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MAY-JUNE 2005, VOL.11, NO.3

THE HOW-TO HOMEBREW MAGAZINE

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Where to find it

Reward Yourself

You Be The Judge.

Silver Medallion Winner, Great American Beer Festival®.

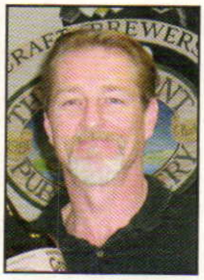
2004 American-Style Dark Lager Category

Contributors

John Maier was born in Riverside, California, in 1955. As a child in 1962, he moved to Portland, Oregon.

John was employed by Hughes Aircraft Co. in El Segundo, California, from 1975 to 1986, as Senior Electronic Technician. While there, he worked on the F-14 Tomcat Radar System.

In the Fall of 1986, John attended the Siebel Institute of Technology, graduating from their course in Brewing Technology three months later. The Alaskan Brewery in Juneau hired John Maier as Assistant Brewmaster in March of 1987. He left there in May 1989. That same month, John walked in as the very first brewer at the Rogue Ales Brewery in Newport, Oregon. He has brewed over 30 million pints of various Rogue beers since that day and now holds the top position of Brewmaster. He is a member of *Brew Your Own*'s review board and appeared on the cover of our 5th anniversary magazine. Also, in this issue, John contributed one of our tips on balancing hoppy beers, for our "Tips from the Pros" department on page 14.



This issue we thank review board member **Greg Noonan** for all his contributions to *BYO*. Greg is a brewer, an author and the owner and brewmaster of Vermont Pub and Brewery in Burlington, Vermont. His books include "Brewing Lager Beer" (Brewers Publications, 1986), "Scotch Ale" (Brewers Publications, 1993), and he is also the co-author of "The Seven Barrel Brewery Brewers' Handbook" (G.W. Kent Inc., 1996).

Greg started homebrewing in 1977 with an all-grain brew. The dearth of information about all-grain brewing led him to teach himself the hobby through extensive research and experimentation. Greg opened the Vermont Pub and Brewery, a 14-barrel brewing house, in 1988 after a three-year battle with local officials to allow on-premise brewing. Noonan embraces a broad range of traditional and historic styles. The pub is now renowned for its wee heavy.

Greg also founded the Seven Barrel Brewery in West Lebanon, New Hampshire in 1994.

James Azotea started brewing extract beers about eight years ago. After three years of brewing on his own, James joined the Saratoga Thoroughbrews (STB) brewing club. He often brews 40-gallon (151-L) all-grain batches with the STB club, Troy brew club and Brewhicans homebrew club. Beer styles brewed, with club members, range from light lagers to Wee Heavy Scotch ales. James designed a 15-gallon (57-L) all-grain brew system for home use that allows him to brew year-round in his basement. The home system is comprised of a picnic cooler mash tun, a picnic cooler hot liquor tank, copper manifold with "butterfly valves," a PBS counter flow chiller, a March brand magnetic drive pump, a 6.6KW electric hot plate heating system and a 26-gallon (100-L) brew pot. He has enough refrigeration for 50 gallons (189 L) of homebrew. James is a native of Saratoga Springs, New York. His first article for *Brew Your Own*, on designing your own custom brewing spreadsheet, appears on page 44.

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.

Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

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Stupid Step?

In Chris Colby's article, "Cereal Mash" (March-April 2005), he calls for adding 10 to 15% of the base malt to the cereal mash and doing a 158 °F saccharification rest for five minutes. Why would a homebrewer want to fuss with trying to hit a five minute rest prior to boiling an adjunct when the bulk of the starch is not available for conversion until after the boil? Why wouldn't one want to just cook the adjunct at the same time they are preparing their strike water and add it to the start of the main mash?

David Fraser
Portland, Oregon

The quick, 5-minute rest at 158 °F (70 °C) degrades any starch available at that point in the cereal mash. (This temperature is above the starch gelation range for corn starch, although much of the starch may be physically constrained before boiling.) This 158 °F (70 °C) rest makes the cereal mash a bit less viscous when you boil it. Also, you get some use out of the enzymes in the malt added to the cereal mash before boiling them. Besides, for most of us, an all-grain brewday is a minimum of 6 hours. An added 5 minute rest in the middle shouldn't make that big of a difference.

Ignored of the Rings

Your reply to Steve Gambrell in the March-April 2005 issue was concise and to the point, and even had me questioning some of my own techniques as far as how I treated my own brewing procedures. However, you neglected to mention one of the primary sources of keg contamination, namely all the soft parts that are part of the keg. The rubber that makes up the O-ring for the dip tubes, top and post seals can absorb flavors and aromas from whatever the kegs previously contained, namely soda syrups. I'll make the assumption that the kegs were received in an "as is" condition. Therefore the soft parts could contain the source of his contamination. I suffered from a similar problem when I first switched from bottles to kegs. It was only after replacing all of the soft parts and a cleaning of the kegs with a strong solution of TSP was I able to finally get rid of those nasty tastes that were left over from the previous owners. Hope this added info helps.

Russ Leitheuser
Ballston Spa, New York

This is a very good point. O-rings can easily harbor contaminating bacteria or wild yeasts and replacing them is cheap. Thanks for writing us.

True Grits

I read the letter to the editor in the March-April 2005 issue regarding corn grits ("Well Kiss my Grits"). With the popularity of instant or quick grits, it is difficult to find "real" grits in grocery stores in Georgia. There is no comparison between instant grits, which are processed beyond recognition, and pure stone ground grits, which are nothing more than dried ground corn. Call 1-800-84GRITS and order the real thing from Logan Turnpike Mill in Blairsville, Georgia. Believe me, it is totally different from the instant stuff.

Alex Tillman
neophyte homebrewer
and longtime grit lover
Albany, Georgia

You're right. Instant grits — like just about everything else that is instant — is lacking. What you gain in convenience, you pay for with a sacrifice in quality. Organic supermarkets frequently carry grits (or polenta, which is nearly the same thing). If not, as you mention, there are other places you can order them from. A Google search for "corn grits" yields a gaggle of responses. (Remember life before Google? Neither do we.) It's worth it to put good ingredients in your beer.

Requisitioning a Rotameter

I loved Marlon Lang's article, "CO_2 Out the Wazoo" (January–February 2005). I've been trying to find a source for a rotometer. Countless searches on Google, Yahoo and Ebay have resulted in disappointment. I don't seem to be able to locate anything close to what is described or pictured in the article. Any chance you have a source (other than Ebay as mentioned in the article?) for such a device? I've searched "rotometer, rotameter, flow meter, CO_2 meter, CO_2 flow meter, and so on", but no luck. All the manufacturer sights that result in search engine queries seem to have only very expensive meters.

Milan Bartolec
via email

Both McMaster-Carr and Grainger carry rotometers — also called rotameters or flow meters. (Their websites are http://www.mcmaster.com and http://www.grainger.com, respectively.) Rotameters show up on eBay occasionally, but you have to watch for them.

Split Stout

Why is the grain bill split into two separate beers for the Guinness clone (in "The Dark Secrets of Stout," by Ashton Lewis, January-February 2005)? Is there any problem mashing all the grains at once?

Joe Fleischman
via email

Guinness breweries around the world brew pale lagers or ale that are darkened and flavored with Guinness Flavor Essence that is shipped from Dublin. Although the addition of dark grains sometimes causes lautering problems, the Guinness Foreign Extra Stout recipe was designed as it is to mimic Guinness' procedure. If you prefer, you can just mash all the grains together and brew the beer in a normal all-grain manner.

Metric System

10

We are living in the 21st century, so I'm amazed *BYO* still doesn't use the metric units system, introduced by Napoleon Bonaparte in 1798! They say "The Anglo-Saxons go metric inch by inch," but I think that's an understatement and I hope it won't take another few centuries. But without jokes, when does *BYO* intend to go metric, a system used all over the world? I think it will give you more subscribers.

Nico van Leeuwen,
The Netherlands

Grandpa Simpson, from the FOX TV show "The Simpsons" responds: "The metric system is the tool of the devil. My car gets 40 rods to the hogshead and that's the way I likes it!"

Actually, we understand the usefulness and simplicity of the metric system (or SI units, which is a slightly different system) which is why we give metric equivalents to all English unit numbers we provide in the magazine. However, Brew Your Own *is based in North America and we list first the units that the majority of our readers are most familiar with followed by metric equivalents for all numbers.*

Dew Brew Redux

Speaking of metrics, due to a mix up in English and metric units, the amount of malt extract specified in the recipe for Mt. Brew in the March–April 2005 issue (in "10 Wildest Recipes") is incorrect. The correct amount should be 2.66 lbs. (1.2 kg) instead of 4.0 lbs. (1.8 kg). Using 4.0 lbs. (1.8 kg) will yield a stronger beer with an original gravity of 1.058 instead of 1.046. BYO *apologizes for the error.*

Tip Top Question

I just tried to brew North Coast Brewing's Blue Star American Wheat beer from the Replicator recipe in the March-April 2005 issue. Although the recipe is for 5 gallons (19 L) of beer, the directions say to top off with water to 5.5 gallons (21 L). As a novice, I find these directions confusing and possibly detrimental to the final product.

Tom & Ann Godwin
via email

Steve Bader (The Replicator) instructs homebrewers to top off their beers to 5.5 gallons (21 L) to counter losses due to racking later on in the brewing process. Whether you follow his instructions or top off your fermenter to 5 gallons (19 L) with water, your beer will be fine. An extra half gallon of water, of course, will dilute the beer slightly but it won't affect the quality of the beer. Someone once gave some advice that — for copyright reasons— we can't repeat. So let's just say instead, "Calm down, cease fretting and enjoy a fermented grain beverage brewed in your own domicile."

brewer PROFILE

Mark Pasquinelli • Bellefonte, Pennsylvania

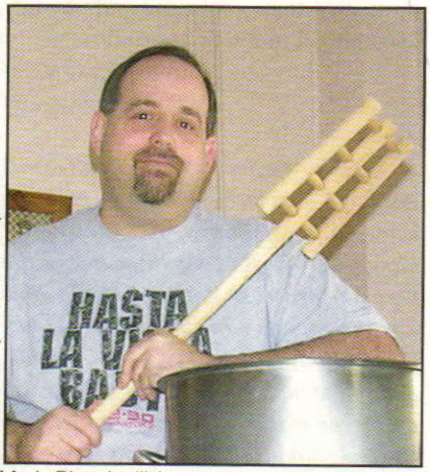


photo courtesy of Mark Pasquinelli

Mark Pisquinelli has come a long way from his beginner's blunders of Pilsner. He now brews everything from barleywine to dubbels.

My first foray into homebrewing nine years ago was an unmitigated disaster. I wanted to make something memorable, so I carefully researched the various styles and, of course, selected something totally inappropriate for a beginner — a Pilsner. To make matters worse, I soon found out that my brew pot was too small. Half the wort boiled over and the other half burned. My Pilsner was memorable indeed. The crystal clear, effervescent beer that I had envisioned turned out pitch black, with a bizarre aftertaste. Neither my friends, nor I knew much about beer then — and no one wanted to hurt my feelings — so we drank it anyway.

Armed with a bigger pot, I persevered and started churning out some respectable pale ales, reds and an imperial stout. My friends named the stout "Bed o' Deer," because it "put them down like a bed of deer." The name only made sense after quaffing a few pints, at which point one would feel compelled to take a lengthy nap.

In late 2000, I moved from Pennsylvania to South Carolina because I thought my life needed change. The change, unbeknownst to me at the time, turned out to be the start of a long-distance relationship with my girlfriend Karol, who still lived in Pennsylvania. She took my move in stride, saying I did it to fulfill her dream of being worshiped from afar.

This was a hectic period in my life and, unfortunately, my brewing took a brief hiatus. Predictably, I moved back to Pennsylvania two years later (so I could worship Karol from "anear") and resumed brewing.

I had dabbled with partial mashes before, but decided now was the time to jump into all-grain brewing. I bought a 40-quart (~ 40-L) pot with a built-in thermometer and false bottom, then started brewing from kits. At this time, I learned the true meaning of "Relax. Don't worry. Have a homebrew." Working in a medical laboratory, I was used to controllable reactions with predictable results. My first experiences with all-grain were anything but, especially when it came to controlling my mash temperatures. I would become catatonic with fear if they were off by a degree or two. But I just kept repeating the mantra and eventually standardized my procedures.

With technique under control, I was then able to formulate my own recipes with the aid of ProMash and my two cats — Terrance and Philip, named after the flatulent duo from South Park. I try to keep the brewing area a kitty-free zone, even though they love the rotating sparge arm. However, I do let my boys make suggestions when I'm working on a recipe. (Catnip beer, anyone?) When starting a recipe from scratch, I try to mix several different malts to achieve a complex and unique beer. The flexibility and control all-grain brewing gives me is unparalleled, especially in being able to tweak a recipe that's almost there. It has allowed brewing to become the quintessential blend of art and science that I had envisioned for that first Pilsner. I try to keep a couple of standbys in my pantry or to share with my friends at work: usually a wheat beer we call Heifer Weizen, a dry stout that Karol refers to as Oxymoron Stout and one of my favorites — an Irish Red named Better Red Than Dead Ale.

The big beers, however, are my true passion. I love the planning that goes into making a high alcohol beer and the challenge of hitting the target gravities. The big beers have also taught me that patience is a virtue. That patience has rewarded me with a barleywine and Belgian dubbel that are just coming into their own, as well as an imperial stout made with cherries and Ghirardelli chocolate that's aging nicely.

An added bonus of my hobby is that Karol has jumped on the brewing bandwagon, although her beers tend to be more esoteric, fruit and pumpkin — maybe even a dandelion or rhubarb beer. Karol has taught me a few things about brewing, too: be judicious with the hops (sometimes less is more) and don't be afraid to experiment with different ingredients.

While Mark tries to maintain a "kitty-free" brewing zone, Terrance and Phillip take in the iguana races in the living room.

homebrew COMPETITION

Homebrew Inquisition • Austin, Texas

The Austin ZEALOTS homebrew club (of Austin, Texas) is pleased to announce their second annual Homebrew Inquisition. The Homebrew Inquisition is a homebrew competition that operates on a different model than standard BJCP contests. BJCP contests can be likened to AKC dog shows. If you have a pedigreed Pekinese, you enter him in the Pekinese category and he is judged for his "Pekinosity." On the other hand, if you have a mixed-breed dog that is great with kids, catches a frisbee and recites Shakespeare, all you'd hear from the judges is that your lovable mutt not a very good example of a Pekinese. The Austin ZEALOTS Homebrew Inquistion is designed for the "lovable mutts" of the homebrewing world — beers that are designed to taste great, but are not necessarily meant to represent a classic beer style.

We have 10 regular categories: malty or sweet beers, bitter or hoppy beers, session beers, strong beers, dark beers, "yeasty" beers, lagers, flavored beers, experimental beers and an open category. In each category, our judges (the Inquisitors) score the beer on its overall quality, not how well it mimics any classic beer style. As we mentioned before, our contest is great for brewers who make their own house ales or "mutt beers." Our contest is also a good place to submit clones of commercial beers that wouldn't fit well into any of the BJCP categories. We also have a special category, The Crusade — a ZEALOT-mandated mission for homebrewers who are especially pure of heart (or those who have had a couple). This year's Crusade is historical beers. First, second and third place awards are given in each category and for the contest as a whole.

It is our goal to provide extensive feedback to entrants. Our score sheet is two pages in length and prompts the Inquistitors to describe both the good and bad aspects of an entrant's beer as well as make suggestions for improvement. Beers are judged on a 100-point scale with 15 points for appearance, 30 points for aroma, 45 points for flavor and 10 points for overall impression. We send entrants not only their own scores, but the breakdown of scores in every category so they can see how their beer fared compared to other entrants (if they did not place 1st, 2nd or 3rd). In our first year, we received 148 entries.

This year, we are accepting entries from April 1st to May 1st. Austin residents can pick up entry sheets at Austin Homebrew (at their new location at 7951 Burnet Road) and entries can be dropped off there as well. Entry sheets are also available on-line (at www.austinzealots.com) and beers can be mailed to Austin Homebrew. The entry sheet gives more details on each category and all other necessary details. The cost is $5 per entry. Only one 12 oz. bottle is required per entry. Judging will be held May 7th and results will be announced on May 14th at the Texas Craft Brewers Festival.

Inquisitors judged 148 homebrewed beers at the 2004 Austin ZEALOT Homebrew Inquisition.

homebrew DICTIONARY

tap: a device that is attached to a keg or cask in order to control the flow of the beer.

terminal gravity: a term used to define the specific gravity after a beer has fermented and aged appropriately. A synonym that is commonly used is final gravity.

tertiary fermentation: this is a fermentation that is carried out in bottles as a conditioning technique.

Tettnang: a German hop variety in the 3–5 percent alpha acid range.

thermometer: a tool for measuring temperature. Thermometers specifically made for brewing use alternative materials to mercury (such as alcohol) as a precautionary measure, so that if the thermometers break, no poisonous chemicals will infect the beer.

toasted malt: a pale malt that is kilned for varying amounts of time, at different temperatures in order to produce certain "toasty" flavor characteristics.

tonne: a wooden cask that is 2.2 barrels (68.2 gallons/259.1 L) in volume.

top fermentation: a fermentation method that utilizes yeast that hover on the surface as opposed to sinking to the bottom. Ales are "top fermented" beers while lagers are bottom fermented.

topping up: A term used to define the addition of water after boiling a concentrated wort or extract; or the practice of adding water after primary fermentation in order to decrease the head space and prevent air contamination.

trappist beer: Beer brewed from any of the seven monasteries in Belgium and the Netherlands. These beers are all top-fermented, bottle conditioned and range in alcohol content from 4 to 12% by volume. They are renowned for their fruity flavor and spritzy carbonation.

tripel: a strong Belgian ale that is pale in color and high in alcohol (upwards of 7% by volume).

homebrew CALENDAR

May 14, 2005
9th Annual B.E.E.R. Brew-Off Competition
Nesconset, New York

This year's Brewer's East End Revival (B.E.E.R.) Homebrew Competition will be held on May 14 at the Knight's of Columbus Hall located at 130 Lake Ave in South Nesconset, New York. Entries will be accepted from April 23 through May 7. All styles from the 2004 BJCP guidelines will be accepted. This is an AHA/BJCP sanctioned event. Judging will be conducted from 9 a.m. to 4 p.m., at which time the doors will be open to the public for the awards ceremony. For all the homebrewing chefs, we'll also feature a "Beer Recipe Cook-Off" — any food items made with beer will qualify. Visit the B.E.E.R. website at www.hbd.org/beer/ or call Steve at (631) 736-6013 for complete details

June 4, 2005
Pennsylvania Microbrewers Fest
Pittsburgh, Pennsylvania

The 11th annual Pennsylvania Microbrewers Fest, will be held on Saturday, June 4, 2005 at the Penn Brewery in Pittsburgh. Approximately 30 craft brewers representing the mid-Atlantic, midwest, northeast and beyond. Three sell-out sampling sessions of beer, music, food and "German ambiance" will be offered. Tickets are $30.00 (plus tax) and go on sale March 1 by mail, fax or e-mail. Send your name, address, telephone, number of tickets and which session (noon, 3:30 or 8 p.m.). Send a check for $32.10 per person; or credit card information including expiration date and signature. Address is: Pennsylvania Microbrewers Fest, 800 Vinial Street, Pittsburgh, PA 15212. The fax number is (412) 237-9406 and the email address is pennbrew@hotmail.com. For more information call (412) 237-9402.

July 13, 2005
8th Annual E.T. Barnette Homebrew Competition
Fox, Alaska

Seven categories will be judged in this AHA sanctioned competition: bock (5A-D), English pale ale (8A-C), American ale (10A-C), porter (12A-C), stout (13A-F), IPA (14A-C) and fruit/spice/herb/vegetable beer (20 and 21A). The grand prize awarded to Best of Show is $500. Other prizes (to be announced) and custom medals will be awarded to the 1st, 2nd and 3rd place winners in each of the seven category. Entries will be accepted between June 27 and July 13. Please submit three 12–16 oz. brown or green crown capped bottles and a check or money order for $5.00 in U.S. funds per entry. Judging will take place on July 16th in Fox, Alaska (10 miles north of Fairbanks). More information as well as entry and bottle identification forms may be found at the following Website: www.mosquitonet.com/~stihlerunits/ScottsDen/Beer/Events/Events.html. Should you have any questions or are interesting in judging contact Scott Stihler by telephone at (907) 474-2138 or via email at stihlerunits@mosquitonet.com.

replicator

by Steve Bader

Dear Replicator,

A few months ago (when I was low on homebrew), I went to the closest "real" beer store and found the most wonderful brew — Tröegs HopBack Amber Ale. One taste and any hophead will fall in love. I'd love to try my own hand at a brew this full of hop flavor. I have gathered some data from Tröegs' Website, but would like any other insight you may have. Lastly, according to their Website, this beer is only available within a three hour drive of Harrisburg, Pennsylvania. A good replicator recipe would let many more curious homebrewers enjoy this jewel of a brew.

Scott Flieg
Stafford, Virginia

I talked to founder & brewer John Trogner about their HopBack Amber, and what makes it so popular. The use of a hopback is how Tröegs gets the full hop flavor in their HopBack Amber Ale. A hopback is a container that you fill with fresh hops, and run hot wort right through the fresh finishing hops, then into your wort chiller or fermenter. John says that by using a hopback, the hop aroma and flavor that you extract from the hops is not as "raw" as the hop aroma from dry hopping. Also, you retain more of the aroma since it is a closed system. There are many different ways to build a hopback for homebrewing (see our Projects column on page 50).

John describes HopBack Amber as the ultimate amber ale, with Oktoberfest style maltiness and a nice hop flavor of citrus, mango and spice from the hops used in the hopback. HopBack Amber is a big beer, with an alcohol content right at 6% — it holds up nicely to the bigger hop and malt profiles of this beer. Its fresh hoppy aroma, spicy taste and rich caramel notes define this amber ale.

John also suggested making a yeast starter or using two packages of yeast to ensure that you are using a large amount of yeast. This large amount of yeast will ensure a fast fermentation, which will minimize flavors like diacetyl and encourage the clean flavors desired in this beer.

For more information you can visit the Tröegs Brewing Company Website at www.troegs.com or call the brewery at (717) 232-1297.

Tröegs HopBack Amber Ale (5 gallons/19 L, extract with grains)

OG = 1.063 FG = 1.017
IBUs = 55 SRM = 10 ABV = 6.0%

Ingredients

7.75 lbs. (3.5 kg) Briess Pilsen Light malt extract syrup
2.5 lbs. (1.1 kg) Munich malt (10 °L)
0.25 lbs. (113 g) crystal malt (20 °L)
1.0 oz. (28 g) chocolate malt
15.25 AAU Nugget hops (bittering hop, boil 60 min.) (1.2 oz./33 g of 13.0% alpha acid)
5.7 AAU Nugget hops (in hopback) (0.5 oz./14 g of 13.0% alpha acid)
2.8 AAU Liberty hops (in hopback) (0.25 oz./7 g of 4.0% alpha acid)
2.8 AAU Simcoe hops (in hopback) (0.25 Oz. (7 g) of 12.0% alpha acid)
Wyeast 1056 (American Ale) yeast or White Labs WLP001 (California Ale) yeast
0.75 cup (180 mL) of corn sugar (for priming)

Step by step

Steep the three crushed malts in 3 gallons (11.3 L) of water at 152 °F (67 °C) for 30 minutes. Remove grains from wort, add the malt syrup and bring to a boil. Add the Nugget bittering hops and boil for 60 minutes.

For the hopback, run the hot wort through an in-line hopback type filter where you have the remaining three hops in a straining bag, with the outlet going into 2 gallons (7.6 L) of water in a sanitary fermenter and top off with cool water to 5.5 gallons (21 L). Cool the wort to 75 °F (24 °C), aerate the beer and pitch your yeast. Allow the beer 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 and enjoy!

All-grain option:

This is a single step infusion mash. Replace the 7.8 lbs. (3.5 kg) of malt syrup with 10.3 lbs. (4.7 kg) of Briess Pilsner malt. The rest of the grains used are the same as the extract recipe. Mash the four grains together at 152 °F (67 °C) for 60 minutes. Collect approximately 7 gallons (26 L) of wort to boil for 90 minutes and have a 5.5-gallon (21-L) yield. Lower the amount of the Nugget hops in the boil to 1 ounce (28 g) to account for the higher extraction ratio of a full boil. The remainder of the recipe is the same as the extract.

Chilling Wort

Practices and equipment

You've completed the boil and, unsurprisingly, you have very hot wort that needs to be prepared for fermentation. Your yeast profile alerts you that the proper temperature for pitching is between 68–72 °F (20–22 °C) and here you are with wort hovering around 200 °F (93 °F) — much too hot for your yeast to survive or perform any type of fermentative duty. Waiting hours for the wort to cool on its own is never a recommended option, as warm wort, below 140 °F (60 °C), is susceptible to bacterial contamination. You want to cool the wort as quickly as possible in order to continue a sound brewing session — here are four ways to accomplish this goal:

Topping up with cold water

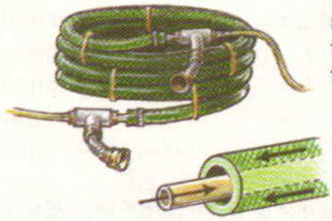
Extract brewers typically boil concentrated worts that are smaller than the entire batch volume and require "topping up" with water before fermentation can proceed. The cooler the water a brewer uses, the more heat it will absorb from the hot wort. It is then, a simple chilling process to refrigerate your topping water. One thing to note, it is the preferred process to add the hot wort slowly into the cool water, rather than dumping the cool water on top of the hot wort — it is safer for the brewer and the equipment (both can be damaged by excessive heat and extreme changes in temperature). In order to gain another benefit from chilling wort — extracting cold break — you should top up in a separate container than your fermenter. When you chill your wort, proteins (known as cold break) come out of solution and precipitate to the bottom of the vessel (typically a bucket or carboy). Once your wort is cool and the cold break is settled, you can rack (siphon) the clear wort into your fermenter, leaving behind the debris.

Chillin' in the sink

The simple process of filling your sink (or bath tub) with cold water, then submerging your brewpot to allow the surrounding water to absorb the wort's heat is a common practice for homebrewers. To expedite the process, stir the water in the sink and circulate the wort inside the pot with a sanitized brewing spoon (paddle). Also, change the water every five minutes to ensure that it is as cool as possible. Remember to keep the lid on the pot (when not stirring the wort) to prevent contamination. When you can comfortably touch the brewpot, start to add ice to the water. Keep adding ice and stirring your wort while monitoring the wort temperature with a sanitized thermometer. Once the wort is adequately cool, rack it to the fermenter, leaving behind the cold break, and pitch your yeast.

Immersion wort chiller

This piece of equipment makes chilling a more convenient and speedier process than chilling in the sink. The immersion chiller is typically a copper coil that has a tube connected to each end. Cold water enters one side of the coil and is released through the other. The chiller is immersed into the wort (hence the name "immersion chiller") and the water is turned on. The exit tube is inserted into a drain. As the cold water passes through the tube, it absorbs the heat of the wort. As a sanitation measure, insert the coil about 15 minutes prior to the end of the boil. Then, turn the water on and stir the wort with the chiller every five minutes so that it cools uniformly. Monitor the chilling process with a thermometer and rack the cooled wort into the fermenter when it reaches the target temperature.



(Left): The counter-flow chiller runs hot wort through a tube that is within a tube of cold flowing water.

(Right): The immersion chiller is constructed of coiled metal tubing that contains cold water and is submerged in hot wort.

Counter-flow chiller

This chiller has a tube within a tube construction. Your hot wort will travel from the brewpot (through a spigot if your pot is equipped with one) while cold water flows in the opposite direction in the outer tube. Many counter-flow chillers are made out of garden hose and tubing, but the best are constructed of copper. While the counter-flow chiller cools wort rapidly and efficiently, it exports cloudy wort that is laden with cold break. To relieve your wort of this, direct it into a bucket as described earlier, let the solid material settle, then rack into your fermenter. It is important to cleanse your chiller with hot water and sanitizing solution after use to avoid contamination in the tube where the wort travels.

Balancing Hoppy Beers

Beers with good hops need not be over the top

by Thomas J. Miller

Brewer: Ed Kopta attended the UC Davis Master Brewer's Program in 1998. Out of school he joined Hopstreet Bistro and Brewery in Sacramento. In June of 1999 the pub was sold to Hoppy Brewing Company, which had long been a contract brewery searching for a home.

The concept of balance seems to be something of a moving target for me. As far as our brewing goals are concerned with respect to balance, we try to cover as much ground as possible while erring on the side of a bit more hops than called for. Most of our beers are fairly hoppy — one popular Brewers' Special is ridiculously so. We try to satisfy the folks who prefer maltier beers with a couple tap handles and Brewers' Specials as well.

When constructing a recipe for a balanced, hoppy brew, the question might be: What should the brewer be thinking? Is it a question of picking the correct kind of hops — one that has nice aroma and flavor characteristics that fade nicely on the palate toward maltiness? Or is it in the grain bill — having enough malt "oomph" to rise to the heavy hop characteristics?

Both points are important to us. We'll use a decent charge of a high alpha variety hop for the start of the boil, but we try to emphasize character from late and dry hops more than overall bitterness. To do this we use hefty doses of aroma varieties at the end of the boil — hops like (the obligatory) Cascade, Crystal, Liberty, East Kent Goldings and the likes.

On the other side, malt "oomph" does have to rise up to meet the hops in our most balanced beers. We'll use good amounts of caramel malts, carapils and even small touches of chocolate. Other good malts for this effect are Munich and Vienna used as a fair percentage of the base. One pretty well-balanced IPA uses all Maris Otter for its base malt.

We generally don't play around with too many different yeasts; we use the Chico strain for just about everything. However, I suppose that selecting an estery, lower-attenuating strain of yeast (like the Fullers ESB variety) would serve to compete better with an overabundance of hops.

Brewing methodology plays a role. A higher mash temperature certainly serves to increase the final gravity, which will lead to malt sweetness. Our brewhouse only allows for single temperature infusions, so we don't get too fancy about our mash profiles. Additionally, we have fairly hard water here and we don't generally add salts. Calcium tends to increase the perception of bitterness, which is good for a typical IPA but may be too much for a really hoppy one. On the other hand, chloride ions help with palate fullness and will probably help the overall balance of the beer.

We add a good charge of high alpha hops (typically Nugget) a little before the kettle comes to a boil (around 206 °F/97 °C). I haven't been convinced that additions 30 minutes before the end of the boil have much value, so we don't add any more hops until 15, 10 and 5 minutes before the end, or directly at the end of the boil, depending on the beer. These tend to be lower alpha aroma types, though we do sometimes use small amounts of Columbus in this role. We vary the time of the additions between beers more for variety's sake than for any overall brewing philosophy. Most of our beers are ales and most of them get a dose of aroma hops at the end of the boil. I prefer to boil the last hops charge in lagers for about five minutes — I have learned in my brewing experience that this is effective.

Again, the limitations of our brewhouse impose restrictions on what we can do. We only use hop pellets, but whole leaf hops would also be wonderful for late additions. A hop jack (hopback) would be even better.

Often times our beers use a single variety of late hops in order to display the characteristics of that one variety. I've learned that this can be perilous, as year-to-year variations in each variety of hops can cause variations in our beer! Also, many of our Brewers' Specials will use multiple late and dry additions of a single new hops variety just to see what it has to offer. We've had good success with Vanguard, Glacier and Santiam in this regard (though I hear that the latter is being phased out).

Dry hopping is important to increase the hop flavor and aroma without increasing the bitterness. Again, plant limitations dictate our procedures: we simply pour pellets into the top of the fermenter when the beer is getting close to 32 °F (0 °C) — note that if the beer is too warm it will gush out the top of the fermenter when a large amount of hops is added! The beer will be in contact with the hops for about four to five days. Often times we'll be forced to delay dry hopping a beer since we need to use the yeast for our next brew, and we don't want it mixed with hops!

But homebrewers can do it differently. I'd drop hops plugs into the secondary carboy a week before packaging, or even place whole leaf hops into a tertiary one and rack the beer into it. Highly carbonated beers have more CO_2 bite that prickles the tongue and makes a beer seem more bitter. Lower carbonation would serve to minimize that effect. We serve one beer in this vein with a Guinness-style tap and a 75/25% blend of nitrogen and CO_2. The smaller bubbles of nitrogen greatly enhance the smoothness of the beer, which helps out the perception of balance.

I've never experimented with hop oil extracts, but I imagine that this could be a fun type of beer to start with.

ROGUE

Brewer: John Maier brewed for Alaskan Brewing from 1987 to 1989, and has been the Rogue Ales Brewmaster since 1989. He has also won the Russell Schehrer Award and was the 1988 AHA Homebrewer of the Year. Rogue's accomplishments have landed him in the NW Microbrewer Hall of Fame.

There are not many people who like hops as much as I do, but when I taste a beer that is so dry that there is no malt to back up the bitterness, even I get turned off. So, ultimately, I guess that's the concept of a "balanced, hoppy beer" — creating an all-around enjoyable brew.

There are four things that are important to maintaining balance. First, the use of specialty malts in large quantities will add body to your beer. We use lots of Munich and crystal malts in order to achieve this.

The second factor is mash temperature. A higher mash temperature will generally reduce your attenuation through the creation of non-fermentables. Although I mention that, I still think it is more important to consider how your malts are going to work with the hops to achieve the balance you are seeking.

The third thing is yeast. Yeast selection will play a role. I suggest using a strain that will not ferment bone dry. Check the attenuation rating provided by the yeast lab.

And finally, the fourth is fermentation temperature. Ferment cool. We ferment at 60 °F (16 °C). This will reduce attenuation. Our yeast is unique as it will ferment as low as 50 °F (10 °C), but beware — not all yeasts perform like ours at Rogue.

Part of creating balance has to do with picking the correct kind of hops. Use hops with a low co-humulone level. High-alpha hops like Horizon, Simcoe, Amarillo and noble varieties give a smooth clean bitterness.

How and when you hop your brews is going to be based on your preferences and experience, but here's an idea of what we do at Rogue: We always hop at the start of the boil. Sometimes we do a first wort hopping, but not normally. We also hop heavily in the hopback.

That being said, hoppy, balanced beers do not require dry hopping. Part of the balance equation happens in the bottle or keg. By that, I mean that some carbonation is required for mouthfeel. Our CO_2 levels at Rogue are on the low side. Too much CO_2 interferes with the taste experience. I'd suggest going lighter-than-normal on the priming sugar if you bottle condition your brews.

Wonders of Wort

"Help Me, Mr. Wizard"

Determining final alcohol and modifying malts

I've read that with the Texas 2-step and late extract methods that you will get better extraction of hop bitterness if the wort is less dense. Also, from the late extract method, it sounds like the full 60-minute boil isn't necessary for most malt extracts . . . just the last 15 minutes to sanitize it before cooling the wort. So my question is: Can you hold off the addition of malt extract (in an all-extract or partial-mash recipe) until the end of the boil? And then, taken to an extreme, can you just boil the hops in plain water in some smaller volume (like 1 gallon or 3.8 L) in an all-extract recipe, or does something else in the wort (like pH levels) play a part in extracting bitterness from hops? The root of my question is whether or not I can boil less wort, as this would require less energy to maintain a vigorous boil with a normal kitchen stove.

Patrick Louie
San Francisco, California

This question really shows me how homebrewers have changed since the early days of the legal homebrewing movement in the United States. The early pioneer homebrewers in the mid to late 70s wanted to brew beers with flavor since the selection of domestic products on the market had reached an all-time low; the last thing a pioneer homebrewer wanted to do was look to commercial brewers for ideas. Things have changed dramatically in the last 25 years and the idea of a technologically advanced brewery no longer implies yellow, flavorless barley pop.

The Texas 2-step was developed to address space issues many homebrewers have on their stoves by boiling normal strength wort (as opposed to low volume, high strength followed by dilution) in two 2.5-gallon (9.5-L) batches over two days to end up with 5 gallons (19 L) of wort. As Chris Colby mentioned in his article in October 2003 most medium and large commercial brewers add more than one batch of wort to a fermenter for economic reasons . . . not too different than homebrewing, as we would all probably install a professional Viking stove with six gas burners if it would fit in the house and within the budget!

The late extract method was designed for partial mashers and suggests boiling the small volume of homemade extract with hops for about 45 minutes and then adding the dry or liquid malt extract to bring the gravity into check during the last 15 minutes of the boil. This method also appeals to the homebrewer who cannot easily boil large volumes of wort and who does not want to boil highly concentrated wort. The reason most seasoned brewers wish to avoid boiling concentrated wort and diluting later with water is that color and flavor are sacrificed and hop utilization goes down. When the concentrated wort is diluted to the desired original gravity, it is usually different from its counterpart boiled at a lower concentration and with all the required water in the kettle from the beginning.

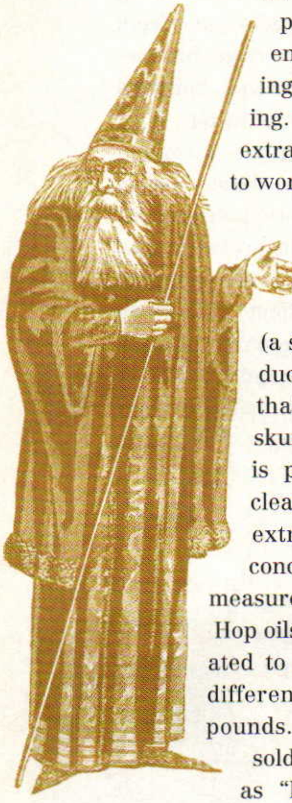
The method you suggest is not new and a version of this practice is unknowingly used by many homebrewers. Your idea is to essentially skip wort boiling, except for a few minutes for wort sterilization. And the hop bitterness and flavor would be added from a little pot of boiling water and hops. The idea reminds me of cooking where the dish comes together from a variety of little side projects happening all at once on the stove top. This is actually how most hopped malt extracts are made, except the hops are not boiled in a little kettle in the corner of the plant; they come in a can from a hop extract plant!

This is where most homebrewers get "turned-off" to what happens in the commercial arena. The idea of adding hops from a can just seems too mechanical. If a brewer then wants hop aroma, another can or bottle is pulled off the shelf and a few drops added for bouquet. There is a reason, however, that hop extracts come from specialty companies — extract production involves much more than boiling a fist full of hops in a pot of water.

Hops contain hundreds of components and about three classes are of most interest to brewers: polyphenols, bittering acids and the aromatic oils. Polyphenols or tannins react with proteins during wort boiling and aid in trub formation. Some survive into the finished beer and can add a grassy character if present in highly hopped beers. The bittering acids in hops have a very low solubility in aqueous solutions, e.g., wort and beer, and isomerize during boiling into iso-alpha acids that are water-soluble. Finally, there are the oils in hops that lend piney, citrusy and spicy aromas to beer.

When hops are added to wort and boiled the pH is around 5.2 and there is protein present to precipitate much of the polyphenols extracted from the hop leaf. Boiling time is important and most beers that have hop aroma use late additions. During the boil, hop acids undergo numerous chemical changes and the resultant mix has a profound influence on beer bitterness and the quality of bitterness. When the pH of wort boiling is increased by adding alkaline buffers, hop utilization increases but bitterness is reportedly unpleasant. If you boiled hops in water as opposed to wort, the pH would be higher and the flavor would lack.

Commercially produced hop extracts are made by extracting the acids and oils from the plant material. Acid extracts can be bought and added to the brew kettle like whole hops or pellets. Isomerized extracts are also avalibale and are made by isomerization under controlled conditions so that the mixture of compounds is not too different than that seen during traditional wort boiling. Isomerized alpha-acid extracts can then be added to wort or beer to impart bitterness. Isomerized alpha-acids can be further treated using sodium borohydride (a strong reducer) to produce light-stable extracts that are immune to skunky flavor when beer is packaged in green or clear glass bottles. All hop extracts are extremely concentrated and must be measured carefully.



Hop oils are typically fractionated to separate the oils into different classes of compounds. Oils are frequently sold with descriptors such as "late hop aroma" and "dry hop aroma" to give brewers an idea of the qualities the oil should impart to beer. In the early days of extract production, acids and oils were separated with solvents such as hexane but the industry has completely switched to liquid and supercritical carbon dioxide extraction methods.

Suffice to say hop extract and oil production is a high tech venture. Most of the hop chemistry experts in the world have advanced degrees in some type of chemistry and think about hops completely differently than the practical brewer. Luckily, their products are available for brewers to easily and conveniently use.

You can have all the creative freedom as all-grain brewers by using unhopped malt extracts, assorted specialty malts, the yeast of your choice and hop extracts for bitterness and aroma. This method could be morphed with the late extract method to produce 5-gallon (19-L) batches of wort with small pots and would avoid the complexity of producing your own hop extract.

Calci the alchi

I currently use brewing software to calculate the alcohol content of each batch that I make. I input the original gravity before pitching my yeast and the final gravity at packaging. Not terribly difficult, but just one more step in the process. Alas, short of a laboratory it seems to be the only method available to me. Then, the other day I was re-reading the article on bock biers in your July–August 2004 isssue and noticed that the alcohol percentages stated in the article matched the original gravities listed exactly, simply by moving the decimal up one place. I have not noticed that relationship before, but now that I am looking for it, I notice it in practically every recipe. Is there a "rule of thumb" for approximating alcohol percentage within 0.1–0.2% using only original gravity readings?

Robert Kennedy
via email

This question interests me because I have never noticed this obvious relationship. The rule of thumb you are noticing is that the OG in specific gravity points, for example 48, relates to approximate alcohol content by volume by a factor of 0.1. I dug through various texts and analytical test reports for various beers and think this easy relationship is fairly consistent for most beers.

The key when estimating alcohol from original gravity is knowing how much of the extract is actually fermented. Hypothetically, wort could have a specific gravity of 1.048 and be completely unfermentable and the alcohol content would be zero. Usually, the specific gravity of wort drops by about 75–80% of the original gravity and beers beginning at 1.048 (12 °Plato), for example, finish between 1.010 and 1.012 (2.5–3 °Plato). This change in specific gravity is called the apparent degree of fermentation (ADF) because alcohol interferes with the hydrometer reading and the amount of residual extract is actually higher.

The real degree of fermentation (RDF) expresses how much of the original gravity was truly fermented and is a lower number. The RDF can only be determined in a lab by directly measuring residual extract and this method is out of reach to homebrewers without a chemistry lab in their basement . . . it's also out of reach of almost all small breweries. So rules of thumb are used to estimate alcohol concentration.

This is a point I like to stress because any calculation, no matter how sophisticated it appears, is based on assumptions about RDF. For most beers, it is safe to assume that the RDF will be about 65%. For example, if the original gravity is 1.048 (12 °Plato) the real extract in the beer will be about 1.017 (4.2 °Plato). For all of you calorie counters, the real extract is a pretty good estimate of the carbohydrate content of beer, although protein does have a minor contribution to this number. In this example, 4.2 °Plato is roughly equivalent to 4.2 grams of carbs per 100 mL of beer.

As the old expression goes "assumptions are the mother of all screw ups". I am willing to accept that most beers ranging in original gravity from 1.040 (10 °Plato) to 1.064 (16 °Plato) have an RDF around 65% if the mash was conducted in such a way to produce "normal" wort. Very hot and thin mashes are often used in order to produce beer with a higher final gravity (and have a lower RDF). The same holds true of higher gravity beers for a variety of reasons. The bottom line is that if you assume the RDF is higher than it really is you will overestimate alcohol content. Personally, I do not get the machismo rush from brewing highly alcoholic beers that some brewers do and am content with the true reflection in the mirror. When I hear about beers that have more than 8% alcohol by volume I begin to get skeptical and when the number exceeds 10% I usually require lab analyses to confirm the reported number.

So let's run through some math here. Two molecules of carbon dioxide and two molecules of ethanol are formed when glucose is fermented by yeast. Glucose, by the way, is the starting point of fermentation in the yeast cell (as maltose, maltotriose and fructose are converted to glucose by enzymes in the cell before any fermentable carbohydrate is fermented). Glucose has a molecular weight of 180 grams per mole, carbon dioxide weighs in at 44 grams per mole and ethanol as a molecular weight of 46. This means that one gram of carbon dioxide produces 0.51 grams of alcohol and 0.49 grams of carbon dioxide. In reality, other compounds are formed in addition to ethanol and the ethanol yield from glucose is closer to 0.48 grams.

This is where I will switch units to °Plato (kilogram solids/liter wort) because we need to know how much extract by weight we have in the wort. Wort beginning at 12 °Plato (1.048) will have 65%, or 7.8 grams per 100 mL, of that extracted fermented and about 48% of that weight is converted to ethanol. This translates to 3.7% alcohol by weight and 3.7% divided by 0.79 (the density of ethanol) equals 4.7% alcohol by volume.

To sum up, if one assumes that the RDF is 65%, this method is within the 0.1% error you desire. When brewing higher gravity beers you may want to use a lower assumed RDF and you can develop a different multiplier by working through the math in the preceeding paragraph. Thanks for the good question!

Malt modification

I am involved in a club competition, "Iron Brewer." Everyone uses the same grain bill, but you can vary the amount of water to make a higher gravity or lower gravity beer. The grain bill is: 8 pounds pale malt, 2 pounds Munich malt (light or dark), 1 pound crystal malt (any Lovibond), and 20 ounces molasses. We had to specify the yeast to be used prior to knowing that molasses would be a secret ingredient. I chose a British Ale yeast that our local microbrewery uses. This leads me down the path of Porters. We are allowed to modify any of the malts that we wish. I located a previous Mr. Wizard answer at (www.byo.com/mrwizard/404.html) about roasting pale malt to make "brown malt" and you indicate that making "chocolate malt and black patent malt" is also accomplishable, but you don't indicate how. Can you elaborate on the required roasting time and temperature?

Doug Lasanen
Cincinnati, Ohio

I am a big Iron Chef fan and I somehow feel guilty answering this question. It feels like cheating or something, yet as a dedicated homebrew pundit, I must press forward! Roasted malts can be made using pale, previously kilned malt as the raw material. Really, the methods are not too different than coffee roasting and commercially produced roasted grains are made in drum roasters.

Roasted malts include amber, brown, chocolate and black malt and the principal difference among these grains is the roasting temperature and roasting duration. Roasting pale malt at 200 °F (93 °C) for 15–20 minutes, then gradually heating to 280–300 °F (138–149 °C) and holding for some time (determined by visual inspection by the roaster) is one way to make amber malt. Chocolate malt is made by roasting pale malt at 420–450 °F (221-233 °C) for 2 to 2½ hours; if this time is extended black malt results. It is critical that the roasting temperature does not exceed 480 °F (250 °C) because grain converts to charcoal (literally!) above this temperature.

"Quenching", or adding water to the hot malt, quickly stops the roasting process and causes the grain to swell. In a commercial roaster the water is added inside the roasting drum before the drum is opened. This is critical since opening the hot roasting drum is a sure way to ignite the combustible fumes contained inside the drum. At home you could roast your malt on a cookie sheet and use a spray bottle to apply the quenching water — the idea is to cool the grain and flash the water off as steam so you don't want to go crazy with the application. I hope this brief explanation of roasting helps in the upcoming Iron Brewer competition. If I were in this match things may proceed a bit differently …

"Fukui-san!"

"Yes, Ota."

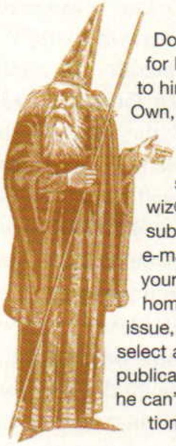
"I just spoke to Iron Brewer Wizard. It seems he is planning on making a 19th century candy with the molasses. Says he cannot imagine adding the sweet gooey syrup to beer and was shouting something about the rind hinds!"

"Most interesting, I taught the gals in the pen how to make pulled molasses candy in the 'Cooking for Cons' class I organized. This should be interesting with the Wizard's brew."

"And Ota, you dolt, I don't think he plans on serving this with pork rinds — the old coot was making reference to the German Beer Purity law! What is he brewing anyway?"

"It appears Martha, that the Wizard is making smoked amber ale."

Whatever style that you end up brewing, good luck to you in the upcoming competition!



Do you have a question for Mister Wizard? Write to him c/o 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 to questions personally. Sorry!

Flanders Oud Bruin

An "old brown" ale from two Belgian provinces

by Horst D. Dornbusch

The Flemish term Oud Bruin (old brown) always conjures up images in my mind of the picturesque cities of Brugge and Ghent, the two capitals of the modern Belgian provinces of West and East Flanders, respectively. Brugge means bridge in Flemish. In medieval times, between the 12th and 16th century, these two cities were fierce rivals, economically, politically and culturally. Both were textile centers and both were members of the Hanseatic League, a formal alliance of dozens of mercantile cities throughout Northern Europe that traded in anything of value, including wine, oil, grain, leather, cloth, copper, iron, dry goods, spices, salt and beer.

At one time, before the religious wars of the Reformation caused a general decline in economic activity in the 16th and 17th centuries, Ghent had the largest textile industry in Europe and was second only to Paris in population, while Brugge was regarded as the cultural center of the league. Ghent was the birthplace, in 1500, of the Hapsburg monarch Charles V, Emperor of the German Empire and King of Spain. Charles V was baptized in Ghent's St. Bavo Cathedral, which still stands today and houses what is now considered the most important Flemish painting, The Adoration of the Mystic Lamb, by the van Eyck brothers. While Flanders' powerful merchants ran the councils of the cities and looked after the burghers' economic prosperity, the region's arts, crafts, and culture flourished, and Flanders' guilds, especially the brewers' guild, became bastions of revolt against the exploitative labor practices of the prevailing feudal system. Happily, both Brugge's and Ghent's stately medieval mansions and public buildings have survived the many wars fought since in Europe and are today a testimony of Flanders' erstwhile Renaissance greatness.

Not a British Ale, Not a Lambic, Not an Alt

All the finer things of life, it seemed, passed through the hands of the Flanders merchants, which made them not only rich . . . but thirsty. After a day of counting their profits in the comptoirs, these good burghers of commerce may have congregated in the taverns, where, while contemplating their next big deal, they were indulged by the innkeepers with Carbonnade Flamande, a local beef stew cooked in beer, and tankards of fine ale.

The beers these early entrepreneurs poured down their avaricious and parched throats were typical of the brewing traditions that had by then evolved in the temperate climes of the lowlands of northwestern Europe. In those days, all the brews of Flanders were ales. Being close to the Atlantic Ocean, it just never got cold enough for lager fermentation in what are now Belgium, Holland and the Rhineland of Germany — unlike in Bavaria in the frigid foothills of the Alps, for instance, where lager-making had become firmly ensconced by the 16th century.

Because the malting techniques at the time yielded only darkish grains, the Flanders brews were also invariably darkish to reddish, not unlike British brown ales, Irish red ales or Düsseldorf alt. Flanders beers could be strong or mild, and more often than not they were infected with souring bacteria. They were drunk young or well aged. Sometimes they were even blended from young and old beer, reminiscent of the fabled "threads" that composed the original London Porter. Sometimes they were flavored with

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flanders ale by the numbers

OG	1.044–1.060 (11–15 °P)
FG	1.008–1.013 (2–3.25 °P)
SRM	10–20
IBU	15–25
ABV	4.8–6%

RECIPE

Flanders Brown Ale (5 gallons/19 L, all-grain)

OG = 1.049 FG = 1.012
IBU = 20 SRM = 16.4
ABV = 4.7%

Ingredients

- 5.0 lbs. (2.3 kg) pale Pils malt (1.5–2 °L)
- 1.26 lbs. (0.57 kg) 6-row pale brewers malt (1.7–2 °L)
- 1.89 lbs. (0.86 kg) Vienna malt (3–4 °L)
- 2.14 lbs. (0.97 kg) crystal malt (40 °L)
- 5.5 AAU German Hallertauer Mittelfrüh (1.4 oz./ 39 g of 4% alpha acid)
- 1 oz. (28 g) Saaz for aroma
- 2 cups French oak chips (medium-toast)
- 2 packages Wyeast 1388 (Belgian Strong Ale) or White Labs WLP550 (Belgian Ale) yeast
- 1 package Wyeast 4335 (Belgian *Lactobacillus*) bacteria
- ¾ cup dry malt extract (for priming)

Note that the total grain bill of 10.33 lbs. (4.7 kg) is based on a brew system with a nominal extract efficiency of approximately 65%. If your setup is better or worse, adjust the grain quantities accordingly. Original gravities (OG) may vary depending on your brand selection for grain and on your evaporation losses during the boil. Always use your hydrometer to verify the OG at the end of the boil and liquor your wort down to the target OG if necessary.

Step by Step

Mash in at approximately 125 °F (52 °C) for a 20-minute rest

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photo by charles a. parker

hydration, beta-glucan and protein rest. Using a combination of hot-water infusion and direct heat, raise the temperature to 144 °F (62 °C) for a 40-minute beta-amylase rest. Raise the temperature again to 162 °F (72 °C) for a 40-minute alpha-amylase rest. Recirculate the run-off for 15–20 minutes, until it runs clear; then start lautering and sparging, until the wort in the kettle reaches a gravity of approximately 1.48 (12°P).

Boil the wort for about 90 minutes. Add the bittering hops 15 minutes into the boil and the aroma hops 75 minutes into the boil. After shutdown, the wort should have evaporated sufficiently to be at or above the target original gravity. If not, liquor down to adjust. Stir the wort gently with a spatula to create a whirlpool effect. Then let the brew rest for at least 30 minutes (longer is better) to allow for sedimentation of the hot break and hop debris.

Siphon the wort off the trub and heat exchange it to the primary fermentation temperature of about 68 °F (20 °C), add 1 cup of French oak chips (medium-toast) and pitch one package of yeast as well as the package of bacteria. Because the bacteria have a longer lag time, the yeast will start primary fermentation and metabolize most of the sugars before the bacteria become active. Rack after two weeks, then again after four weeks, and add the second cup of French oak chips.

Pitch the second package of yeast and the priming agent into the still, racked brew and package immediately. Condition the finished beer in bottles or in a keg for another six weeks. The beer improves with longer conditioning and will keep for at least six months if stored in a cool and dark environment.

Flanders Brown Ale
(5 gallons/19 L, extract with grains)

OG = 1.049 FG = 1.012
IBU = 20 SRM = 16.4
ABV = 4.8%

Ingredients

3.85 lbs. (1.75 kg) pale Pils liquid malt extract
1.26 lb. (0.57 kg) 6-row pale brewers malt (approx. 1.7–2 °L)
1.89 lbs. (0.9 kg) Vienna malt (3–4 °L)
2.14 lbs. (0.97 kg) crystal malt (40 °L)
5.5 AAU German Hallertauer Mittelfrüh for bittering (approximately 1.4 oz./39 g of 4% alpha acid)
1 oz. (28 g) Saaz for aroma
2 cups French oak chips (medium-toast)
2 packages Wyeast 1388 (Belgian Strong Ale) yeast or White Labs WLP550 (Belgian Ale) yeast
1 package Wyeast 4335 (Belgian *Lactobacillus*) bacteria
¾ cup dry malt extract (for priming)

Note that the grain-to-extract equivalent of 7 lbs. (3.2 kg) liquid malt extract (LME) is based on a nominal LME solid content of approximately 80% and on a theoretical zero-contribution to gravity of the steeped grain. Original gravities (OG) may vary depending on your LME brand selection. Also, for convenience you may wish to use just an entire 6.6-lb. (3-kg) can of LME and accept a slightly smaller volume of wort. Always use your hydrometer to verify the OG at the end of the boil.

Step by Step

Replace the pale Pils malt from the all-grain recipe with the Pils LME. Place each of the milled specialty grains in a separate muslin bag. Steep them for about an hour in about 2 gallons (0.9 L) of approximately 190 °F (88 °C) water. Lift the bags and rinse with cold water, but without squeezing them. Heat the flavored and colored brewing liquor to the boiling point. Turn off the heat. Stir in the LME and fill the kettle to about five gallons (19 L). Bring it to a boil again. From here on, follow the equivalent instructions from the all-grain recipe.

continued from page 19

sour fruit, usually cherries.

Thus is the Flanders ale tradition that has come down to us. In typical Belgian fashion, these ales are now a diverse lot and there seems to be no right or wrong way of classifying them. There is only one characteristic that all have in common: Like the lambics of Brabant, Flanders ales are all fermented with both yeast and lactic bacteria, that is, they are all sour ales. Among the finer and readily available commercial examples of the breed are the Liefmans beers from Oudenaarde in East Flanders and the Rodenbach beers from Roeselare (Roulers, in French) in West Flanders.

Many authors draw complex stylistic distinctions between the brews from East and West Flanders and between their red, brown and dark as well as strong and mild variations. While such distinctions are interesting in theory, upon closer inspection they turn out to be fairly complicated and meaningless in practice, mostly because Flanders breweries themselves do not employ these style designations with any degree of consistency. Unless we want to get lost in endless nitty-gritty, perhaps we should take a more sanguine approach and just lump all red, brown and dark ales of Flanders, from both West and East, into one category and just call them Oud Bruin. Then we can accept that there are many different ways of brewing them.

Deconstructing Oud Bruin

A quick check of the standard homebrew literature and a "tour de Google" through the recipe offerings for Flanders ales on the net both confirm that this style is about as elusive as they come. The different specifications, grain bills, hop loadings and processes offered for this style are often so contradictory, in my view, that they fail to generate a coherent set of guidelines for the practical brewer. Therefore, in my own effort to tame this Oud Bruin beast, I have relied mostly on my trusty taste buds, on my practical brewing experience and the competent descriptions of the Flanders' beers and breweries by Michael Jackson, in his Great Beers of Belgium. From these, I propose the following broad generalizations:

•The typical sour Flanders ale tends to have a medium body and ranges in color from deep copper to ruby to brown.

•The brew's fruity-acidic sourness tends to be the dominant flavor, though some commercial breweries achieve a counterbalance to the tartness by eliminating all fermentation agents (both yeast and bacteria) from the finished brew through filtration and then adding sugar for a noticeable residual sweetness.

•The grain bill for an Oud Bruin appears to be a free-for-all. The beer may contain pils, six-row, Vienna, crystal, caramel, and roasted malts, as well as adjuncts and sugar. To my taste, too much roastiness in any sour brew conflicts with the brew's signature tartness. Therefore, to get the reddish-brownish color, I suggest a combination of Vienna and 40-Lovibond crystal. To supply the brew with a slightly tannic component I suggest about 15% six-row malt in the grain bill. For the brew's backbone of medium-body maltiness, I suggest a grain bed composed of about 50% neutral pale Pils malt.

•Some Flanders breweries use a multiple decoction mash, especially when adjuncts are part of the grain bill. Without adjuncts, though, a multi-step infusion mash appears to be sufficient.

•A certain hop character should always be present in an Oud Bruin, but it must be subtle, subdued and in the background. For my taste, an English hop variety like Goldings for bittering and an aromatic hop variety like Saaz or Hallertauer Mittelfrüh for the late addition stand up well in the sour Oud Bruin environment. Jackson reports that Liefmans uses Goldings and Saaz, while Rodenbach uses Brewers' Gold.

•One extract alternative is a kit beer from Brewferm called "Old Flemish Brown" or, as it reads on the can, "*Oud Vlaams Bruin.*"

•Because there is no malt extract on the market that replicates exactly the grain bill formulated for my all-grain and extract-plus-grain versions, I haven't included an extract-only recipe for this brew. In a pinch, experiment with a generic "Belgian ale" extract and use the fermentation and cellaring regimen suggested in the all-grain recipe. In fact, I have made a passable (in my view) extract-only Oud Bruin by simply mixing half-and-half Weyermann Pilsner and Oktoberfest liquid malt extract and adjusting the volume of brewing liquor to the requisite original gravity.

The Problem with Tart

Because an authentic commercial Oud Bruin is aged in oak vats or casks for up to two years, I always add about a cup of French oak chips (medium toast) to the primary fermenter and another cup to the aging carboy. Sterilize the chips for about 20 minutes in 180 °F (82 °C) water. For a stronger oak flavor, add the cooled sterilizing water to the brew. Note that this technique is only an imperfect substitute for real oak aging, because a carboy, unlike oak is impermeable. Oak allows some miniscule amount of air to penetrate into the beer, where the oxygen stimulates the production of a complex set of acids by certain strains of lactic bacteria, which otherwise would not materialize. For a discussion of the chemistry of acidification in beer, see Chris Colby's article "Sour Beer" in the October 2004 issue of *BYO*.

As a general rule, in the realm of Oud Bruin, the brew's value tends to increase with both the brew's age and blending lineage. To simulate this delightful fact in the homebrew environment, simply brew two batches of Oud Bruin in six-month intervals. When it's time to bottle the first batch, divert about 2 gallons (8 L) of the finished beer into a sterile container for further aging. When it's time to bottle the second batch, package only two gallons (eight liters) and blend the stored beer from the first batch into the second batch. Prime the blended beer, inoculate it with a fresh package of yeast and package it immediately. Let it age in the bottles or keg for at least another six months before drinking it, the longer the better.

Oud Bruins require great patience and can test a homebrewer's self-discipline because the best of Oud Bruins seem to take an eternity to ferment and mature from brew day to serving day. So here's a compromise that lets you have your beer and drink it too — simply taste-test the brew at a rate of one bottle or glass every two weeks and take notes on the brew's progress.

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

Cooking with Flanders Ale: Carbonnade Flamande

Ingredients

3.5 lbs. (1.6 kg) stewing beef (about 7 oz. (200 g) per person)
2 tablespoons Dijon-style mustard
1 tablespoon vinegar
2 large onions
1 bouquet garni (2 sprigs of thyme, 1 bay leaf, 3 sprigs parsley)
1.5 oz. (50 g) flour
4 tablespoons (50 g) butter
1 tablespoon sugar
1 clove garlic
1 qt. (~1 L) Flanders ale (or more)
salt and pepper to taste
2 slices old or toasted white bread
8 oz. (250 g) smoked bacon

Steps

In a Dutch oven, casserole or similar heavy pot, heat the butter. Fry the garlic in butter over low heat for about 5 minutes. Fry cubes of stew beef over high heat in the garlic-flavored butter. Remove and set aside. Dice the smoked bacon, fry over high heat in the pot. Remove and set aside. Peel and dice the onions. Fry until just golden brown (about 15 minutes). Add the sugar and keep frying until the onions caramelize. Remove and set aside.Deglaze the pot with the vinegar.

Return all ingredients to the pot and mix well. Dust the mixture with the flour. Add salt and pepper to taste. Mix again. Spread the slices of dry or toasted bread with mustard and slide underneath the meat and onions to the bottom of the pot. Place the bouquet garni in the center of the mixture and pour the beer into the pot. Use enough beer to immerse the dish. Cover the pot and cook in the oven forabout 3 hours at 300 °F (150 °C). If necessary, adjust heat to maintain a gentle boil. If the stew is too liquid at the end of the cooking time, reduce it quickly uncovered on the stove top over high heat. Serve hot, accompanied by boiled spring potatoes and pints of Oud Bruin.

FATHER'S DAY GIFT GUIDE

This Father's Day give him something he'll really use! Check out these businesses for great gift ideas for your dad or your own Father's Day wishlist.

STEEPing

GETTING THE GOODIES FROM YOUR GRAIN

Extract brewing is quick, (relatively) simple and can be done with a minimum of specialized equipment. However, there are still many options to consider. Most extract brewers steep some specialty grains when making their beers. (Specialty grains are those grains that do not have to be mashed, such as crystal malts, chocolate malts or dark roasted grains or malts.) Although steeping is a seemingly simple step, extract brewers perform this step in a variety of ways. These procedural differences influence what is (and isn't) extracted from their grains. This, in turn, can have a big influence on their beer's quality.

size matters

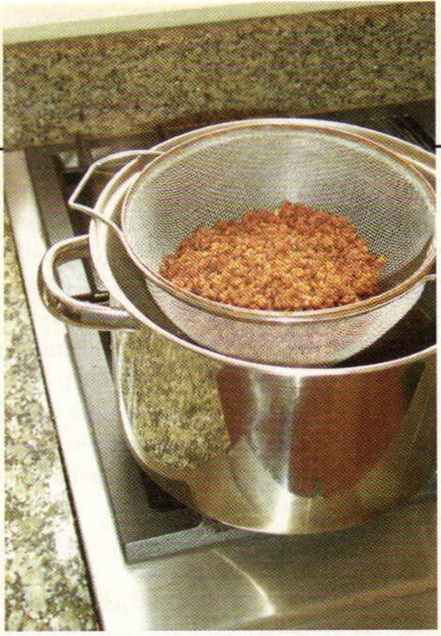
Many homebrewers fill their brewpot with as much water as it will reasonably hold, place their crushed grains in a steeping bag and dunk the bag in the pot. Although steeping grains in a full brewpot is simple, and widely practiced, it has one serious drawback.

When you steep a small amount of specialty grains in a relatively large amount of water, you will extract all the "goodies" from the grain very easily. The sugars from the grain will dissolve quickly and you'll extract a lot of color and flavors from the husk. Unfortunately, you'll also be extracting one thing you don't want — excess tannins. Tannins are compounds found in the husk. Tannins are required, in small amounts, in order for beer to taste like beer. In excess, however, they yield a character in beer that can be described as harsh, mouth-puckering, drying or astringent.

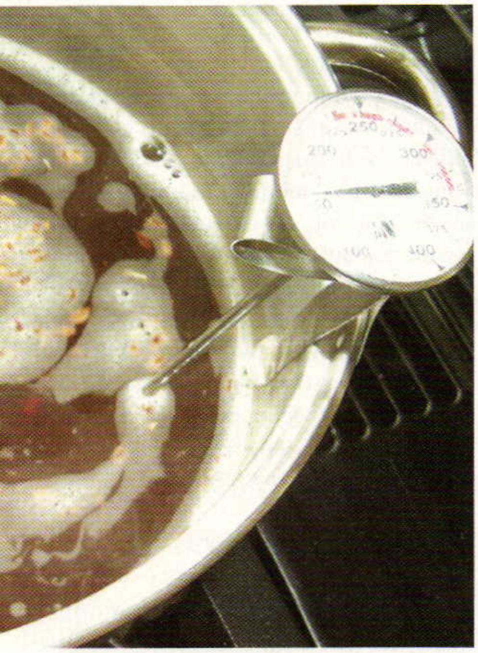
The reason that tannins are extracted by a "dilute steep" is that the pH of the water is too high. Water chemistry and pH are complicated topics. However, a practical homebrewer really doesn't need to know a lot about them when steeping grains if he or she keeps a few basic ideas in mind.

First of all, if you add grains (or malt extract) to pure water — water with no dissolved minerals in it, such as distilled or RO water — the pH of the solution will drop. In other words, the liquid in the grain and water mix will be more acidic than the water. A mixture of pure water and pale base malt (such as 2-row pale malt) will yield a pH around 5.6. A mix of pure water and darkly roasted specialty grains can show a pH as low as 4.0. If you add grains to tap water or bottled spring

story by **chris colby**



Specialty grains add color and flavor to extract brews. By steeping them in hot water, brewers extract sugars and flavored compounds from the husk. However, under the wrong conditions, excess tannins can be extracted — leading to astringent flavors in the beer. There are a variety of ways you can keep from extracting excess tannins while steeping. Most importantly, you need to keep the steeping liquid and rinse water fairly acidic.



photos by michael pollio

water, the pH will also drop. However, the minerals in the water will affect the pH compared to a situation in which pure water is used.

The pH of tap water varies quite a bit, but pH values in the 7–9 range are fairly common. If you were to combine 1.0 qt. (0.9 L) of water with 1.0 lb. (0.45 kg) of pale 2-row malt, you would have a fairly thick mixture of grain and water. The pH of the liquid in this mix would depend on a number of things (especially the amount of calcium and carbonate in the water), but would most likely be in the 5.2 to 6.0 range. (Waters that are high in calcium but low in carbonates would be on the low end. High carbonate, low calcium waters would yield higher numbers.) If you continued adding water to this mix, the pH would continue to rise and would eventually approach the pH of the base water. If you ended up with a swimming pool's worth of water for each grain, the grain would be doing little to influence the pH of the solution.

The second thing you need to know is that tannins are more easily extracted in solutions with higher pH values. In other words, the more acidic your steeping liquid is, the fewer tannins will be extracted.

Armed with only this knowledge, an obvious solution to lowering the amount of tannins you extract is to steep your grains in a volume of water such that the pH falls into a suitable range. Experience has shown that steeping grains at a ratio of 1 to 3 quarts of water per pound of grain (2.1–6.3 L/kg) works well. To calculate how much water to steep your grains in, multiply the weight times the volume of water corresponding to the ratio you desire. For example, lets say you have 0.75 lbs. of crystal malt and choose to go with a liquid to grain ratio of 2 qts. per pound. Just multiply 0.75 lb. times 2 qts./lb. and you would get your answer, 1.5 quarts of water.

You can go about steeping your grains in a smaller volume of water a couple ways. The first would simply be to add only the amount of water needed to your brewpot while steeping. Afterwards, you could add water to the full amount you plan to boil. This works fine, but if you have a second fairly large pot there is a better option. If you have a large soup pot or stockpot in addition to your brewpot, steep the grains in that pot while heating your brewing water in your brewpot. This way, once the steep is over, your brewing water is already hot.

steeping in dilute wort

Another easy way to avoid extracting excess tannin is to steep your specialty grains in dilute wort instead of water. Adding a small amount of malt extract to your steeping water will lower its pH and let you steep at much higher liquid to grain ratios. In fact, by adding just a small amount of malt extract, you can use the old "bag in your brewpot" method. The bare minimum amount of extract you need would depend on your water, but making a wort with a specific gravity over 1.010 should work for everybody. To reach this gravity, add 3.5 oz. (99 g) of dried malt extract for every gallon of wort in your steeping pot — the amount you plan on steeping the grains in, not the volume of the recipe.

is it getting hot in here?

Specialty grains are usually steeped in hot water. But how hot should that water be?

When steeping specialty grains, all you are doing is extracting compounds from the grain. You do not need to keep the grains within a narrow temperature range as you do when mashing base grains. If you are steeping within the 1-3 quarts per pound range, or steeping in dilute wort, you can steep at just about any temperature you want — from room temperature perhaps all the way up to boiling. And, in general, higher steeping temperatures extract the colors and flavors from the grains faster.

A smart bet for steeping grains is to steep them in the range that grains are mashed (148–162 °F/64–72 °C). With a reasonable liquid-to-grain ratio or a steep in dilute wort, you know you won't run into any problems with tannin extraction. And, more importantly, you will be heating the grains and liquid to roughly the same extent they would have been heated in a mash. In cooking, heating ingredients to different temperatures can yield different results. And, it's not too crazy to think that the liquid from a steep heated to, say, 190 °F (88 °C) will taste different than liquid from a steep heated to 150 °F (66 °C). Since many extract recipes are derived from all-grain recipes, steeping in the mashing range is a "safe" recommendation.

lather, rinse, repeat

Finally, after steeping the grains, you have a bag full of wet grains. What do you do with it? One answer is to simply lift the bag out of the "grain tea," let it drip dry and discard it. Many homebrewers do this and this is a very safe option. If you didn't extract an excess of tannins in your steep, there won't be any in your beer. However, when you skip the rinse, you do leave behind some "goodies" in the grain bag and so rinsing is an option.

When rinsing the grains in your grain bag, however, you face much the same dilemma as you did when steeping. You want to extract sugars, color and flavors, but not excess tannins, from the grain. And, as before, using larger volumes of water and hotter water is more likely to extract tannins.

One solution is to rinse with a limited amount of water. If you rinse with 0.5 qts. of water per pound of steeped grain (1 kg/L), or less, you should not run into any problems with tannins. Keep the temperature at (or below) the temperature you steeped at. Some homebrewers take this a step further and rinse with room temperature water. During the rinsing stage, you're only trying to rinse off liquid already extracted in the steep, so there's no reason to rinse with hot water.

If you are steeping your grains in a separate pot, there is another option that has one extra benefit. Remove the steeping bag and place it in a colander over your brewpot. Add hot water (at around steeping temperature) to your grain tea. The amount of water can be up to 2 quarts of water per pound of grain. For example, if you steeped a pound (0.45 kg) of crystal malt, add up to 2 quarts of water to your grain tea. Next pour the diluted grain tea through the grain bag. This will rinse a bit of stuff from the grains, but not extract any tannins as the dilute grain tea will have a reasonably high specific gravity. And, you will strain out any solid bits from the grain tea.

the skinny on steeping

So, when steeping specialty grains for an extract beer, limit the amount of water you use for steeping or steep in dilute wort. Keep the temperature within the range normally used for mashing and rinse with only a small amount of water.

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

by **Horst Dornbusch**

DARK COLOR without the Roasty Flavor USING SINAMAR® Liquid MALT COLOR

Most people associate dark color in beer with strong flavors and paleness with the opposite. And, if statistics and long-time trends are anything to go by, average beer drinkers — as opposed to homebrewers or craft beer lovers — do not like dark or strongly flavored beers. In fact, low-flavor brews hold at least an 80-percent market share in the United States. (The brewers of these products would likely vigorously disagree with that description of their products.) In a few countries that percentage is slightly lower, but in many more it is much higher. Virtually all beers designed for mass-market appeal are at the pale to straw-blond edge of the beer-color spectrum. No wonder the consumer has come to associate paleness in beer with mildness and lightness and darkness with assertiveness and heaviness.

As brewers, of course, we know that there is not necessarily a correlation between a beer's color and its flavor or alcoholic strength. For example, Duvel — the Belgian golden ale — is a pale straw color yet weighs in at 8.5% alcohol by volume (ABV). In contrast, Guinness Draught — which is just about jet black — is only 4.2% ABV.

We also know that brewing a dark beer that does not taste assertively chocolate, roasty or acrid can be difficult. This is because the darkness in beer comes from dark malts and dark malts are highly kilned and often roasted to the point of tasting burned. The intense roasting process not only darkens the malt, it also accentuates sharp, tannic bitter notes that stem mostly — though not exclusively — from the grain's husks. When these bitter notes are leached into the wort during mashing and lautering, a mouth-puckering sip of the resulting scorched liquid can cause an unexpected and unpleasant jolt to the palate — especially of those drinkers who do enjoy dark, strongly malty brews but dislike the acrid flavor components often associated with high-Lovibond malts.

photo courtesy of Horst Dornbusch

Each of these five beers comes from the same pale wort base. Increasing amounts of SINAMAR® were added to each beer going from left to right. In front is a bowl of the dark grain SINAMAR® is made from — dehusked Carafa® II (375–450 °L).

Debittered Beer Coloring

It is this realization that, in 1903, drove Johann Baptist Weyermann — the great-grandfather of Sabine Weyermann, co-president with her husband Thomas, of the Weyermann Malting Company in Bamberg, Germany — to come up with a beer-coloring product. Herr Weyermann invented a "de-bittered" liquid concentrate of roasted malt, which he called SINAMAR®. He derived the name from the Latin *sine amaro*, which means "without bitterness." For a century now, SINAMAR® has been used by hundreds of commercial breweries on four continents, from Mongolia to Norway to Japan to Brazil. It has been used to produce dark beers ranging from dunkel to schwarzbier to bockbier to dunkelweizen to porter to stout. In fact, the Guinness brewery has developed a modified version of the patented Weyermann process to make its own proprietary coloring agent for its style-setting stout. (Of course, Guinness Flavor Extract intentionally retains the roasty flavors from the dark grains.) Briess Industries, Inc. of Chilton, Wisconsin offers a super-condensed roasted-malt extract, which it calls Maltoferm®.

Color Help at Home

Until recently, these coloring agents have not been available to homebrewers. In 2004, however, Weyermann introduced its product in a size that is suitable for homebrewers. A small, plastic bottle containing 4 ounces by weight (110 g) or 3.2 fluid ounces (96 mL) in liquid measure. It is distributed to homebrew supply shops by Crosby & Baker of Westport, Massachusetts. (A few homebrew shops buy Maltoferm® in commercial quantities and repackage it for homebrewers.)

SINAMAR® is made entirely from unhopped, fermented wort that is extracted from a mash of nothing but de-husked Carafa® Special Type II roasted malt of roughly 375–450 °L. Therefore, Weyermann's color extract even conforms to the strict requirements of the Reinheitsgebot,

How SINAMAR® Is Made

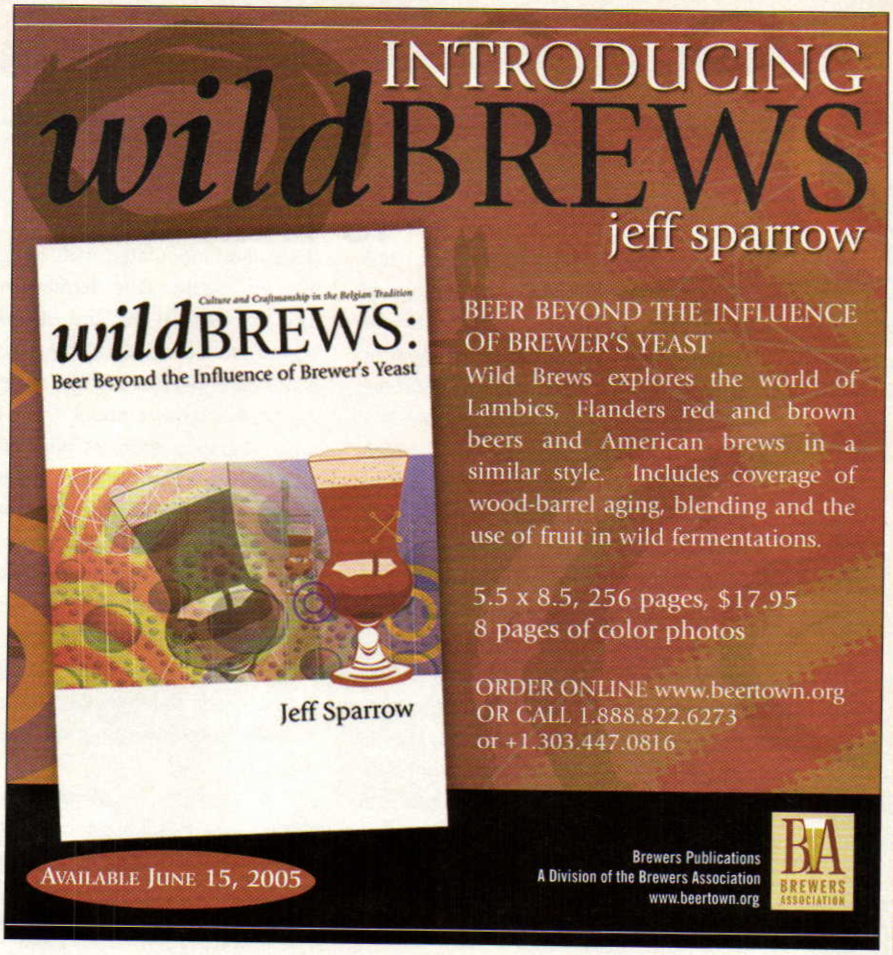
In the brewhouse of the Weyermann Malting Company in Bamberg, Germany, SINAMAR® is made in a sequence of stages in approximately 100-hectoliter (85-barrel/2,635-gallon) batches from intensely drum-roasted malted barley, which gives the product its dark color. However, because most of the harsh, unpleasant bitterness in severely roasted malts comes from the husks, these are mechanically removed from the raw barley by a special machine before the start of the malting process. This "de-bittered" malt is then turned into grist by a six-roller mill that can handle about 1,500 kg (3,300 lbs.) in eight minutes. The milled malt is then mixed with water in a heated mash tun fitted with a mash agitator. The mash rest lasts for three hours at a temperature of 118 °F (48 °C). This mash is lautered into the kettle to a starting gravity of about 1.040 (10 °P). Because of the density of the mash, recirculation and lautering are extremely slow and usually last about four hours combined, but it keeps many bitter substances in the grain from being leached into the kettle. This wort, of course, has next to no sugars, except from malting, because there are no active enzymes in roasted malt. (The 1.040 specific gravity is mostly due to dissolved solids other than sugars.)

After a 90-minute boil (without hopping), the result is 92 hectoliters (78 barrels/2,418 gallons) of wort at an original gravity of roughly 1.050 (12.5 °P). During the intensive boil, many of the unpleasant aroma substances are being driven off into the brew stack, the kettle's "exhaust pipe" for evaporation. After 40 minutes of whirlpooling, which drives additional bittering substances into the hot trub, the wort is heat-exchanged to 59 °F (15°C) and inoculated with bottom-fermenting yeast. One fermenter takes four batches. At the end of fermentation, the FG is about 1.040 (10 °P), the same as the kettle starting gravity, and its alcohol level is about 1.2% by volume. Because there is very little fermentable sugar in the wort, the fermentation is complete after no more than 36–48 hours. The result is an extremely dark, but essentially undrinkable, high final gravity, low-alcohol, roasted-malt beer. This brew now undergoes a sterile-filtration at a nominal porosity of 0.45 microns to remove all residual particulate and remaining bittering substances.

To become liquid malt color, the finished beer is sent to two 11-meter high (36 feet), two-stage vacuum columns for evaporation. To speed up evaporation and to sterilize the beer, the beer is heated to roughly 162 °F (72 °C). At this stage, any dissolved carbon dioxide (CO_2), much of the water, as well as all alcohol, and any remaining volatile oils and aromatics from the grain are literally pulled out of the brew. Evaporation continues until the brew has turned into a concentrated liquid with a gravity of roughly 1.192–1.224 (48–54 °P), at which point it is sterile-packed into hermetically sealed shipping canisters of 5, 10 and 30-L (1.32, 2.64 and 7.93-gallon) sizes for commercial breweries and into 3.2-fl. oz (96-mL) plastic bottles for homebrewers.

The entire SINAMAR® production process is fully automated and runs 24 hours a day, all year round, for an annual output of about a quarter million liters (about 200,000 gallons). To put this in perspective, this is enough SINAMAR® to make about 10% of all the beer brewed in the United States 1 SRM darker.

photo courtesy weyermann malting company



the German Beer Purity Law. (The Reinheitsgebot is still in effect for German-made beer for sale in Germany. However, the German goverment cannot enforce this law on imported beers nor German beers meant for export.)

This "roasted-malt beer" undergoes a two-stage vacuum-evaporation to become a highly pH-stable tincture that is as black and complex as espresso and has the consistency of vanilla extract. Because of its enormous concentration, SINAMAR® is a veritable color bomb with a SRM rating of roughly 3,000 to 3,200. (The switch in units from the Lovibond rating of Carafa® II to SRM in the extract made from it is due to the fact that ingredient color is measured in Lovibond, but beer color is measured in SRM.) It contributes darkness to the finished beer, but next to no bitterness or roasted notes. It can be added in the hot kettle or whirlpool. Alternatively, because it is packaged hot for sterility and produces no turbidity, it can also be added to the cold beer before fermentation or to the finished beer just before bottling or kegging. After opening a container, it may of course cease to be sterile. Partially used containers, therefore, should be refrigerated — or even frozen — and from that point on the liquid malt color ought to be added only to the hot brew kettle.

Styles and SINAMAR®

SINAMAR® can be used in conjunction with any beer style. (You can even color soft drinks, teas, spirits, or bread dough with it.) Modern malting techniques — according to Thomas Kraus-Weyermann, co-president with his wife Sabine of the Weyermann Malting Company — allow for the production of such super-pale Pils malt that many breweries now infuse even their blond Pilsners and Helles with just a touch of liquid malt color to give these beers a more golden hue.

There are several beer styles — notably dunkelweizen, Oktoberfestbier, Bavarian dunkel, Thuringian schwarzbier, bockbier, Märzen, and altbier — that come with contradictory brewing requirements. These beers demand that the brewer put some color and opacity into the beer while keeping acrid, burnt flavors out of it, because roasted notes would be completely out of character.

Not only German-style lagers, but British-style ales, too, such as porter, dark ale, Irish red, and stout, are often more appealing to certain drinkers, if they are brewed to be more drinkable, smooth, and pleasing. So, if roasted notes are not your mug of beer — or if the man or women in your life is not fond of burned flavors in the dark beers you make — try using a lighter hand in the darker-malt department. Consider substituting some or all of the caramel, chocolate or black malts with pale malt and then adding a smidgen of color extract for some de-bittered, easy-drinking, palate-friendly darkness. With this technique you are also likely to improve your system's mash efficiency, because you are replacing enzyme-poor with enzyme-rich grains.

Extract Brewing

For extract brewers, too, SINAMAR® makes it easy to brew different beers from your favorite pale malt extract. You can even make different beers from the same batch by apportioning the brew at racking-and-priming time into several smaller containers and then adding different amounts of color to these.

Addition Guidelines

A little liquid malt color goes a long way. The mixing guidelines from the Weyermann Malting Company specify the following quantities:

"14 grams or 11.9 milliliters of SINAMAR® make 1 hectoliter of beer or wort 1 EBC darker."

For the North American homebrewer, used to a different set of units, this translates into the following useful equations:

About 0.25 oz. (7 g) or 0.2 fl. oz. (6 mL) of SINAMAR® make 5 gallons (19 L) of wort or beer 1 SRM darker. To make a 5-gallon (19-L) batch of wort or beer 10 SRM darker, for instance, you need 2.5 ounces (70 g) or 2 fl. oz. (60 mL) of SINAMAR®.

An entire homebrew-size bottle of SINAMAR®, which contains 4 ounces by weight (110-g) or 3.2 fl. oz (96 mL) in liquid measure, makes one 5-gallon (19-liter) batch of wort or beer 16 SRM darker.

Horst Dornbusch is Brew Your Own*'s "Style Profile" columnist.*

Meet Maltoferm®

Briess Malt and Ingredients Co., of Chilton, Wisconsin, makes two forms of their coloring agent, Maltoferm®. Maltoferm A-6000 Liquid (Black Malt Extract) is a very dark liquid malt extract, rated at 3,000–5,000 °L. A dried malt extract, Maltoferm A-6001 Dry (Black Malt Extract) is also rated at 3,000–5,000 °L. The liquid is available in 5-gallon (19-L) pails and 55-gallon (208-L) drums, while the dry extract is available in 50-lb. (23-kg) bags. These sizes contain enough coloring agent to make over 2,000 gallons (7,571 L) of stout-colored beer (SRM 40). Obviously, this is not a convenient size for homebrewers. However, some large homebrew shops repackage Maltoferm® into smaller packages.

Maltoferm® differs from SINAMAR® in that it is a malt extract, not a beer. It is made from black malted barley and water. Either the liquid or dried extract can be added to the kettle for adjusting the color of a beer. If sterilized, it can be added post-fermentation for small color adjustments. For small color adjustments, it is flavor neutral.

The product literature says that a mere 1.3–1.5 oz. (37–43 g) of Maltoferm® per barrel (31 gallon/117 L) of beer will increase its color by one degree SRM. For a 5-gallon (19-L) batch of homebrew, this would amount to 0.21–0.24 oz. (6–7 g) of Maltoferm® to raise the color one degree SRM.

Brew Your Own

You can also make your own dark grain extract at home. See the Techniques article, "Blending," on page 47 of this issue.

classic 10 clones

There are a lot of new beers on the market these days. While new types of beer come (and sometimes go), many classic beers remain on the shelf and entice us back repeatedly — perhaps reminding us of why we began enjoying good beer in the first place. As part of Brew Your Own's year-long 10th anniversary celebration, we bring you 10 new homebrew formulations of 10 classic beers.

We used data from many sources — including our own measurements of the color and final gravity, published alcohol content, information from breweries websites and details from books such as "Michael Jackson's Beer Companion" (1997, Running Press) — combined with our own tasting notes and brewing experiences to come up with these clones.

For our extract brewing readers, we detail the brewing methods that are most likely to yield the best possible color and bitterness — but still allow the wort to be made on a stovetop. For best results, you should be able to bring 3 gallons (11 L) of wort to a rolling boil; we recommend using a 5-gallon (19 L) (or larger) stainless steel brewpot to allow ample space for foaming. Also, extract brewers should follow the steeping instructions as best they can — the temperatures and water volumes given are fairly specific because some base malts are used in these recipes. Steeping at different temperatures or in larger volumes of water, may result in starch haze.

A big part of the flavor and aroma of any beer comes from the yeast strain it is fermented with. For many of these clones, the recommended yeast strain is known or suspected of coming from the respective brewery. To get a representative performance from these yeast strains, we strongly suggest that you follow our yeast starter recommendations. For each recipe, we give a yeast starter size that should yield an adequate cell count. For every 1.0 qt. (0.95 L) of your starter, use approximately 6.2 oz. (0.18 kg) of dried malt extract. (This will yield a wort with an original gravity around 1.035.) Let the starter ferment for 2 or 3 days at room temperature, then discard the starter beer and pitch only the yeast. Making a starter takes some extra effort, but you'll thank us when your friends sample your clone and say, "This tastes like the real thing!"

Fuller's ESB Clone

(5 gallons/19 L, all-grain)
OG = 1.060 FG = 1.014
IBU = 35 SRM = 15 ABV = 5.9%

This is a clone of the bottled version of Fuller's ESB (5.9% ABV), the beer available in the US. There is also a cask version (at 5.5% ABV) available in England. Fuller's is a little darker and a little drier than its rival, Bass, and it shows a little more hop flavor. The biggest difference, however, is the distinctive character that derives from the yeast. The Fuller's website gives the types of hops used and the yeast strains listed below are reputed to be from Fuller's. With these yeast strains, you need to pitch an adequate amount of yeast or it may settle out before fermentation is complete.

Ingredients

9 lbs. 2 oz. (4.2 kg) English 2-row pale ale malt (3 °L)
2.0 lbs. (0.91 kg) flaked maize
1 lb. 2 oz. (0.51 kg) crystal malt (60 °L)
5.25 AAU Target hops (60 mins) (0.53 oz./15 g of 10% alpha acids)
2.6 AAU Challenger hops (60 mins) (0.34 oz./10 g of 7.5% alpha acids)
0.83 AAU Northdown hops (15 mins) (0.1 oz./2.7 g of 8.5% alpha acids)
1.66 AAU Goldings hops (15 mins) (0.33 oz./9.4 g of 5% alpha acids)
¼ tsp yeast nutrients
1 tsp Irish moss
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast (2 qt./2 L starter)
0.75 cups corn sugar (for priming)

Step by Step

Heat 15 qts. (14 L) of water to 165 °F (74 °C) and stir in crushed grains and flaked maize. Mash at 154 °F (68 °C) for 60 minutes. Stir boiling water into mash to boost temperature to 168 °F (76 °C) and hold for 5 minutes. Recirculate for 20 minutes then begin running off wort. Sparge with 170 °F (77 °C) water. Boil wort for 90 minutes, adding hops to boil for the times indicated in recipe. Add yeast nutrients and Irish moss with 15 minutes left in boil. Cool wort and transfer to fermenter. Aerate wort and pitch yeast. Ferment at 70 °F (21 °C). Rack to secondary when fermentation is complete. Bottle a few days later, when beer falls clear.

Fuller's ESB Clone

(5 gallons/19 L, extract with grains)
OG = 1.060 FG = 1.014
IBU = 35 SRM = 14 ABV = 5.9%

Ingredients

1.45 lbs. (0.66 kg) Muntons Light dried malt extract
4.0 lbs. (1.8 kg) John Bull Light liquid malt extract (late addition)
1 lb. 2 oz. (0.51 kg) English pale ale malt (3 °L)
1 lb. 2 oz. (0.51 kg) crystal malt (60 °L)
1 lb. 5 oz. (0.60 kg) corn sugar
5.25 AAU Target hops (60 mins) (0.53 oz./15 g of 10% alpha acids)
2.6 AAU Challenger hops (60 mins) (0.34 oz./10 g of 7.5% alpha acids)
0.83 AAU Northdown hops (15 mins) (0.1 oz./2.7 g of 8.5% alpha acids)
1.66 AAU Goldings hops (15 mins) (0.33 oz./9.4 g of 5% alpha acids)
¼ tsp yeast nutrients
1 tsp Irish moss
Wyeast 1968 (London ESB) or White Labs WLP002 (English Ale) yeast (2 qt./2 L starter)
0.75 cups corn sugar (for priming)

Step by Step

In a large soup pot, heat 3.4 quarts (3.2 L) of water to 165 °F (74 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 154 °F (68 °C) for 45 minutes. While grains steep, begin heating 2.25 gallons (8.5 L) of water in your brewpot. When steep is over, remove 1.1 qts. (1 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour grain tea (with water added) through grain bag. This will strain out any solid bits of grain and rinse some sugar from the grains. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minutes boil. With 15 minutes left in boil, add sugar, remaining hops, yeast nutrients and Irish moss. Then turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, cool wort and transfer to fermenter. Add water to make 5 gallons (19 L), aerate wort and pitch yeast. Ferment at 70 °F (21 °C). Rack to secondary when fermentation is complete. Bottle a few days later, when beer falls clear.

Guinness Draught Clone

(5 gallons/19 L, all-grain)
OG = 1.038 FG = 1.006
IBU = 45 SRM = 40 ABV = 4.2%

Guinness Draught, the kind found in widget cans or bottles, is an Irish dry stout. Guinness has a sharper roast character and more hop bitterness than Murphy's. The key to making a great clone is using roasted unmalted barley (or black barley) with a color rating around 500 °L. Do not use roasted barley (300 °L), roasted malt (500 °L) or black patent malt (500 °L). The yeast strains listed below are reputed to be from Guinness. Make sure the dark malt is crushed adequately, but not turned to powder or dust.

Ingredients

5.0 lbs. (2.3 kg) English 2-row pale ale malt
2.5 lbs. (1.1 kg) flaked barley
1.0 lb. (0.45 kg) roasted barley (500 °L)
12 AAU East Kent Goldings hops (60 min) (2.4 oz./68 g of 5% alpha acids)
Wyeast 1084 (Irish Ale) or White Labs WLP004 (Irish Ale) yeast (2 qt./2 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step

Heat 2.66 gallons (10 L) of water to 161 °F (72 °C) and stir in crushed grains and flaked barley. Mash at 150 °F (66 °C) for 60 minutes. Stir boiling water into grain bed until temperature reaches 168 °F (76 °C) and rest for 5 minutes. Recirculate until wort is clear, then begin running wort off to kettle. Sparge with 170 °F (77 °C) water. Boil wort for 90 minutes, adding hops with 60 minutes left in boil. Cool wort and transfer to fermenter. Aerate wort and pitch yeast. Ferment at 72 °F (22 °C). Rack to secondary when fermentation is complete. Bottle a few days later, when beer falls clear. If beer is kegged, consider pushing with a nitrogen blend (see the Jan-Feb 2005 issue for more information on this).

Guinness Draught Clone

(5 gallons/19 L, extract with grains)
OG = 1.038 FG = 1.006
IBU = 45 SRM = 40 ABV = 4.2%

Ingredients

14.5 oz. (411 g) Muntons Light dried malt extract
2.66 lbs. (1.21 kg) Muntons Light liquid malt extract (late addition)
1 lbs. 6 oz. (0.62 kg) English pale ale malt (3 °L)
10 oz. (0.28 kg) flaked barley
1.0 lb. (0.45 kg) roasted barley (500 °L)
12 AAU East Kent Goldings hops (60 min) (2.4 oz./68 g of 5% alpha acids)
Wyeast 1084 (Irish Ale) or White Labs WLP004 (Irish Ale) yeast (2 qt./2 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step

Place crushed grains and flaked barley in a steeping bag. In a large kitchen pot, heat 4.5 qts. (4.3 L) to 161 °F (72 °C) and submerge grain bag. Let grains steep for 45 minutes at around 150 °F (66 °C). While grains are steeping, begin heating 2.1 gallons (7.9 L) of water in your brewpot. When steep is over, remove 1.25 qts. (1.2 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour diluted grain tea through grain bag. Heat liquid in brewpot to a boil, then stir in dried malt extract and hops and begin the 60 minute boil. With 15 minutes left in boil, turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, cool wort and transfer to fermenter. Add water to make 5 gallons (19 L), aerate wort and pitch yeast. Ferment at 72 °F (22 °C). Rack to secondary when fermentation is complete. Bottle when beer falls clear.

Wang, Dang, Sweet Guinness Tang

To get that "Guinness tang," try this. After pitching the yeast to your stout, siphon 19 oz. of pitched wort to a sanitized 22 oz. bottle. Pitch bottle with a small amount of *Brettanomyces* and *Lactobacillus*. Cover bottle with aluminum foil and let ferment. When beer in bottle is done fermenting, pour it in a saucepan and heat to 160 °F (71 °C) for 15 minutes. Cool the beer and pour and pour it back in the bottle. Cap bottle and refrigerate. Add to stout when bottling or kegging.

Sierra Nevada Pale Ale Clone

(5 gallons/19 L, all-grain)
OG = 1.052 FG = 1.011
IBU = 37 SRM = 10 ABV = 5.3%

The Sierra Nevada website has tons of information about their flagship brew, including the new information that they now use Magnum hops. Use only fresh hops that have been stored correctly (frozen, preferably in an airtight container) for the best hop flavor and aroma.

Ingredients

9 lbs. 15 oz. (4.5 kg) 2-row pale malt
1.0 lb. (0.45 kg) crystal malt (40 °L)
2.5 AAU Magnum hops (60 mins) (0.18 oz./5.1 g of 12% alpha acids)
4.8 AAU Perle hops (60 mins) (0.7 oz./19 g of 7% alpha acids)
5 AAU Cascade hops (15 mins) (1.0 oz./28 g of 5% alpha acids)
0.75 oz. (21 g) Cascade hops (0 mins)
0.75 oz. (21 g) whole Cascade hops (dry hop)
1 tsp Irish moss
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast (1.5 qt./1.5 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

Heat 3.42 gallons (13 L) of water to 161 °F (72 °C), stir in crushed grains and mash at 150 °F (66 °C). Mash for 60 minutes then stir in boiled water to raise grain bed temperature to 168 °F (76 °C). Hold for 5 minutes. Recirculate until wort is clear (about 20 minutes), then begin running wort off to kettle. Sparge with 170 °F (77 °C) water. Boil wort for 90 minutes, adding hops at times indicated in recipe. Add Irish moss with 15 minutes left in boil. Cool wort and transfer to fermenter. Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Rack to secondary when fermentation is complete and add dry hops. Bottle when beer falls clear.

Sierra Nevada Pale Ale Clone

(5 gallons/19 L, extract with grains)
OG = 1.052 FG = 1.011
IBU = 37 SRM = 11 ABV = 5.3%

Ingredients

1.8 lbs. (0.82 kg) Briess Light dried malt extract
4.0 lbs. (1.8 kg) Briess Light liquid malt extract (late addition)
1.0 lb. (0.45 kg) 2-row pale malt
1.0 lb. (0.45 kg) crystal malt (40 °L)
2.5 AAU Magnum hops (60 mins) (0.18 oz./5.1 g of 12% alpha acids)
4.8 AAU Perle hops (60 mins) (0.7 oz./19 g of 7% alpha acids)
5 AAU Cascade hops (15 mins) (1.0 oz./28 g of 5% alpha acids)
0.75 oz. (21 g) Cascade hops (0 mins)

0.75 oz. (21 g) whole Cascade hops (dry hop)
1 tsp Irish moss
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast (1.5 qt./1.5 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

In a large soup pot, heat 3.0 quarts (2.8 L) of water to 161 °F (72 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 150 °F (66 °C) for 45 minutes. While grains steep, begin heating 2.4 gallons (9.1 L) of water in your brewpot. When steep is over, remove 0.83 qts. (0.78 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour grain tea (with water added) through grain bag. This will strain out any solid bits of grain and rinse some sugar from the grains. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minutes boil. With 15 minutes left in boil, add hops and Irish moss, then turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, add last charge of hops, cool wort and transfer to fermenter. Add water to make 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Rack to secondary when fermentation is complete and add dry hops. Bottle when beer falls clear.

Anchor Steam Clone

(5 gallons/19 L, all-grain)
OG = 1.051 FG = 1.013
IBU = 33 SRM = 12 ABV = 4.9%

Like Sierra Nevada Pale Ale, Anchor Steam is an American classic. Brewed with an interesting yeast strain that is usually used between typical lager and ale temperatures, Anchor Steam is a little darker and has a touch more caramel malt character to it. And, Anchor Steam has less hop bitterness and flavor than Sierra Nevada. Pitching enough yeast and holding fermentation temperatures constant will give your clone the right flavor and aroma.

Ingredients

9.66 lbs. (4.4 kg) 2-row pale malt
1.0 lbs. (0.45 kg) crystal malt (60 °L)
7 AAU Northern Brewer hops (60 mins) (0.8 oz./22 g of 9% alpha acids)
3.3 AAU Northern Brewer hops (15 mins) (0.4 oz./10 g of 9% alpha acids)
0.5 oz. (14 g) Northern Brewer hops (0 mins)
1 tsp Irish moss
Wyeast 2112 (California Lager) or White Labs WLP810 (San Francisco Lager) yeast (2 qt./2 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

Heat 3.33 gallons (12.6 L) of water to 165 °F (74 °C), stir in crushed grains and mash at 154 °F (68 °C). Mash for 60 minutes then stir in boiled water to raise grain bed temperature to 168 °F (76 °C). Hold for 5 minutes. Recirculate until wort is clear (about 20 minutes), then begin running wort off to kettle. Sparge with 170 °F (77 °C) water. Boil wort for 90 minutes, adding hops at times indicated in recipe. Add Irish moss with 15 minutes left in boil. Cool wort and transfer to fermenter. Aerate wort and pitch yeast. Ferment at 64 °F (18 °C). Rack to secondary when fermentation is complete. Bottle when beer falls clear.

Anchor Steam Clone

(5 gallons/19 L, extract with grains)
OG = 1.051 FG = 1.013
IBU = 33 SRM = 13 ABV = 4.9%

Ingredients

1.875 lbs. (0.85 kg) Northwestern Gold dried malt extract
3.75 lbs. (1.7 kg) Northwestern Gold liquid malt extract (late addition)
1.0 lb. (0.45 kg) 2-row pale malt
1.0 lb. (0.45 kg) crystal malt (60 °L)
7 AAU Northern Brewer hops (60 mins) (0.8 oz./22 g of 9% alpha acids)
3.3 AAU Northern Brewer hops (15 mins) (0.4 oz./10 g of 9% alpha acids)
0.5 oz. (14 g) Northern Brewer hops (0 mins)
1 tsp Irish moss
Wyeast 2112 (California Lager) or White Labs WLP810 (San Francisco Lager) yeast (2 qt./2 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

In a large soup pot, heat 3.0 quarts (2.8 L) of water to 165 °F (74 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 154 °F (68 °C) for 45 minutes. While grains steep, begin heating 2.25 gallons (8.5 L) of water in your brewpot. When steep is over, remove 1 qt. (0.9 L) of water from brewpot and add to the "grain tea" in steeping pot. Place a colander over your brewpot and place your steeping bag in it. Pour grain tea (with water added) through the grain bag. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minutes boil. With 15 minutes left in boil, add hops and Irish moss. Then turn off heat and stir in liquid malt extract well, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, add last charge of hops, then cool wort and transfer to fermenter. Add water to make 5 gallons (19 L), aerate wort and pitch yeast. Ferment at 64 °F (18 °C). Rack to secondary when fermentation is complete. Bottle when beer falls clear.

Orval Trappist Ale Clone

(5 gallons/19 L, all-grain)
OG = 1.059 FG = 1.002
IBU = 33 SRM = 12 ABV = 6.2%

Orval pours orange-brown with a big, rocky head. The very spritzy levels of carbonation and lightly sour character make the beer feel prickly on the tongue. Orval beer is distinctly dry and has little hop bitterness or flavor, although it is the only Trappist ale to be dry hopped. You'll really taste the pale malt base, so don't use US, German or English malts for this.

Ingredients

6.25 lbs. (2.8 kg) Belgian pale ale malt
2.5 lbs. (1.1 kg) Vienna malt (60 °L)
0.25 lbs. (0.11 kg) crystal malt (160 °L)
1.75 lbs. (0.79 kg) cane sugar
7.5 AAU Hallertau-Hersbrücker hops (60 mins) (1.9 oz./53 g of 4% alpha acids)
2.5 AAU Styrian Goldings hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
0.33 oz. (9.4 g) Styrian Goldings hops (dry hops)
¼ tsp. yeast nutrients
Wyeast 3522 (Belgian Ardennes) or White Labs WLP530 (Abbey Ale) yeast (1.5 qt./1.5 L yeast starter)
Wyeast 3526 (*Brettanomyces lambicus*) or White Labs WLP650 (*Brettanomyces bruxellensis*) yeast
1.2 cups corn sugar (for priming)

Step by Step

Heat 2.8 gallons (10.6 L) of water to 164 °F (73 °C), stir in crushed grains and mash at 153 °F (67 °C). Mash for 60 minutes then stir in boiled water to raise grain bed temperature to 168 °F (76 °C). Hold for 5 minutes. Recirculate until wort is clear, then begin running wort off to kettle. Sparge with 170 °F (77 °C) water. Boil wort for 90 minutes, adding hops at times indicated in recipe. Add sugar and yeast nutrients with 15 minutes left in boil. Cool wort and transfer to fermenter. Aerate wort and pitch beer yeast. Ferment at 70 °F (21 °C). Rack to secondary when fermentation is complete and add *Brettanomyces* and dry hops. Let condition for 2 months before bottling. Bottle in heavy bottles.

Orval Trappist Ale Clone

(5 gallons/19 L, extract with grains)
OG = 1.059 FG = 1.002
IBU = 33 SRM = 12 ABV = 6.1%

Ingredients

1.75 lbs. (0.79 kg) Coopers Light dried malt extract
2.25 lbs. (1.0 kg) Coopers Light liquid malt extract
2.0 lbs. (0.91 kg) Belgian pale ale malt
13 oz. (0.37 kg) Vienna malt (6 °L)
0.25 lbs. (0.11 kg) crystal malt (160 °L)
1.75 lbs. (0.79 kg) cane sugar
7.5 AAU Hallertau-Hersbrücker hops (60 mins) (1.9 oz./53 g of 4% alpha acids)
2.5 AAU Styrian Goldings hops (15 mins) (0.5 oz./14 g of 5% alpha acids)
0.33 oz. (9.4 g) Styrian Goldings hops (dry hops)
¼ tsp. yeast nutrients
Wyeast 3522 (Belgian Ardennes) or White Labs WLP530 (Abbey Ale) yeast (1.5 qt./1.5 L yeast starter)
Wyeast 3526 (*Brettanomyces lambicus*) or White Labs WLP650 (*Brettanomyces bruxellensis*) yeast
1.2 cups corn sugar (for priming)

Step by Step

In a large soup pot, heat 4.6 quarts (4.4 L) of water to 164 °F (73 °C). Add crushed grains to grain bag and steep around 153 °F (67 °C) for 45 minutes. While grains steep, begin heating 2.1 gallons (7.8 L) of water in your brewpot. When steep is over, remove 1.5 qts. of water from brewpot and add to the "grain tea" in steeping pot. Place a colander over your brewpot and place your steeping bag in it. Pour grain tea (with water added) through the grain bag. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minutes boil. With 15 minutes left in boil, add hops, sugar and yeast nutrients. Then turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, add last charge of hops, then cool wort and transfer to fermenter. Add water to make 5 gallons (19 L), aerate wort and pitch yeast. Ferment at 64 °F (18 °C). Rack to secondary and add *Brettanomyces* and dry hops. Let condition for 2 months before bottling. Bottle in heavy bottles.

Duvel Clone

(5 gallons/19 L, extract with grains)
OG = 1.072 FG = 1.006
IBU = 30 SRM = 5 ABV = 8.5%

Duvel is the classic Belgian golden ale. Although it is very strong (8.5% ABV), the beer is extremely light in color and dry in taste. The dense, white head that sits above the beer lasts until the beer is done. In the US, bottles of Duvel often show some oxidation in the aroma. Brewing it fresh at home gives you a glimpse of what it tastes like in Belgium. The yeast will not have an easy job here; they are dealing with a high-gravity, high-adjunct wort. Help them (and yourself) out by making a big yeast starter for a high cell count at pitching.

Ingredients

1.8 lbs. (0.82 kg) Coopers Extra Light dried malt extract
3.5 lbs. (1.6 kg) Coopers Light liquid malt extract (late addition)
3.0 lbs. (1.4 kg) Pilsner malt
1 lb. 11 oz. (0.77 kg) corn sugar (kettle)
11 oz. (0.31 g) corn sugar (dosage)
6 AAU Styrian Goldings hops (60 mins) (1.2 oz./34 g of 5% alpha acids)
3.75 AAU Saaz hops (15 mins) (0.93 oz./27 g of 4% alpha acids)
0.75 oz. (21 g) Saaz hops (0 mins)

¼ tsp yeast nutrients (kettle)
1/16 tsp ("a pinch") yeast nutrients (dosage)
1 tsp Irish moss
Wyeast 1388 (Belgian Strong Ale) or White Labs WLP570 (Belgian Golden Ale) yeast (3 qt./3 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

In a large soup pot, heat 4.5 quarts (4.3 L) of water to 161 °F (72 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 150 °F (66 °C) for 45 minutes. While grains steep, begin heating 2.1 gallons (7.8 L) of water in your brewpot. When steep is over, remove 1.5 qts. (1.4 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour diluted grain tea through grain bag. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minute boil. With 15 minutes left in boil, add kettle sugar, hops and Irish moss, then turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, add last charge of hops, cool wort and transfer to fermenter. Add water to make 5 gallons (19 L), aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Rack to secondary and add dosage sugar. Bottle when beer falls clear.

All-grain option

Replace grains and extracts with 10.5 lbs. (4.8 kg) Pilsner malt, 8.5 oz. (0.24 kg) CaraPils malt, 1 lb. 11 oz. (0.77 kg) corn sugar (kettle) and 11 oz. (0.31 g) corn sugar (dosage). In your kettle, mash in to 131 °F (55 °C) and heat the mash slowly, over 15 minutes, to 140 °F (60 °C). Add boiling water to raise temperature to 148 °F (64 °C) and hold for 60 minutes. Mash out to 168 °F (76 °C). Boil for 90 minutes, following remaining instruction in extract recipe.

Paulaner Hefe-Weizen Clone

(5 gallons/19 L, extract with grains)
OG = 1.053 FG = 1.010
IBU = 18 SRM = 5 ABV = 5.6%

Paulaner Hefe-Weizen is a well-balanced example of a hefe-weizen. Follow the mash details and watch your fermentation temperatures to get the much sought after "breadiness" and banana/clove aroma of a German hefe-weizen. Prost!

Ingredients

1.5 lbs. (0.68 kg) Briess dried wheat malt extract
3.75 lbs. (1.7 kg) Weyermann Bavarian Hefeweizen light liquid wheat malt extract (late addition)
2.1 lbs. (0.95 kg) wheat malt
0.91 lbs. (0.41 kg) Pilsner malt
4.75 AAU Hallertau-Hersbrücker hops (1.2 oz./34 g of 4% alpha acids)
Wyeast 3638 (Bavarian Wheat) or White Labs WLP380 (Hefeweizen IV) yeast (1.5 qt./1.5 L yeast starter)
1.2 cups corn sugar (for priming)

Step by Step

In a large soup pot, heat 4.5 quarts (4.3 L) of water to 169 °F (76 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 158 °F (70 °C) for 45 minutes. While grains steep, begin heating 2.1 gallons (7.8 L) of water in your brewpot. When steep is over, remove 1.5 qts. (1.4 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour diluted grain tea through grain bag. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minutes boil. With 15 minutes left in boil, turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, cool wort and transfer to fermenter. Add water to make 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Rack to secondary when fermentation is complete. Bottle a few days later, when beer falls clear.

All-grain option

Replace grains and extract with 7.5 lbs. (3.4 kg) wheat malt and 3.25 lbs. (1.5 kg) Pilsner malt. Use a single decoction mash with a 30 minute rest at 131 °F (55 °C) and a 45 minute rest at 153 °F (67 °C). Boil for 120 minutes.

Pilsner Urquell Clone

(5 gallons/19 L, extract with grains)
OG = 1.048 FG = 1.014
IBU = 40 SRM = 7 ABV = 4.4%

Brewed in Plzen, Czechoslovakia, Pilsner Urquell is the original Pilsner beer. For the best results, brew this clone with soft water.

Ingredients

1.0 lb. (0.45 kg) Laaglander Light dried malt extract
3.75 lbs. (1.7 kg) Coopers Light liquid malt extract (late addition)
1.75 lbs. (0.79 kg) Pilsner malt
0.5 lbs. (0.23 kg) Vienna malt
0.25 lbs. Munich malt (10 °L)
0.5 lbs. (0.23 kg) CaraPils malt
8.75 AAU Cluster hops (60 mins) (1.3 oz./38 g of 6.5% alpha acids)
3.75 AAU Saaz (Zatek) hops (15 mins) (0.93 oz./27 g of 4% alpha acids)
0.75 oz. (21 g) Saaz (Zatek) hops (0 mins)
1 tsp Irish moss
Wyeast 2001 (Urquell Lager) or White Labs WLP800 (Pilsner) yeast (3 qt./3 L starter)
0.75 cup corn sugar (for priming)

Step by Step

In a large soup pot, heat 4.5 quarts (4.3 L) of water to 169 °F (76 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 158 °F (70 °C) for 45 minutes. While grains steep, begin heating 2.1 gallons (7.8 L) of water in your brewpot. When steep is over, remove 1.5 qts. (1.4 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour grain tea (with water added) through grain bag. This will strain out any solid bits of grain and rinse some sugar from the grains. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minute boil. Add other hop charges at times indicated.

With 15 minutes left in boil, add Irish moss. Then turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, cool wort, transfer to fermenter and top up to 5 gallons (19 L) with water. Aerate wort and pitch yeast. Ferment at 70 °F (21 °C). Rack to secondary and lager for at least five weeks at 40 °F (4.4 °C) or below.

All-grain option

Replace grains and extracts listed above with 8.0 lbs. (3.6 kg) Pilsner malt, 1.0 lb. (0.45 kg) Vienna malt, 0.5 lbs. (0.23 kg) Munich malt (10 °L) and 0.5 lbs. (0.23 kg) CaraPils malt. Perform a single decoction mash with a 15 minute rest at 131 °F (55 °C) and a 45 minute rest at 155 °F (68 °C). Boil wort for 90 minutes.

Warsteiner Premium Varum Clone

(5 gallons/19 L, extract with grains)
OG = 1.046 FG = 1.009
IBU = 33 SRM = 4 ABV = 4.8%

Warsteiner is a well-known German Pilsner. This light-colored lager has a more rounded, less crisp, malt profile compared to Bitburger. Treat your yeast well to reach the fairly low final gravity of this beer.

Ingredients

1.35 lbs. (0.61 kg) Coopers Extra Light dried malt extract
3.75 lbs. (1.7 kg) Weyermann Bavarian Pilsner liquid malt extract (late addition)
1.7 lbs. (0.77 kg) Pilsner malt
0.25 lbs. (0.11 kg) CaraPils malt
6.65 AAU Magnum hops (60 mins) (0.48 oz./13 g of 14% alpha acids)
2 AAU Tettnang hops (15 mins) (0.5 oz./14 g of 4% alpha acids)
2 AAU Hallertau-Hersbrücker hops (15 mins) (0.5 oz./14 g of 4% alpha acids)
0.25 oz. (7 g) Hallertau-Hersbrücker hops (0 mins)
0.25 oz. (7 g) Saaz hops (0 mins)
1 tsp Irish moss
Wyeast 2124 (Bohemian Lager) or White Labs WLP830 (German Lager) yeast (4 qt./4 L yeast starter)
⅞ cup corn sugar (for priming)

Step by Step

In a large soup pot, heat 3.0 quarts (2.0 L) of water to 167 °F (75 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 156 °F (69 °C) for 45 minutes. While grains steep, begin heating 2.4 gallons (9.0 L) of water in your brewpot. When steep is over, remove 1.0 qt. (0.9 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour grain tea (with water added) through grain bag. This will strain out any solid bits of grain and rinse some sugar from the grains. Heat liquid in brewpot to a boil, then stir in dried malt extract, add first charge of hops and begin the 60 minute boil. Add other hop charges at times indicated. With 15 minutes left in boil, add Irish moss. At end of boil, turn off heat and stir in liquid malt extract. Stir well to dissolve extract, and let hot wort sit (covered) for 15 minutes before cooling. Cool wort and transfer to fermenter. Add water to make 5 gallons (19 L), aerate wort and pitch yeast. Ferment at 55 °F (13 °C). Rack to secondary and lager for at least five weeks.

All-grain option

Replace the grains and extracts above with 9.0 lbs. (4.1 kg) Pilsner malt and 6.0 oz. (170 g) CaraPils malt. Use a step infusion mash with 15 minute rests at 131 °F (55 °C) and 140 °F (60 °C) and 45 minute rest at 149 °F (65 °C). Boil wort for 90 minutes.

Celebrator Clone

(5 gallons/19 L, extract with grains)
OG = 1.073 FG = 1.021
IBU = 22 SRM = 30 ABV = 6.7%

This massively malty Bavarian doppelbock is darker than Salvator and shows a distinct chocolate malt character. Brew now for winter.

Ingredients

2.75 lbs. (1.25 kg) Laaglander Light dried malt extract
5.33 lbs. (2.42 kg) Weyermann Bavarian Dunkel liquid malt extract (late addition)
1.33 lbs. (0.6 kg) Munich malt (10 °L)
1.33 lbs. (0.6 kg) Munich malt (20 °L)
0.33 lbs. (0.15 kg) chocolate malt
6 AAU Hallertau hops (60 mins) (1.5 oz./42 g of 4% alpha acids)
1 tsp Irish moss
Wyeast 2206 (Bavarian Lager) or White Labs WLP820 (Octoberfest/Märzen) yeast (4 qt./4 L yeast starter)
0.75 cups corn sugar (for priming)

Step by Step

In a large soup pot, heat 4.4 quarts (4.2 L) of water to 169 °F (76 °C). Add crushed grains to grain bag. Submerge bag and let grains steep around 158 °F (70 °C) for 45 minutes. While grains steep, begin heating 2.1 gallons (7.8 L) of water in your brewpot. When steep is over, remove 1.5 qts. (1.4 L) of water from brewpot and add to the "grain tea" in steeping pot. Place colander over brewpot and place steeping bag in it. Pour grain tea (with water added) through grain bag. This will strain out any solid bits of grain and rinse some sugar from the grains. Heat liquid in brewpot to a boil, then stir in dried malt extract, add hops and begin the 60 minute boil. With 15 minutes left in boil, add Irish moss. Then turn off heat and stir in liquid malt extract. Stir well to dissolve extract, then resume heating. (Keep the boil clock running while you stir.) At the end of the boil, cool wort and transfer to fermenter. Add water to make 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 55 °F (13 °C). When fermentation is complete, allow temperature to rise to 60 °F (16 °C) for two days, then rack to secondary and cool to 40 °F (4.4 °C). Lager for at least six weeks, then bottle or keg.

All-grain option:

Replace the extracts and malts given above with 10.2 lbs. (4.6 kg) Pilsner malt, 2.33 lbs. (1.05 kg) Munich malt (10 °L), 2.33 lbs. (1.05 kg) Munich malt (20 °L) and 0.5 lbs. (0.23 kg) chocolate malt. Perform a single decoction mash with a 15 minutes rest at 131 °F (55 °C) and a rest at 158 °F (70 °C) for 45 minutes. Boil wort for 90 minutes.

Rauchbear
by Mark Ryan
(5 gallons/19 L, all-grain)
OG = 1.058 FG = 1.016
IBUs = 11 SRM = 21 ABV = 5.7%

This beer took First Place in the Classic Rauchbier category at the 2001 Alaska State Fair Homebrew Competition.

Ingredients
3.0 lbs. (1.4 kg) DeWolf Cosyns Pilsner malt
3.75 lbs. (1.7 kg) Weyermann's smoked malt
3.5 lbs. (1.6 kg) Weyermann's Munich malt (6 °L)
1.25 lbs. (0.57 kg) Carapils malt
1.25 lbs. (0.57 kg) Caramunich® Malt (75 °L)
4 AAU Spalt pellet hops (30 mins) (1 oz./28 g of 4% alpha acids)
Wyeast 2206 (Bavarian Lager) yeast

Step by Step
Prepare mash using 1 tsp. lactic acid. Mash all grains for 60 minutes at 154 °F (68 °C). Sparge to brewkettle, adding 1 more tsp. lactic acid to the sparge. Heat wort toward boil. Boil for 60 minutes, add Spalt hops after 30 minutes. At end of boil, remove from heat and chill wort. Pitch yeast and primary ferment for 14 days at 52 °F (11 °C), then secondary ferment for 14 days at 65 °F (18 °C), both in glass. Artificially carbonate in soda kegs.

Birch Sap Lager
by Jay Levell
(5 gallons/19 L, extract)
OG = 1.052 FG = 1.013
IBU = 37 SRM = 3 ABV = 5.1%
(stats do not take birch sap into account)

This recipe is from the Specialty/-Experimental/Historical category of the GNBC recipe book and is of local interest.

Ingredients
5.8 lbs. extra light dried malt extract
6.9 AAU Northern Brewer whole hops (60 mins) (0.76 oz./22 g of 9% alpha acids)
4.0 AAU Hallertauer whole hops (30 mins) (1.0 oz./28 g of 4% alpha acids)
5.0 gallons (19 L) birch sap
White Labs WLP820 (Octoberfest/Märzen) yeast

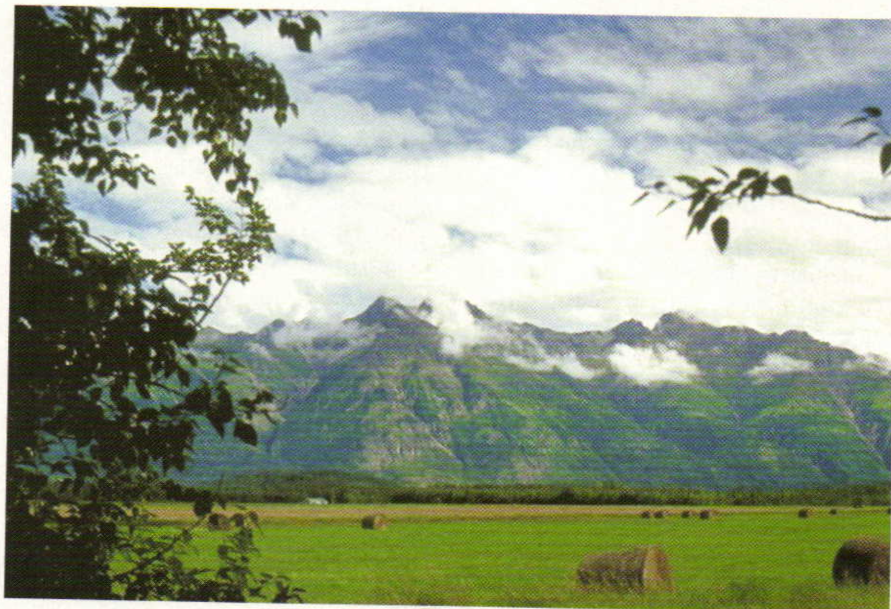
Step by Step
Heat birch sap slowly and bring to boil. Add malt extract. Bring to boil. Total boil time is 60 minutes. At boil, add Northern Brewer hops. Pitch Hallertauer hops at final 30 minutes of boil. At final 15 minutes of boil, add Irish Moss for clarity. At end of boil, chill wort and pitch yeast. Primary ferment for 10 days at 63 °F (17 °C) Secondary ferment for 2.5 months at 46 °F (7.7 °C). Cold filter and serve from a keg.

THE ALASKAN GOLD RUSH in the late 1800s brought breweries to the southeastern part of the state to help quench the thirst of the miners. Over 100 years later, while most of the gold might be gone, brewpubs, microbreweries and homebrewers are there to stay.

"The Gold Rush brought people to Alaska, and the people brought their desire for beer and other beverages," says Pete Devaris, a local homebrewer with a passion for spruce beer.

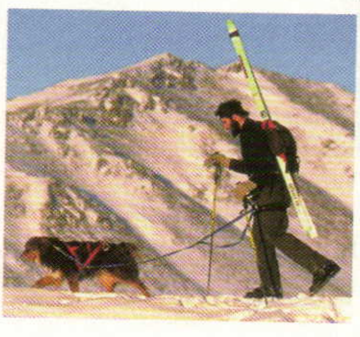
This big state with a small population has kept a big appetite for all things beer. The U.S. Census Bureau estimated the 2003 Alaskan drinking-age population to be around 420,000. Despite these numbers, the state has been able to support 12 microbreweries and brewpubs, according to *Anchorage Press* beer columnist James Roberts, who's known as Dr. Fermento to his readers. In addition, the greater-Anchorage area supports quite a saturated beer information market, with two beer columnists who tap out a total of 78 installments of their columns annually.

"It's a pretty incestuous industry," says Roberts. "If you take my 52 pieces, and Dawnell Smith's 26 for the *Anchorage Daily News*, plus occasional coverage by other media types and divide it by the [Anchorage] population — 265,000 — that's a pretty big interest."



photos courtesy of Travel Alaska

AlaSkan brewing



story by **jeff kane**

Homebrewer's Paradise

Locals all agree that the homebrewing scene thrives despite the distance from the U.S. mainland. "We've got the best homebrew shop I've ever been to," says homebrewer Jason Ditsworth, a past president of the Anchorage-based Great Northern Brewers Club (GNBC). "People come up here all the time and say, 'Man, I wish I had place like this!' Arctic Brewing Supply, the store, has got a mailing list of like 1,000 people, and our club [the GNBC] has 150 members."

And homebrewing, like pretty much everything else in Alaska, is done just a little bit different from how people do it in the lower 48.

"Homebrewing has always been a steady thing up here," says GNBC member Breck Tostevin. "People like to make their own things. There are all sorts of adventurous people in Alaska." Roberts agrees. "To live here, you have to be different, you have to be a survivalist, a bolder soul," he says. "We're not afraid to experiment, break limits and brew different styles."

Two unusual styles that have become especially prominent in Alaska are smoke-flavored beers and spruce beers.

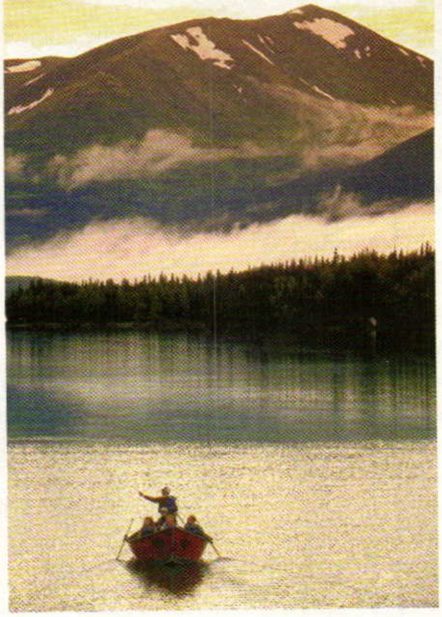
Spruce on the Loose

Spruce beers have a rich history as America's oldest indigenous style, according to Devaris. He says the pilgrims began the style as a way to make easy, inexpensive beer.

"They didn't have barley or hops, and other typical ingredients were expensive to import from England," he says. "They were desperate to make beer out of anything they could get their hands on, and spruce worked perfectly because it was free, abundant and full of sugar."

Gold miners, on the move up the West Coast, were likely forced to use spruce in their beers for the same reasons.

"Spruce is a regional item," Devaris says, "and you won't find any of it in the Great Plains or say, Kansas. However, once you hit the West Coast, it's everywhere from Kodiak Island down to southern Oregon. All around that route, miners traveling up to Alaska were surrounded by spruce, so



the style's prominence here clearly goes back to the Gold Rush days in southeast Alaska." Devaris says the tips of the trees, when harvested and used correctly, impart a "floral, orangey, citrus flavor on the beer."

"Real spruce beers use tips harvested in a seven to 10 day window in springtime," he says. "However, there have been a lot of attempts to brew them without the connection to their history, and to make them any other way can be wretched."

Hence, Devaris' calling. "I'm just trying to revive the style," he claims, modestly. "The misinformation on the Internet and elsewhere has hurt the style. People think it's going to taste piney and resiny like PineSol, but it really tastes nothing like that, if made correctly." Devaris has used spruce tips in all sorts of styles.

"I try to showcase the spruce in light, less hoppy beers, but will use it in everything from Russian Imperial Stouts to Bohemian Lagers," he says. "It lends itself to many styles, but once you get into big heavy stouts, the flavor is less descript."

Smokey the Beer

And while Alaskan homebrewers don't limit themselves to brewing only certain styles, another "very Alaskan" style, according to Devaris and others, is smoke-flavored beer. This style, like spruce, has an historical appeal to brewers and drinkers alike.

"In the 1400s and 1500s, the only way brewers could get their wet malt to dry was by heating it," says homebrewer Steve Schmitt. "They couldn't separate the heat from the smoke, so historically, all beers were smoky. Finally, in industrial times, they could heat malt without the smoke."

The renewed interest in the style came both from Alaskans who smoke meats and fish, and from a tasty Smoked Porter created by the Alaskan Brewing Company, based in Juneau. Smoke-flavored beers also have a history in Germany, where cities such as Bamberg are known for their rauchbiers.

There are two different ways to make a smoked beer, according to Tostevin. "You can either buy the rauchmalt from Germany, or you can make your own," he says.

Schmitt, like many Alaskans, prefers to smoke his own malt. "I use a fish smoker," he says. "You put wet grains on it, and it holds the smoke that is then permeated into the grain."

Smoking beers is "unbelievably easy," according to Schmitt, "but to make a good one is different. There's a lot of art to it."

The main type of wood used to smoke beers among Alaskans is alderwood, which is found in the Pacific Northwest. Other woods commonly used are applewood, birchwood and beechwood, the last of which is the main type used in German smoked beers.

One tip the smoke brewers have to offer is a simple one: Don't make a beer too smoky! "Since smoke can create an astringency, one of the changes we usually do is to mellow the hops and lower the hopping level," says Tostevin. "The real key is balance. A lot of people overdo the smoke, and that can cause some problems."

Tostevin maintains that smoked beers are generally an acquired taste. "We have a fireman in the club, and he doesn't like to associate fire or smoke with his beer," Tostevin says. To others, smoked beers stir up memories of campfires and the outdoors, which are staples of local homebrew club events.

"Alaskans don't like to be cooped up inside," says Roberts. "Even in the winter, if we have the opportunity to do anything outside that would be easier or more comfortable to do inside, we'll choose to do it outside."

BREWING SPREADSHEET

write your own

Create Your Own Personalized Tool for Designing Your Own Beers

By **J.K. Azotea**

Most aspiring home brewers begin brewing by following a recipe, whether from the back of their first brew kit, their local homebrew shop, books, magazines or the Internet. After brewing some successful batches from existing recipes, however, many homebrewers start formulating their own recipes. There are many possible calculations to do when formulating a beer recipe and doing them all by hand can be tedious. There are commercial software packages and Internet sites that can help you with these, but another solution is to write a custom spreadsheet specialized for your own needs.

I have written a brewing spreadsheet that helps brewers design their own beer. With this spreadsheet, you can calculate the original gravity of your homebrewed creation (and estimate its alcohol content) based on the amounts of grains and malt extract in your recipe. You can also estimate the bitterness — in IBUs, International Bittering Units — of your beer from the hopping schedule. Brewers who plan on entering homebrew contests can use the spreadsheet to see if their beer matches the specifications of the appropriate beer style in the Beer Judge Certification Program (BJCP) Style Guidelines. (These are given at www.bjcp.org.)

In this article, I'll describe my brewing spreadsheet (BSS) — which is available for download at www.byo.com — and give pointers as to how you can write your own customized spreadsheet. (It will be assumed that you know how to use a spreadsheet program, such as Microsoft Excel or Lotus 1-2-3.)

Filename and Recipe Documentation

The first item on my spreadsheet is a space for the name or type of beer. The second entry is for the BJCP category, if applicable. The spreadsheet can help you

Workbook2

document your recipes. Files can be saved under different filenames, with each file corresponding to a different recipe.

Extract Efficiency

The first value you input on my spreadsheet is extract efficiency — a measure of the amount of fermentables you extract from your grains compared to the maximum amount of fermentables that can be extracted from the grain. Most homebrew texts explain how to calculate this number for your system. Typical numbers for efficiency ranges from 60% to 80%. (Recipes in BYO assume a 65% extract efficiency.)

Kettle Additions

Extract efficiency does not apply to ingredients like sugar, honey, dried spray malt extract and malt extract syrup. The weight of these, multiplied by their potential extract, gives the weight of material they contribute to the brew. Dried malt extract has a higher potential extract than liquid malt extract, because part of the weight of liquid malt extract comes from water.

In my spreadsheet, this section can easily be used for making recipes for all-extract brews, meads or yeast starters. You can also calculate how much malt extract to add if you fail to hit your target gravity in an all-grain brew session.

Grain Bill and Malt Specifications

In the grain bill section, the name of various grains, their potential extract and their color (in degrees Lovibond) is given. These values can be edited as well as the names and types of grain. The spreadsheet calculates gravity units, color (in SRM) and percentage of grain bill for each. The SRM ratings chart included in the spreadsheet (taken from the book "Clone Brews") allows you to look up a color description corresponding to the SRM number returned by the spreadsheet.

Original Gravity

The spreadsheet calculates the original gravity (OG) as the weight of the grains times their potential extract times the extract efficiency, all divided by the volume of the beer. Potential extract is the maximum amount a grain could contribute to the specific gravity of a beer. For North American homebrewers, this is usually expressed in terms of the gravity points that one pound of the ingredient would yield in one gallon of water. For example, if one pound of a grain would give a maximum original gravity of 1.038 when mashed in one gallon of water, its potential extract would be 38 point gallons per pound (often phrased as "points per pound per gallon.")

The potential extract for various ingredients can be found on the websites of malting companies. Lists of typical potential extracts can also be found in the books "Clone Brews" (1998, Storey Books) and "Beer Captured" (2001, Maltose Press), both by Tess and Mark Szamatulski. The equation for calculating original gravity is:

$$SG = \frac{W * PE * EE}{V}$$

where W equals weight in pounds, PE equals potential extract in point gallons per pound (or ppg — points per pound per gallon), EE equals extract efficiency as a decimal (i.e. 65% is 0.65) and V is volume in gallons. This equation gives you the specific gravity (SG) in gravity points (GP) (i.e. an SG of 48 corresponds to a specific gravity of 1.048). The SG can be calculated for each ingredient and summed to obtain the original gravity (OG) of the beer.

Final Gravity and Alcohol Content

The final gravity of a beer (in gravity points) can be calculated as:

$$FG = OG\ (1 - AA)$$

where OG is original gravity in gravity points and AA is the apparent attenuation as a decimal. Typical ranges of apparent attenuation of different yeast strains are given in the websites of yeast suppliers such as Wyeast and White Labs. (A value of 0.75 for AA gives a decent estimate for most yeast strains.)

Alcohol (ABV, alcohol by volume) can be calculated as:

$$ABV = (OG - FG) * 0.129$$

where OG and FG are the original and final gravity of the beer (in GP).

The BU to GU ratio — a measure of bitterness to original gravity, defined by Ray Daniels in his book "Designing Great Beers" (1996 Brewers Publications) — is also calculated in my spreadsheet.

Various equations for estimating color exist in the homebrew litera-

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ture. One common calculation, a curve-fit by Dan Morey, is:

$$SRM = 1.49 * MCU^{0.69}$$

where MCU (malt color units) is the weight of the ingredient in pounds times its color rating (in °L) divided by volume (in gallons).

IBU Calculations

Five entry areas for calculating International Bittering Units (IBU or BU) are designed into my brewing spreadsheet. This adds flexibility to calculating IBU when making American pale ales and IPAs. The ounces of hops and the total IBUs are totaled at the bottom. The Alpha Acid Units (AAU) — calculated as the weight of the hops (in ounces) multiplied by their alpha acid rating (as a percentage) — are given on the right of the IBU calculations. The formula for calculating IBUs is:

$$IBU = \frac{W * AA\% * U * 74.89}{V}$$

where W equals weight (oz.) of the hops, AA% is the alpha acid rating of the hops in percentage, U is the utilization factor as a decimal (charts that give hop utilization as a function of boil time can be found in most homebrew books, including "How to Brew," by John Palmer (2001, Defenestrative Publishing) and V is volume in gallons. (Note that W * AA% = AAU.) An IBU value is calculated for each hop addition, then summed to yield total IBUs.

Other Features

My spreadsheet also calculates the volume and temperature of water needed for mashing in and other steps and a variety of other things. You can customize your own spreadsheet to do as much (or as little) as you want. See www.byo.com to download my brewing spreadsheet (BSS) and another sheet written by Chris Colby. You can use them to perform your brewing calculations or to give you ideas for designing your own spreadsheet.

This is James Azotea's first article for Brew Your Own.

Blending

. . . and using a dark extract for stout flavor

by Chris Colby

homebrewers and home winemakers both make fermented beverages and in many ways the two hobbies are similar. However, there are also many differences. For example, blending plays a large role in home winemaking, but is almost unheard of in homebrewing.

Don't try this at home

Before I get to the few useful applications of blending in homebrewing, we need to discuss when not to blend. When faced with an awful batch of homebrew, many new homebrewers wonder if they could blend it with another beer to save it. This never works. A mix of good beer and bad beer always yields bad beer.

By the numbers

If, however, you have a beer that simply has a recipe error — too much or too little bitterness, specialty malt character, color or other character attributable to adding the wrong amount of ingredients — blending is an option if you are willing to brew a second batch of similar beer.

Let's say, for example, you brewed a pale ale for which you wanted an amber color around 14 SRM. However, you somehow undercrushed your crystal malt and the resulting beer had an SRM around 10. What could you do to correct this? If you can put a number to the character you are blending for, there is a simple formula to guide your blending:

$$N_{(1)} + N_{(2)}X = N_{(B)}\ (1 + X)$$

where N is the value of the character in your 1st and 2nd beer ($N_{(1)}$ and $N_{(2)}$) and in the blend ($N_{(B)}$). X is the volume of the second beer, relative to your first beer, you will need to blend.

Let's work two examples to show how you can use this equation:

In the first case, let's say you have 5 gallons (19 L) of your 10 SRM beer and want to brew a second 5-gallon (19-L) batch to correct it to 14. What should the target SRM of your second beer be?

In this case, the value of X would be 1 as you're planning for a 1:1 blend of the two beers. (If you were going to only make one gallon of blender beer, X would be 0.2.) By substituting in the other known values, you can solve for $N_{(2)}$, the target SRM for your second beer. So, $10 + N_{(2)} = 14(2)$. Solving for $N_{(2)}$ yields a value of 18. Thus, you'd have to brew the second beer to have an SRM of 18. (This makes sense as the first beer was four SRM points low and the second beer is planned to be four points high.)

But let's say you brew the second beer and mess up again. This time you overcrush the crystal malt and brew a beer with a color rating of 20 SRM. How much of the 20 SRM beer would you need to blend to the 10 SRM beer? In this case, X — the proportion of beer to blend — becomes the unknown variable. Substituting in for the known variables yields $10 + 20X = 14 + 14X$. Solving for X gives us a value of 0.66 (the fraction being 2/3). So, to get a beer of 14 SRM, you would need to blend the beer in a ratio of 1 part of the 10 SRM beer to 0.66 parts of the 20 SRM beer. Given that you have 5 gallons (19 L) of the first beer, you'd need (5 X 0.66) = 3.3 gallons (12.5 L) of the second beer for blending.

Stouts and blending

As I mentioned at the beginning, there is at least one circumstance in which blending homebrews can be useful. For most beer styles, the target ranges for most characters are fairly wide. If a beer is little more or less bitter, within reason, it isn't wrecked. The same goes for original gravity, color and most flavor attributes. We like to be able to nail our targets, but — in all but the most delicate, balanced styles — we have a little leeway.

In the case of dry stout, however, there is one character for which you have very little "wiggle room" — the amount of roast character. Many homebrewers view stout as one of the easiest styles to brew, but I don't buy it. If you end up with too little dark roast character in a stout, the beer ends up predominated by a coffee-like flavor, which isn't right. (There are hints of coffee in a great stout, but it isn't the primary flavor note.) Too much roasted grains and the beer is undrinkably harsh. Many homebrewers claim that stouts are so big and flavorful that the overall "volume" of flavor masks most errors in the relative amount of dark, roasted grains. I don't believe this.

Many homebrewers claim that stouts are so big and flavorful that the overall "volume" of flavor masks most errors in the relative amount of dark, roasted grains. I don't believe this.

Hitting the right amount of roast in a stout can be difficult for a few reasons. You need to not only get the right amount of roasted barley (perhaps with other dark malts) in the recipe, you also need to have the grains crushed properly. This can be difficult as the dark roasted grains found in stout are typically smaller than base grains. If you crush your grain bill with the base malts and specialty grains mixed, you may not get an adequate crush of the dark grains. (You also need to realize that roasted barley comes in different roasts. You need to use the highly-roasted version (around 500 °L) for the bulk of the dark grain bill in your stout. This is sometimes called black barley, not to be confused with black patent malt.

Speaking of flavor, I'd like to put in a kind word on behalf of very dark roasted grains and malts. Often, you hear homebrewers describe these as harsh, acrid or burnt. I've heard many homebrewers say, "I've started using de-husked malt because roasted barley (or black patent malt) is too harsh for me." Well I for one actually like some of the "harsher" flavors from dark roasted grains. Just as a dose of "coarse" bitterness from a high-cohumulone hop can give a double IPA a pleasing aggressiveness, a little acrid "bite" from black patent malt can keep a robust porter or stout from being insipid. Just because you can take the rough edges from something doesn't mean you should. But I digress.

A relatively easy way to make your stout turn out right every time is to blend for the right level of roast flavor. To do this, brew a pale base beer without any of the dark malts. At the same time, make a homemade extract from all of the dark grains in your grain bill (perhaps with a bit of base malt). The dark roast extract will add the color and roast flavor to your beer. A mini-mash of the dark grains will give you some very dark wort. This wort is boiled to make an extract, and at this point you have two options. You can either blend the dark wort with your pale wort before fermentation. Or you can ferment the two separately and blend when you keg or bottle the beer. The first option is easier, but the second yields better results — especially if you do a few small-scale blends to really hone in on the flavor you like.

Dark grain mini-mash

To perform your dark grain steep or mini-mash, multiply the amount of the dark grains in your recipe by 1.2. Using a little extra grain will ensure that you have enough roast character to blend into your stout. Crush the dark grains and take a look at them. Dark grains can be very brittle, but you should aim for a crush that does not reduce them to powder. Likewise, you should not see any (or very few) intact kernels. Adjust your mill and crush again if the grains are undercrushed. Place the dark grains in a nylon steeping bag and heat an appropriate amount of water in a large pot. Using between 1.5 to 2 quarts of water per pound of grain is fine. Submerge the grain bag in the pot and hold the temperature at 155–162 °F (68–72 °C). The temperature here isn't critical, especially if there are no base grains in the mix. Hold the mix in this temperature range for 45 minutes to an hour.

If you have a pH meter, take the pH of the dark roast wort. It may be as low as 4. If you have any calcium carbonate, stir some in until the pH rises to at least 4.8 or so. (If you've made stout before the normal way, don't add more calcium carbonate than you normally would to a full batch.) A pH value of 4.8 is a little lower than you normally want wort to be, but the extract will be blended with pale wort later so it's OK.

Also realize that you won't want to be making your pale wort with highly carbonate water; use a water treatment program suitable for a light-colored beer.

Once the dark grains are done steeping (or mashing), remove the grain bag and give it a light rinse. To avoid pH problems, I like to dilute the "grain tea" (or mini-mash wort) with water then use this diluted mixture as rinse (or sparge) water. Your efficiency may not be as high as it possibly could be, but the extra grains you added will compensate for this.

The dark wort is then boiled. Boiling the wort not only sanitizes the dark extract, it concentrates it — making the flavors and colors more intense. As the commercial color extracts show us, color can be concentrated a great deal, to over 3,000 °L. Your homemade extract will likely not approach this value unless you boil for a long time. If you didn't have any base malts in the mix and plan to ferment the wort, you can add a bit of dried malt extract to the boil give the wort a bit of fermentable sugars.

After the dark wort is cooled, you can add it to your pale wort (or refrigerate it in a sanitized container until you brew the pale wort). Or, you can ferment it and blend it in the bottling bucket or keg. Remember that you made the extract from more grains than your recipe called for, so don't dump all of the extract in. Add extract and watch the color. When it gets close to the right target, take a small sample of the wort or beer and taste it. Keep adding the extract until you taste the right amount of roast character. This is easier to judge in beer than wort, but fermenting the dark roast extract separately takes some extra time and energy. Either way yields good results. When blending your extract with the pale wort, stir it in and let the blend sit for 30 seconds or so before sampling.

You can bottle any leftover roast extract beer just as you would a regular beer. If you're stuck going to a party where you know they will only be serving light American beers, bring it along and whip up your own personalized stout on the spot.

Finish

Perhaps you can make great stout simply by mashing (or steeping) your dark grains normally. If so, congratulations. If — on the other hand — you are like me and have been disappointed with your homebrewed stouts, try this method to reach the level of roast you desire.

Just like dark roasted grains, Chris Colby has been described as harsh, acrid and bitter.

Two Simple Hopbacks

Easy-to-build projects to give your hops a boost

Story by **Thom Cannell**

For the serious hop head who demands an aroma that equals a hop field at harvest, we have a device called the hopback. A hopback can be thought of as a percolator for hops that is able to produce liquid that is laden with hop essence. The devil is in the details.

photos courtesy of Thom Cannell

Whether you prefer to work with CPVC or copper, these hopbacks can make a night-and-day difference to your brew's hoppiness.

Boiling extracts essential hop oils. The heat of the wort and mechanical action in the boil dissolve, extract and isomerize (changes the chemical composition) of hop alpha-acids.

Some hops are typically added soon after the boil begins. These are bittering hops to provide the foundation for beer's balance between malty-sweetness and bitterness. An hour's boil evaporates most of the hop aroma. A later flavor addition restores hop taste and a very late addition provides aroma. Of course, not every recipe calls for hop aroma. But the identity of most APA or American-style IPAs is marked by boatloads of hop aroma.

While a good aroma can be achieved by adding hops late in the boil or at its conclusion, a different aroma can be achieved by passing hot wort through a bed of hops on its way to the chiller; the aroma is immediately dissolved into wort.

Our hopback is quite simple and should perform best with post-hopback wort cooling. The design objective is to enable hot wort to extract maximum flavors. The hop bed, acting as a filter, needs to be loose enough to absorb some trub from the kettle without clogging, yet compact enough to force the wort to flow through the hops: wort in — wort plus hop aroma out.

Preventing debris from flowing into your fermenter is important. Some particulates are inevitable, but to keep out the majority of debris, we need a screen to prevent large particles from exiting the hopback, as the hop bed collects most of the particulate matter. Brass window screen is abundant and found in most hardware and home stores. Stainless steel screen is desirable, but harder to find and more expensive. The screen (filter) needs to fit tightly to the diameter of the tubular hopback and be supported so it will not distort or tilt under pressure. Pressure fitting should be sufficient.

In this segment of Projects we will create two easy to use hopbacks for different applications. One is constructed from copper pipe with brazed connections, the other built from CPVC (schedule 40) plastic, which is meant for potable water service. Though Schedule 40 pipe is meant for service at or below 140 °F, at zero pressure and short contact duration there is little danger of failure.

To size the project, we decided on 2" (50 mm) pipe, easy to find at home stores. The connectors were easy to find and purchase. Pipe sections had to be purchased in 10-foot lengths. Ten feet of CPVC pipe is only $3, but 2" copper pipe is $6 per linear foot! Luckily, I found a plumbing shop that agreed to sell a scrap. Maybe you'll have the same luck and save yourself some money.

The next question was, "how much hops should a hopback hold?" There is no clear answer. We relied on the fact that most post-boil aroma hop additions are 0.5–1 oz. Therefore if the hopback tube would hold 2 oz. there would be enough hops to satisfy the hoppiest of hopheads. Of course, you can adjust the size to hold as much as you anticipate using.

Another technical problem is leakage. End caps and solder caps should be soldered or solvent welded to a tube. That's why stainless steel or brass pipe and screw-on caps would be nice, albeit expensive. We'll show you how to add O-rings or a permanent addition of food-grade sealant formed into a gasket to limit dripping and we'll add a safety wire to hold everything together. One detail we'll address, but not solve, is how you will attach the finished hopback to your brewing system. Ready to start? Grab a hacksaw or pipe cutter and head for the workshop.

Step by step

We weighed out 2 ounces of hops and stuffed them into a pipe, tamping to what we think is a decent

Parts List

Copper end cap 2" – 2 @ $3.00	($6.00)
Pipe, 2" i.d. copper 1' @ $6.00	($12.00)
1/2" MPT copper fitting	$1.00
1/2" FPT stainless fitting	$2.50
Silver solder and flux	$2.00
Brass screen	$2.50
Silicone sealant	$3.50
Step Drill	$32.00
CPVC tube 2" i.d. x 10'	$5.00
Barb fitting 3/8" x 3/8"	$2.00
Flare nut	$1.75
Flare coupling (1/2" flare x 1/2" FPT)	$2.24

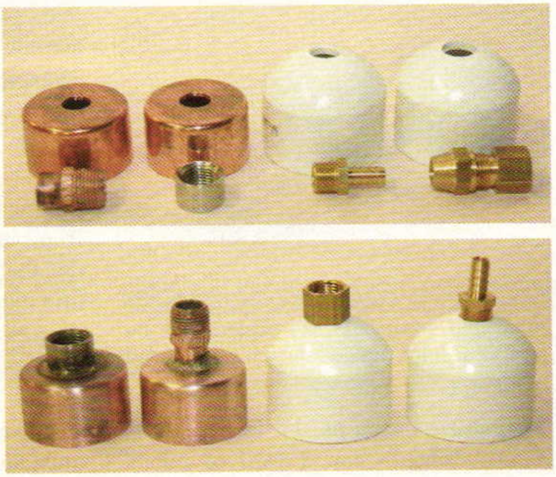
compaction. The tube length required for this amount of hops is 12 inches. That became our basis dimension, 2" inside diameter (i.d.) x 12".

Step One — cut CPVC (schedule 40) or copper tube to length. Set the tube aside after smoothing any sharp or uneven edges — a medium sandpaper will suffice.

Step Two — drill a pilot hole into end caps. Whether copper or CPVC, you must attach an inlet and outlet. I decided that the copper version would use male/female ½" pipe thread couplings silver brazed to the end caps; silver solder might work as well. Use threaded fasteners screwed into the plastic for the CPVC end caps.

Copper — Drill a ⅛" pilot hole into the center of your end cap, followed by successively larger drills. Drill holes that equal, or are slightly smaller than, the internal diameter of the fitting to leave a shoulder to weld or solder to. The best way to do this is to purchase an inexpensive step drill. Or, you can enlarge holes with a large diameter rat-tail file.

CPVC — Same process as the copper version, but enlarge the hole to just under the fitting's thread diameter. 2" CPVC end caps are almost ¼" thick and the brass barbed fittings sufficiently sturdy to self-tap the threads. Note that for the female outlet-side I used a flare fitting and flare cap on the inside to secure that fitting. Flare fittings have a high shoulder and will require an O-ring, or forming a shoulder (leak prevention) with aquarium-grade silicone seal. We suggest the silicone seal.



(Top): For step two, use the pieces shown above to construct your end pieces.
(Bottom): Once you have drilled your pilot holes, assemble your inlets and outlets as shown above.

Step Three — Once your end caps are constructed, run a bead of silicone seal. For copper end caps, the better placement for sealing will be inside the copper caps. Run a small bead of silicone seal (I used black) at the bottom of the cap. Wet your finger with alcohol (an important step) and smooth the silicone to create a smooth sealing surface. Allow to dry.

For CPVC, with its greater wall thickness, run a thin bead onto the tubing end and smooth. This may be an

After your end pieces are constructed, be sure to seal the interior of each with a bead of silicone (this is the black material above).

unnecessary step as the CPVC fits so tightly, tube to cap. I worried about how to hold the hops, first envisioning brass-mesh cylinders and other complex solutions. Then it hit me; we all have tightly woven mesh hops enclosures in our brew kit! Those ubiquitous cotton-mesh hops bags are perfect for this use. Stuff the required hops into a bag; stuff the bag into the tube.

Step Four — To prevent stress and strain, make some strainers out of brass door screen. Place your tube end, copper or CPVC, onto the brass screen and trace a circle with a Sharpie marking pen. Then trace inside the lines with silicone seal, being certain that the seal penetrates the copper mesh. This will both provide a sealing surface and prevent sharp ends from cutting you or the hop bag. Cut out the circle, just large enough to fit into the end cap.

Step Five — Clamping. It is imperative that you hold all three pieces together tightly. Whether you use a bungee cord, safety wire or a pipe clamp, you must secure the end caps to the tube. The wort will be near boiling. Should something come apart the potential for injury is high and the loss of your beer is certain. The simplest safe restraint I can think of, that works on either hopback, is a pair of custom made hooks connected by a safety wire.

Step 7 — Using 8–10 inches of brass welding rod, bend a circular form around a 1" pipe. Bend the remaining rod at 90 degrees, then create another circle. Make a second unit. Once the hopback is ready, loop one hook around each end and secure with a light gauge safety wire.

Step Six — Constructing an attachment. Your brew rig and mine differ. My system uses quick-disconnects and the hopback will be connected with stainless steel pipe. Yours might use reinforced tubing and clamped barbed fittings, as shown on the PVC hopback. Please use reinforced or high-heat tube for all connections, the wort is still scalding hot.

Your completed hopback is just the beginning. You still need to answer many questions for your personal brewing: How much hops? Pump through, pull through or gravity feed? Type of hops? All of these questions depend on the necessities of your brewhouse and brewing process. Enjoy!

Thom Cannell writes the "Projects" column in each issue of Brew Your Own *magazine.*

It's the Water

Understanding residual alkalinity and pH

Story by **Bill Pierce**

Among the advertisements I recall from my misspent youth are those for Olympia beer. "It's the water," they proclaimed, singing the virtues of an artesian spring located on the brewery grounds. Of course many breweries have stressed the quality of the water they use since water accounts for more than 90 percent of a beer by weight.

For extract brewers, water issues are largely limited to some beer flavor and water filtering concerns. See John Palmer's article in the July-August 2004 issue for more information on this. To summarize, the character of the malt extract has already been determined by the water used in the manufacturing process and extensive water treatment is not needed if the water used to dilute the malt extract tastes good.

For the all-grain brewer, water chemistry is more important. It impacts the enzymes that convert the starches in the malt to sugars, and therefore is critical to mashing and producing fermentable wort. The contribution of the water in mashing (with certain exceptions that will be discussed) is not so much directly related to flavor as it is in determining the proper environment for the enzymes.

Don't have a cow, man!

It's impossible to discuss the role of water in mashing without dealing with the underlying chemistry. This is not particularly difficult, but it does require some attention, especially by those who avoided or slept through chemistry class.

Students of the "relax, don't worry" school of brewing may ask why they should be concerned about water chemistry when beer has been brewed for thousands of years and some homebrewers produce award-winning beers with hardly a thought about the brewing water. This attitude is not without merit. In many cases, starch conversion tends to take care of itself without any intervention. However, the nature of your brewing water supply may limit the styles that you can brew successfully without water treatment.

Most of the relevant chemistry involves the pH of the mash. Basically, pH is a measure of acidity or alkalinity of a solution. It is defined as the negative logarithm of the hydronium ion [H_3O^+] concentration. (In the past, pH was defined in terms of hydrogen ions [H^+], but the nomenclature has changed to reflect the fact that hydrogen ions are almost always complexed with a water molecule.) The pH scale ranges from 1 to 14, with 7 considered neutral. A lower pH indicates greater acidity. Pure water with no dissolved minerals or gases has a pH of 7.0. Malt contains acids that lower the pH of a mash made with pure water. The pH of a mash comprised of 100 percent pale malt in pure water is 5.7–5.8, as determined by actual measurement. (If darker grains are added to the mash, the pH is lower.) If minerals are dissolved in the water, the pH of the mash will likely be altered. If you know the concentration of key ions (from dissolved minerals), you can estimate the pH shift they will cause away from the pH of a mash made with pure water.

This lowering of the mash pH by the malt acids is fortunate indeed, because the alpha and beta amylase enzymes in the malt require an acidic environment in order to do their work. To achieve adequate conversion of the malt starches to sugars, the mash pH should be between 5.2 and 5.6. Just as the malt tends to lower the mash pH, in the vast majority of cases the brewing water tends to raise it. Tap water typically has a pH ranging from 7.0 to more than 8.0, depending on the amount and type of dissolved minerals. In addition to raising the pH, the minerals dissolved in the water have another function. They also serve to buffer the pH of the mash — that is, they resist the ability of the malt acids to change it. The buffering power of minerals in brewing water is, however, weaker than the buffering power of amino acids derived from malt.

The acidification and buffering is accomplished primarily by calcium, bicarbonate and carbonate ions. Magnesium duplicates the role of calcium but to a lesser extent. When the malt and strike water are mixed, phosphates in the malt react with calcium in the water to produce calcium phosphate, which is largely insoluble and comes out of solution as a solid, releasing hydronium ions that acidify the mash and lower the pH.

Bicarbonates and carbonates in the water buffer this process, along with the amino acids in the malt. Therefore, adjusting the mash pH is a function of controlling the calcium, bicarbonate and carbonate ions in the water.

You may know that some brewers add gypsum (calcium sulfate) or calcium chloride to the mash in order to lower the pH, and calcium carbonate or baking soda (sodium bicarbonate) in order to raise it. Gypsum and calcium chloride "harden" the water (increase the calcium) and react with the malt to produce more calcium phosphate that lowers the pH. Calcium carbonate and baking soda increase the level of bicarbonates (if the pH is above 8), which has the opposite effect. It should be noted that gypsum or calcium carbonate will not raise or lower the pH of water; they alter the pH of wort due to reactions with malt components.

Get it in writing

It's all but impossible to determine the impact of your water on the mash without a water analysis report. Most municipal water systems are required to provide this information to their customers, although you may have to ask for it politely. If you have your own water supply, you will have to send a sample to a laboratory for analysis. Ward Laboratories (www.wardlab.com) will perform Household Mineral Test W-6, which includes all the significant data for brewing for $15. Keep in mind that the mineral composition of the water can change over time and with the seasons. Many municipal water systems frequently blend water from multiple sources and periodically alter the blending.

Five important pieces of information from the water analysis are the levels of calcium and magnesium (usually expressed as milligrams per liter (mg/L) or parts per million (ppm); these measures can be treated as equivalent to each other), the total hardness (often expressed "as $CaCO_3$"), the bicarbonates (expressed as "HCO_3"), and the alkalinity (usually expressed "as $CaCO_3$"). Hardness is a function of the calcium and magnesium content, and alkalinity depends upon the levels of bicarbonates and carbonates. Not every water report contains all of these values. Fortunately it's possible to derive several of them from the others.

It can be helpful to discuss the values in terms of "milliequivalents per liter" (mEq/L). An equivalent is a mole (a chemical reference unit for measuring the amount of any substance) of an ion with a positive or negative charge of 1, based on the atomic weight of its constituent elements. For example, the equivalent for calcium ions, which have a charge of +2 and an atomic weight of 40, is 20. Here are the equivalents for the relevant ions in brewing water:

Calcium (Ca^{2+}): 20
Magnesium (Mg^{2+}): 12.1
Sodium (Na^{+}): 22.9
Sulfate (SO_4^{2-}): 48
Chloride (Cl^{-}): 35.4
Bicarbonate (HCO_3^{-}): 61

To convert the values expressed as mg/L or ppm in a water analysis to mEq/L, divide the concentration of the ion (in mg/L or ppm) by the appropriate equivalent values listed above. For example, if the value for calcium is 40 mg/L, divide by 20 to calculate the mEq/L as 2.0. To convert hardness and alkalinity values expressed "as $CaCo_3$" to mEq/L, multiply by 50 (the molecular weight of calcium carbonate). Using mEq/L simplifies the math for many of the water calculations.

Total hardness is the sum of magnesium and calcium hardness. Dividing the calcium level in mg/L by 20 and multiplying by 50, or multiplying the value in mEq/L by 50, will determine the calcium hardness as $CaCO_3$. For magnesium hardness as $CaCO_3$, divide the magnesium level in mg/L by 12.1 and multiply by 50, or multiply the value in mEq by 50. If hardness is not separated into the contributions of calcium and magnesium, you can estimate it by attributing 80 percent to calcium and 20 percent to magnesium (the actual percentages in your water may be different). To calculate alkalinity as $CaCO_3$, divide the bicarbonate level in mg/L by 61 and multiply by 50, or again multiply the value in mEq/L by 50.

Hardness also can be thought of as so-called "permanent" and "temporary" hardness. The latter can be removed by boiling the water or by the addition of slaked lime (calcium hydroxide), causing insoluble calcium carbonate to precipitate out of solution; the remaining hardness is deemed permanent. Put another way, permanent hardness equals total hardness minus the alkalinity.

It's the alkalinity, stupid

It's often convenient to discuss brewing water in terms of its hardness. In general, it can be said that soft water (with fewer dissolved minerals) is better for brewing lighter colored beers, while hard water favors darker styles. However, this is not quite accurate from a scientific point of view. The important value is really the water alkalinity, which — as mentioned in the discussion above — is related to the level of bicarbonates or carbonates.

A far more useful value is known as the residual alkalinity. This is the alkalinity not neutralized by temporary calcium and magnesium hardness, and is the real factor in determining the buffering of the mash pH by the brewing water. In the early 1950s, German brewing scientist P. Kolbach discovered that 3.5 units of calcium will react with the malt phosphates to release 1 equivalent of hydrogen ions and neutralize 1 equivalent of water alkalinity. The same is true of 7 units of magnesium. The value can be less than zero for water very low in alkalinity.

Kolbach's formula for residual alkalinity is:
milliequivalents of RA =
milliequivalents of bicarbonate -
milliequivalents of calcium/3.5 -
milliequivalents of magnesium/7.

How does the residual alkalinity affect the mash? Kolbach developed another formula, this time for predicting the shift in the mash pH due to the water residual alkalinity, compared to a mash in pure water. Converted to the units we have been using, his formula is:

pH shift = 0.00168 * RA (as $CaCO_3$) or

pH shift = 0.084 * RA (as mEq/L)

For all but water with the lowest RA, the pH shift due to residual alkalinity is a positive value (that is, the pH will rise). It will be negative (that is, the pH will drop) if the RA is negative. This is countered by the acids in the malt, which lower the mash pH. You may recall that in order for the malt enzymes to function correctly the mash pH should be in the range of 5.2–5.6. A mash with a high pH risks poor conversion and increases the time required. It will decrease the mash efficiency and also could result in tannins and other harsh flavors being extracted. A mash with a low pH converts poorly as well, with the additional possibilities of sourness and inhibition of the yeast metabolism.

The fact that darker malts tend to lower the mash pH is well known, but there is almost no data available as to the specific acidity of each type of malt and its contribution in reducing the overall mash pH. However, it is possible to make some generalizations about water and beer color, and in fact a formula exists for estimating the "ideal SRM" (where SRM is the Standard Reference Model for measuring beer color) of the beer brewed with a particular water, based on the residual alkalinity value. (Due to the assumptions built into this model, think of the ideal SRM as a suggestion, not a hard and fast rule.)

That formula for ideal SRM is = 0.14 * RA (as $CaCO_3$) + 5.2. If the RA is expressed in mEq, the formula is: ideal SRM = 7 * RA (in mEq/L) + 5.2).

Water in the real world

The "ideal SRM" of the water has much to do with the beer styles historically associated with certain cities. For example, in Pilsen (residual alkalinity as $CaCO_3$ of 1.9) this value is 5 SRM, right in the middle of the typical color range for Pilsner beers. For Dublin water (RA as $CaCO_3$ of 66.2), the ideal SRM is 14, not as dark as the stout for which it is known, but certainly far too dark for light colored beers. A Pilsner brewed with untreated Dublin water would exhibit a long conversion time, poor mash efficiency, possible starch haze and astringency. A stout brewed in Pilsen without pH adjustment would be sour and possibly poorly attenuated by the yeast.

Those who are familiar with beer styles and brewing water may ask about the pale ales associated with Burton on Trent, which is known for extremely alkaline (total alkalinity as

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$CaCO_3$ of 246 mg/L) water. The saving grace of Burton water is its correspondingly high calcium level (295 mg/L) from the naturally occurring gypsum dissolved in the water. This greatly buffers the alkalinity and results in a low residual alkalinity value (as $CaCO_3$) of 9.0 and an "ideal SRM" of 6, which is to style for pale ales. Brewers in cities with water of high residual alkalinity eventually learned to mimic what occurred in Burton water. By adding gypsum or (less often) calcium chloride to the mash, they increased the calcium level and reduced the residual alkalinity of the water. Or they removed most of the temporary hardness, reducing the alkalinity and carbonates, by boiling the water, which causes insoluble calcium carbonate to settle out. Another option for removing temporary hardness was to treat the water with slaked lime, which produces a similar reaction. Modern brewers variously employ all of these techniques, as well as sometimes removing almost all of the dissolved minerals from a portion of the brewing water by means of reverse osmosis filtration.

Make a new plan, Stan

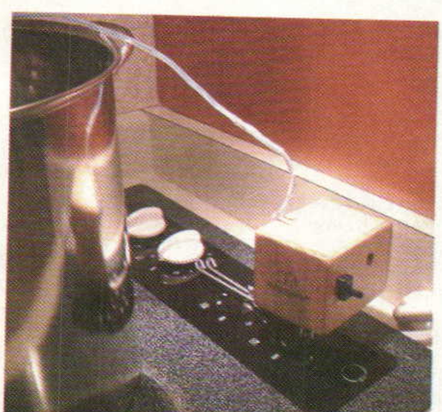
As an all-grain homebrewer, what should you do about your brewing water? The first thing is to obtain a water analysis and study it. Calculate the residual alkalinity of your water and the ideal SRM of the beer brewed with it. This will provide an idea what adjustments you might need to make.

Understand that it's more difficult to brew light colored beers with water high in residual alkalinity than darker beers with low RA water. If the RA of your water is high and you are brewing a lighter colored beer, especially a style such as Czech pilsner that requires nearly neutral water, consider using a significant portion (but not all) of water filtered by reverse osmosis, or distilled water. For delicate beers this is preferable to adding too many salts that could have an effect on flavor.

Water chemistry is a complex topic and many authorities consider water adjustment as one of the last topics to be addressed as a brewers knowledge and skill increases. Don't be surprised if your mash pH is fine without any adjustments. (But neither should you despair if adjustment is needed.) If you follow the guidelines above and your mash pH is in the proper range, you can take a drink of cool water and move on to consider other important issues that impact your beer.

Bill Pierce would like to thank the efforts of and the publications by homebrewers and authors A.J. deLange, George and Laurie Fix, Tom Meier, John Palmer and Ken Schwartz for their contributions toward the understanding of this subject.

BREWER'S log



The Automasher

The Automasher is a device that provides an automated temperature control to the majority of existing kitchen ranges and many gas burners. The product works on the premise that most stoves utilize rotating dials to control their temperature. The device measures mash temperature with a probe and turns the dial accordingly, as programmed by the brewer, to maintain target mash temperatures. For more information visit the company Website at www.info-services.net/automasher.

White Labs Servomyces

Servomyces is a nutritional yeast supplement that enables any yeast strain's ability to incorporate essential nutrients into its cellular structure. Now available in homebrew batch size, it has been proven to cut down fermentation time, increase flocculation, greatly reduce harsh sulfur notes, improve the health and viability of yeast, reduce levels of diacetyl at the end of primary fermentation, produce faster and more complete attenuations, increase yeast production for a better harvest and improve the quality of the finished product. For more information visit www.whitelabs.com.

Brütül Lagerheads

Brütül (pronounced "brew tool") has released a new product called the Lagerhead Black & Tan turtle. The Lagerhead is shaped like a turtle whose legs straddle a standard pint glass, making for an easy black & tan pour of stouts onto ales and lagers. For more information contact Brütül at (866) 278-8851 or visit www.brutul.com.

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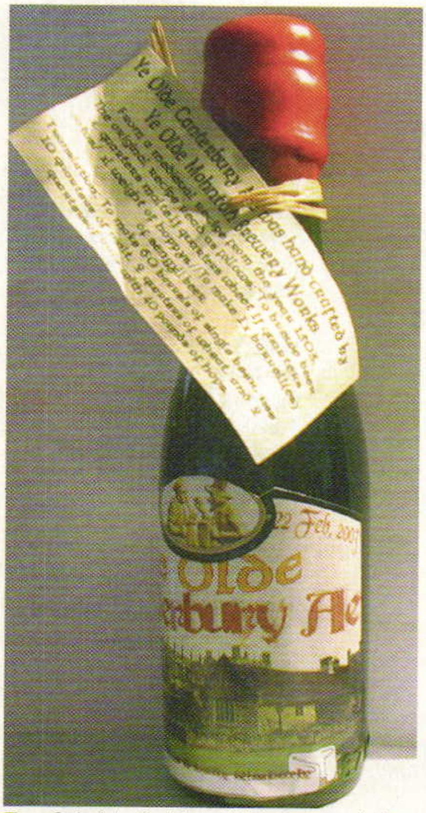
English Brown Ale

A medieval clone from 500 years past

by Tom Schalata, Jr. • Reading, Pennsylvania

When my youngest daughter Kim and her fiancé Brian announced that their wedding in February 2003 would have a medieval theme, it added even more time-consuming wrinkles to the already complicated task of planning a wedding. Our ever-growing "to-do" list now grew longer with such items as Olde English period costumes, swords, scrolled invitations and medieval banners and decorations. Selecting the right ale and wine was of utmost importance (hey, I'm a homebrewer!).

My thirst for brewing has grown since my wife, Donna, got me started four years ago, and I am now working as a part-time brewer at the newly established Legacy Brewing Co. in Reading, Pennsylvania. Not surprisingly, choosing an appropriate brew fell under my jurisdiction and I was fortunate enough to find an English Ale recipe on the Web that traced its roots back to 1503. Perfect!



Tom Schalata fashioned this brown ale from a recipe dating back to 1503.

The basis for the recipe was a research paper written by Lord Frederick Badger. His inspiration came from a quote in a 1503 book by Richard Arnold titled "Customs of London." It translates to "To make 60 barrels of single beer use 10 quarters of malt, 2 quarters of wheat, and 2 quarters of oats with 40 pounds of hops."

Lord Badger took this basic recipe and converted it into one that employs today's ingredients that most closely mimic those that brewers would have used 500 years ago.

Since my brew was to be a gift to our wedding guests, I increased Lord Badger's 5-gallon (19-L) recipe to produce 7 gallons (26.6 L). On top of the normal pressures on the father of the bride, I had the additional worry of this brew, which was my first foray into the world of all-grain brewing!

A picnic cooler lined with a network of PVC pipes dotted with ⅛-inch holes served as my mash tun. After boiling 6 gallons (22.8 L) of water, I used a standard plastic kitchen colander to diffuse the water over the grain. Once that step was complete, the temperature in the cooler settled to the desired 159 °F (71 °C).

After an hour, the temperature remained fairly steady. Then, it was time to vohrlauf and sparge with an additional three gallons (11.4 L) of water. I then boiled the wort for one hour with hop additions during the initial boil and 30 minutes after. From that point, I used common homebrew procedures to cool the wort and pitch the yeast, fermenting from the beginning in glass carboys.

Hear ye, hear ye! More of thy Canterbury Ale for me . . . if you please!

Once the ale was ready for bottling, I placed most of it into 7-ounce green bottles. I originally thought about corking the bottles to give it an old look, but decided to go with standard caps, and dip the top of the bottles in melted red wax.

After the bottles were labeled, a small tag explaining the brew's 500-year-old origins was attached to each one with raffia. Ye Olde Canterbury Ale of 1503 was a big hit with the wedding guests, as was the Royal Black Raspberry Merlot we made.

To top it off, my 1503 ale took third place honors in the B.O.N.E.S. (Brewers of the Northeast) Bash competition in the category of Scottish and Brown Ales. Thus my first all-grain brew entered in my first competition earned me my first ribbon. The recipe for a 5-gallon (19-L) batch follows:

5 lbs. (2.3 kg) pale 2-row malt
3 lbs. (1.4 kg) brown malt
0.25 lbs. (112 g) chocolate malt
0.25 lbs. (112 g) Scottish peated malt (I substituted with roasted malt)
1.5 lbs. (0.7 kg) wheat malt
1.5 lbs. (0.7 kg) flaked oats
1.5 oz. (42 g) English Fuggle hops
Wyeast British Ale Yeast 1098