose Sanitizing Sprayer: Projects (September 2005)
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Build Your Own Bottle Storage System (October 1998)
Finder's Guide to Bottles (September 1995)

Beer Strength

Extract, alcohol and calorie calculations

Story by Bill Pierce

For centuries, both brewers and drinkers (as well as tax collectors and government regulators) have been concerned about the strength of their beers.

Beer strength measurements include such values as specific gravity, extract, attenuation, alcohol content and nutritional value. Brewing software can perform the calculations based on the original gravity (OG) and final gravity (FG) of the wort and beer, but this article will provide an understanding of the concepts behind them and may help increase your knowledge of what is occurring and its effect on your beer.

Matters of gravity

Many of the calculations are based on weight, both of the wort or beer itself and on the substances dissolved in it. Measurement by weight is not always convenient; in some cases it may be necessary to weigh a solution, evaporate the water or alcohol, and weigh the remainder. This also can require a high degree of precision in order to achieve meaningful results. In many cases it is much easier to measure the specific gravity (SG), that is, the density of a solution relative to that of pure water.

The most common device for measuring specific gravity is a hydrometer. If yours reads very close to 1.000 in distilled water at its reference temperature, it is sufficiently accurate for our purposes.

The density of water varies with temperature. Water has the unusual property of being most dense at 39 °F (4 °C); its volume increases both above and below this point. Because the temperatures we encounter in our daily environment are usually higher, brewing hydrometers are often calibrated at a reference temperature of either 60 °F (15 °C) or 68 °F (20 °C).

. . . brewing scientist Carl Balling realized that the percentage by weight of all the dissolved solids in wort was essentially the same as if they were entirely sucrose.

Because the wort and beer being measured are frequently at other than the reference temperature, hydrometer readings need to be corrected. This also requires a reasonably accurate thermometer. There is probably a table with your hydrometer that contains the values to add or subtract from the readings for various temperatures; brewing software often includes this function as well.

An accurate (over the range from 32–212 °F/0–100 °C) formula for determining the specific gravity correction factor for the temperature T (in degrees Fahrenheit) is:

$$SG\ correction\ factor = 0.00130346 - (1.34722124 * 10^{-4} * T) + (2.04052596 * 10^{-6} * T^2) - (2.32820948 * 10^{-9} * T^3)$$

Once the correction factor is known, the hydrometer reading needs to be adjusted by adding the factor:

Corrected SG = SG reading + SG correction factor

For example, a hydrometer reading of 1.046 at 75 °F and a reference temperature of 60 °F result in a correction factor of +0.0017 and a corrected specific gravity of 1.048 (1.0477).

Strong tea

One common brewing measure is called the "extract," that is, the amount of materials (primarily sugars) extracted from the mash and dissolved in the wort or beer. This is usually reported by weight; for example, 10 pounds (4.5 kg) of extract dissolved in a total solution of water weighing 100 pounds (45 kg) would be described as 10 percent extract by weight. This also could be stated as 10 degrees Plato.

In 1843, after making up numerous reference solutions and weighing them, brewing scientist Carl Balling realized that the percentage by weight of all the dissolved solids in wort was essentially the same as if they were entirely sucrose, or table sugar. He called each percentage point a degree Balling (sometimes also called a degree Brix), that is, the number of grams of dissolved sugar per 100 grams of solution. Eventually, about 1900, Dr. Fritz Plato discovered some small errors in Balling's tables and corrected them. The revised unit of measure is now known as a degree Plato, but it represents the same principle.

Extract is usually stated in degrees Plato and these are related to specific gravity units. Because Plato's tables represent empirical measurements, the formula for converting the values

reflects its ability to represent the curve described by the data. As such, there are small errors, especially at the extremes of the degrees Plato and specific gravity scales, but curve-fitting software has emulated the tables with very good accuracy.

One of the more accurate formulas for converting extract (E) in degrees Plato to specific gravity units (SG) (for specific gravities from SG 1.000–1.144/0–33 °Plato) is:

$$SG = 1.00001 + (0.0038661 * E) + (1.3488 * 10^{-5} * E^2) + (4.3074 * 10^{-8} * E^3)$$

And for the corresponding conversion of SG units to °Plato:

$$E = -668.962 + (1262.45 * SG) - (776.43 * SG^2) + (182.94 * SG^3)$$

Much simpler versions of the formulas sufficiently accurate near the center of the degrees Plato/specific gravity units scale and for values typically used by most homebrewers (4–16 Plato, or 1.012–1.064 SG) are:

$$E = (1000 * (SG - 1)) / 4$$

$$SG = 1 + ((E * 4) / 1000)$$

In other words, to determine degrees Plato, divide specific gravity "points" (the portion of the specific gravity to the right of the decimal point multiplied by 1000) by 4. For example, 1.048 is 48 SG points or 12 °Plato. To convert °Plato to SG points, multiply by 4. That is, 12 °Plato is 48 SG points.

Using the more accurate versions of the formulas above, a specific gravity of 1.048 converts to 11.90 degrees Plato, and 12 degrees Plato converts to 1.0484 specific gravity; however, the differences are minor for the purposes of homebrewing calculations. The odds are that the discrepancy is equal to or smaller than the resolution of the instruments you use.

Making it real

As the wort ferments, an important change occurs. The beer is no longer merely a solution of solids in water; there is also alcohol (and carbon dioxide) present. The specific gravity of ethanol at 59 °F (15 °C) is 0.794, and is less dense than water. As the alcohol content increases, hydrometer readings are correspondingly lowered due to its presence.

This produces two values, the so-called "original extract" (OE) present before fermentation begins, and the "apparent extract" (AE), the reading after alcohol is present. The alcohol determines yet another value, the "real extract" (RE), which accounts for this change and difference in density. Imagine that the alcohol were removed and replaced with an equal volume of water. The RE is the reading that would result.

You could remove the alcohol by the relatively difficult process of distillation, but Balling developed a formula

for calculating the real extract value. Here is a version accurate for most original extracts (it uses an "attenuation coefficient" based on an OE of 12.5 °Plato):

RE = (0.8114 * AE) + (0.1886 * OE)

Let's assume a sample beer with an OG of 1.048 and an FG of 1.012. Using the simple formula (SG points divided by 4) to convert to degrees Plato results in an OE of 12 (11.90 using the more exact formula) and an AE of 3 (3.07). The resulting RE is 4.69 (4.73), which converts to SG 1.018 (1.019).

Two, four, six, eight — how do we attenuate?

Yeast strains sometimes are classified by their attenuation, that is, by how completely they ferment the sugars in the wort into alcohol and carbon dioxide. Attenuation also is used to describe the relative dryness or sweetness of a beer; less attenuated beers have a sweeter finish. Moreover, this is the commonly used indicator for fermentation and yeast performance.

Like the final extract values, attenuation comes in two forms, apparent and real. Apparent attenuation is merely the proportional difference in percent between the original and apparent extract values:

Apparent attenuation (AA) = ((OE - AE) / OE) * 100

These are the values published by yeast suppliers and typically vary from 60 to 80 percent or more, with 75 being a common "ballpark" assumption, although many factors can affect attenuation.

Real attenuation is the proportional difference in percent between the original and real extract values:

Real attenuation (RA) = ((OE - RE) / OE) * 100

RA values are typically about 15 percent lower than the corresponding AA value and may represent a better estimate of a beer's perceived sweetness, with the lower values (below 60 percent) indicating sweeter beers.

Apparent and real attenuation are sometimes also referred to as apparent and real degree of fermentation (ADF and RDF).

You can substitute specific gravity points for the extract values and achieve essentially the same attenuation values. For example, our beer with an OG of 1.048 and FG of 1.012 represents an AA of 75 percent and RA of 61 percent, respectively.

Last call for alcohol

An important value, for a variety of reasons including legal requirements for commercial brewers and health factors for all beer drinkers, is the alcohol content. During fermentation, a molecule of glucose (the simplest sugar with a molecular weight of 180

grams per mole) is converted to two molecules of ethanol (molecular weight 46 grams per mole) and two molecules of carbon dioxide (molecular weight 44 grams per mole).

If this were the only reaction, the math would be straightforward and the results would be directly proportional to the difference between the original and real extract. However, fermentation is a biological process that produces other byproducts (for example, biomass due to yeast reproduction) and additional side reactions with intermediate compounds. Accordingly, the actual alcohol produced is somewhat less than a simple proportional formula would indicate.

In the laboratory, the alcohol content is measured by carefully weighing the beer after fermentation and then driving off the alcohol by distillation. The difference in the weight is the alcohol produced. Balling measured this empirically and constructed tables of the alcohol content based on the original and real extract. These are the basis for those published by the American Society of Brewing Chemists (ASBC) and used by many commercial breweries. Fortunately, a reasonably accurate formula can emulate the values in these tables and can be used by homebrewers:

Alcohol percentage by weight (ABW) = (OE - RE) / (2.0665 - (0.010665 * OE))

Employing the simple formula for OE (SG points divided by 4) and RE, a slightly simplified version of the above formula using OG and FG is:

ABW = (76.08 * (OG - FG)) / (1.775 - OG)

As has been mentioned, alcohol is less dense than water, so it is a relatively simple matter to use the specific gravity of ethanol (0.794) to convert the ABW values to alcohol percent by volume (ABV), which is more commonly used by homebrewers and legal entities and displayed on some beer labels:

Alcohol percentage by volume (ABV) = ABW * (FG / 0.794)

Our example beer with an OG of 1.048 and FG of 1.012 results in nearly identical ABW values of 3.77 percent using either of the above ABW formulas, and an ABV value of 4.80 percent.

For quick approximations of alcohol content, the following formulas also may be helpful:

ABW = (OG points - FG points) * 0.105

ABV = (OG points - FG points) * 0.132

To convert ABV to ABW, multiply the value by 0.794; to convert ABW to ABV, multiply by 1.259 (the inverse of 0.794).

Using the example beer with these formulas results in an ABW and ABV of 3.8 and 4.8 percent, respectively.

Watching the waistline

Calories in beer come from three sources: the residual extract (unfermented sugars), the alcohol and a small amount of protein from the malt. Therefore it is possible to calculate the Calories in a beer based on the residual extract, the alcohol content and a factor for the malt protein. Sugar (we assume all the residual sugars in the beer have the same composition) has a caloric value of 3.8 Calories per gram, while ethanol has a higher value of 7.1 Calories per gram. As for the protein, the amount varies with the beer style and malt varieties (the total protein content of beer has been measured at from 5 to 10 percent of the sugar content), but this percentage is small and an average value of 7 percent of the sugar is close enough for our purposes. Protein has a nutritional value of 4.0 Calories per gram. To determine the calories in a beer, add the contribution from each of these sources, using the following formula:

Calories per 12 US oz. (355 mL) bottle = 3.55 * ((3.8 * RE) + (7.1 * ABW) + (4.0 * 0.07 * RE))

The multiplier of 3.55 is 12 US oz. converted to milliliters and divided by 100 (to account for the implicit percent). For the calories in a US pint (16 oz.), multiply by a factor of 4.73.

Combining the formula above with the earlier simple formulas for original, apparent and real extract, as well as alcohol by weight, yields this equation based on the original and final specific gravity of a beer:

Calories per 12 US oz. (355 mL) bottle = 3621 * FG * (((0.8114 * FG) + (0.1886 * OG) - 1) + (0.53 * ((OG - FG) / (1.775 - OG))))

Using this equation, our beer with an OG of 1.048 and FG of 1.012 has 165 calories per 12 US oz. (355 mL) bottle, slightly more than the 163 calories the first formula predicted.

It can be seen that sugar gives up very few calories by being converted to alcohol. The 3.8 calories in a gram of sugar become 3.63 calories (7.1 * 92 / 180, based on the molecular weights) of alcohol. This means that the calories in beer are mostly determined by the original extract. Using a number of assumptions, such as 75 percent apparent attenuation and a moderate OG of 1.050, this results in the following approximation:

Calories per 12 oz. (355 mL) bottle = 851 * (OG - 1) * (OG + 3)

In our example, the approximate calories would be 165, essentially the same as the calculated value of 165 using the second equation.

Bill Pierce wishes to acknowledge the work of homebrewer and scientist Dr. Michael L. Hall, which has appeared in various online and printed sources.

BREWER'S log

Brewferm releases new dried yeasts to homebrewers

Brewferm, a manufacturer of Belgian beer kits, has made two new dried yeasts available to the homebrewer: Brewferm Blanche is a top-fermenting yeast, specially selected for its formation of typical "witbier" aromas like banana and clove. It has a low final gravity and low sedimentation. The best fermenting temperature is between 64–74 °F (18–23 °C). Each 12-gram nitrogen flushed sachet is sufficient for up to 5 gallons (19 L). Brewferm Lager yeast on the other hand is a *Saccharomyces uvarum*. This yeast delivers a consistent and neutral fermentation with very little sulfur components or other undesirable byproducts. This yeast with high sedimentation will give you, when fermented between 50 and 60 °F (10–15 °C), a clean lager with low final gravity. Each 12-gram nitrogen flushed sachet is sufficient for up to 8 gallons (30.4 L). For more information visit www.brewferm.com. Supply shop owners can contact LD Carlson for ordering information.

HarperCollins Publishers release new Charlie Papazian brewing book

"MicroBrewed Adventures: A lupulin filled journey to the heart and flavor of the world's great craft beers," is the title of Charlie Papazian's latest brewing book.

In this 416-page book, Papazian shares many of his unique travel experiences and over 50 homebrew recipes from across the globe. The book is split between traveling adventures — the unearthing of original recipes for mead, sampling the master brews of Europe, drinking barleywine in Anchorage — and gathering behind-the-scenes stories and recipes from many of the microbreweries across the U.S. The book sells for $15.95 USD or $21.50 Canadian. For more information visit www.harpercollins.com.

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Last Call

Make Your Holidays Hop!

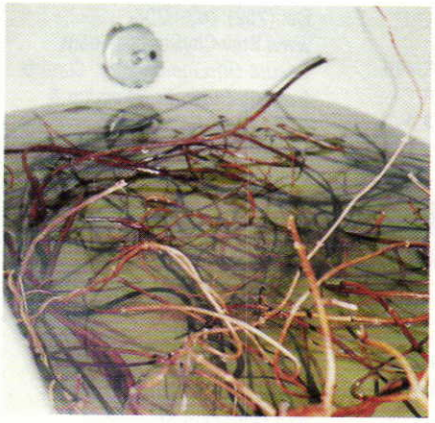
Turn your leftover hop vines into decorative wreaths

Story and photos by Bob Sterner • Hoboken, New Jersey

Your backyard hops have been harvested and nippy autumn air has turned the leaves crispy and brown. Although the vines are dead now, somehow it seems a bit disrespectful of the plants that had towered proudly over the garden all summer to just put them out for the trash collectors. And it can be a bit costly too if the hauling charge is based on bulk.

Rather than becoming landfill fodder, those withered dry vines can be recycled into a center of attention for the coming holiday season when they are formed into wreaths that welcome visitors into your home brewery. It's an easy, quick project, but a bit messy, so wear old clothes and expect to get a bit wet. Here's how to do it:

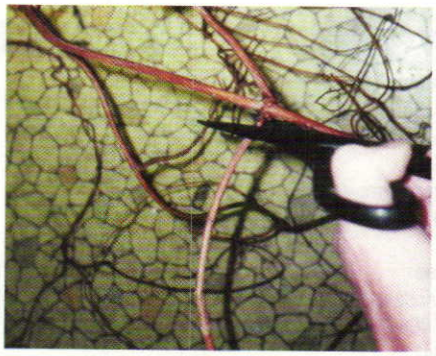
STEP 1: SOAK



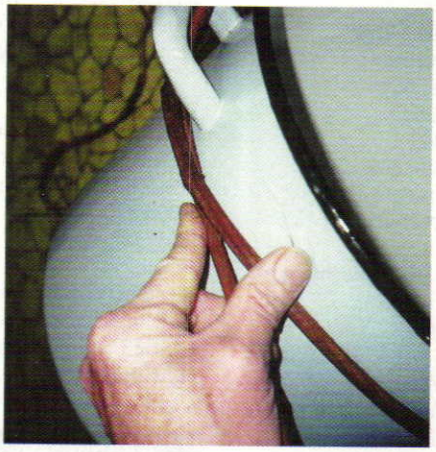
Load the vines into the bathtub, plug the drain and shower hot water on them until the tub is full. Gently press the vines into the water, taking care not to break them. Within about a half-hour, they will become limber and pliable.

STEP 2: SNIP

Use a pair of scissors to cut the branches off of the main vines. This will give you straight lengths of vines from which you will be able to form your wreath.



STEP 3: WRAP

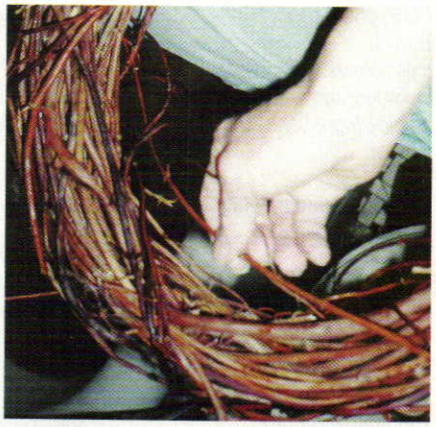


Anchor the largest diameter vine in the handle of a pot and then wrap it around the cooking vessel. Overlap smaller vines on top of largest one, and continue wrapping until only the smallest diameter vines remain.

STEP 4: REMOVE

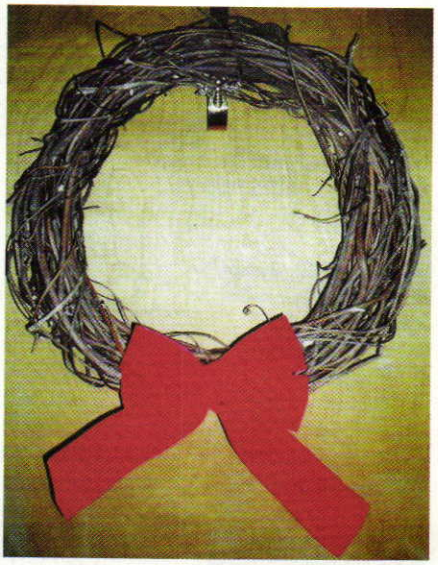
Ease the vines off of the pot and hold them in place with your hands.

STEP 5: CIRCLE



Wrap the small vines diagonally around the vines so that they encircle and hold them in place. Tuck the end of the last small vine into the wreath.

STEP 6: DECORATE



Leave it unadorned for a rustic look. Adding a bow or string of battery-powered lights can brighten its cheerful holiday look.

These stars of the garden now reign over the holidays as a wreath — *Enjoy!*

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Super Deluxe Kit #4

Kegging Super Deluxe Kit #5

Cool Down Your Beer

We carry the largest selection of brewing equipment - over 3,000 products to choose from.

FE600 - $49

FE610 - $89

KEG400 - $180

Keep a Keg Cold for 4 Hours With No Ice!
KEG437 - $30

Slip in Some Ice Packs Before Work...
FE333 - $43

Insulated With Cap No Spilling!
BAR540 - $10

Mini-Regulator
VERY COOL
KEG960 - $135

Cooled Conical Fermenters

No fridge space? No probelm! MoreBeer cooled conicals are the ultimate solution. Ferment your beer up to 30 degrees below ambient temperatures with our powerful, space-saving fermenters.

Manufactured by MoreBeer!

Cooled Conical - CON500
(7.1 Gallons)

Cooled Conical - CON530
(12.2 Gallons)

Cooled Conical - CON660
(24.4 Gallons)

Signature Series Kits

A One-of-a-kind line-up of kits designed by some of our very best customers. Off the beaten path and full of flavor!

The Original:
The Frank Ellis Kit

Jamil's Chocolate Hazelnut Porter

Jim Rossi's Honey Pale Ale

Jason Breatt's Honey Stout

John Palmer's
Klangfreudenfestbier

Jim Nielson's HopMothra

Beer Beer & More Beer™

Since 1995

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- Huge grain choices
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- European Faucets
- Yeast Testing Kits
- Bi-Metal Thermometers
- pH Meters
- Tons of Scales
- RO Water Systems
- Beer Filtering Units
- Stainless Conicals
- Grain Mills
- Quality Wort Chillers
- Yeast Culturing
- Refractometers
- Bottles/Fillers
- Custom-Made Extracts
- New/Used Cornies
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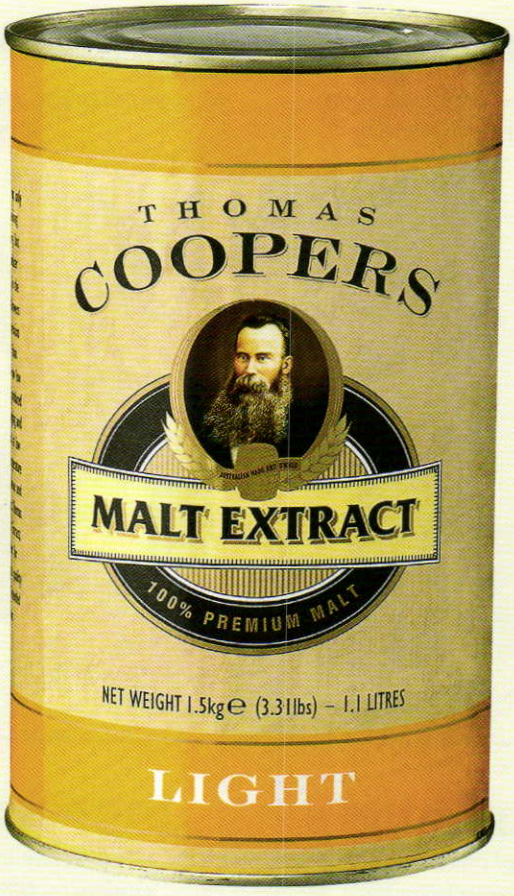

The Same Coopers Brewery Quality!

Also available in Amber, Dark & Wheat. When buying malt extract, Don't trust your beer to an unknown generic and don't forget to look for the "Born On" date; your assurance of freshness and quality.

Have you visited our newly redesigned website yet? www.cascadiabrew.com for tips, recipes and always interesting articles.

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www.cascadiabrew.com