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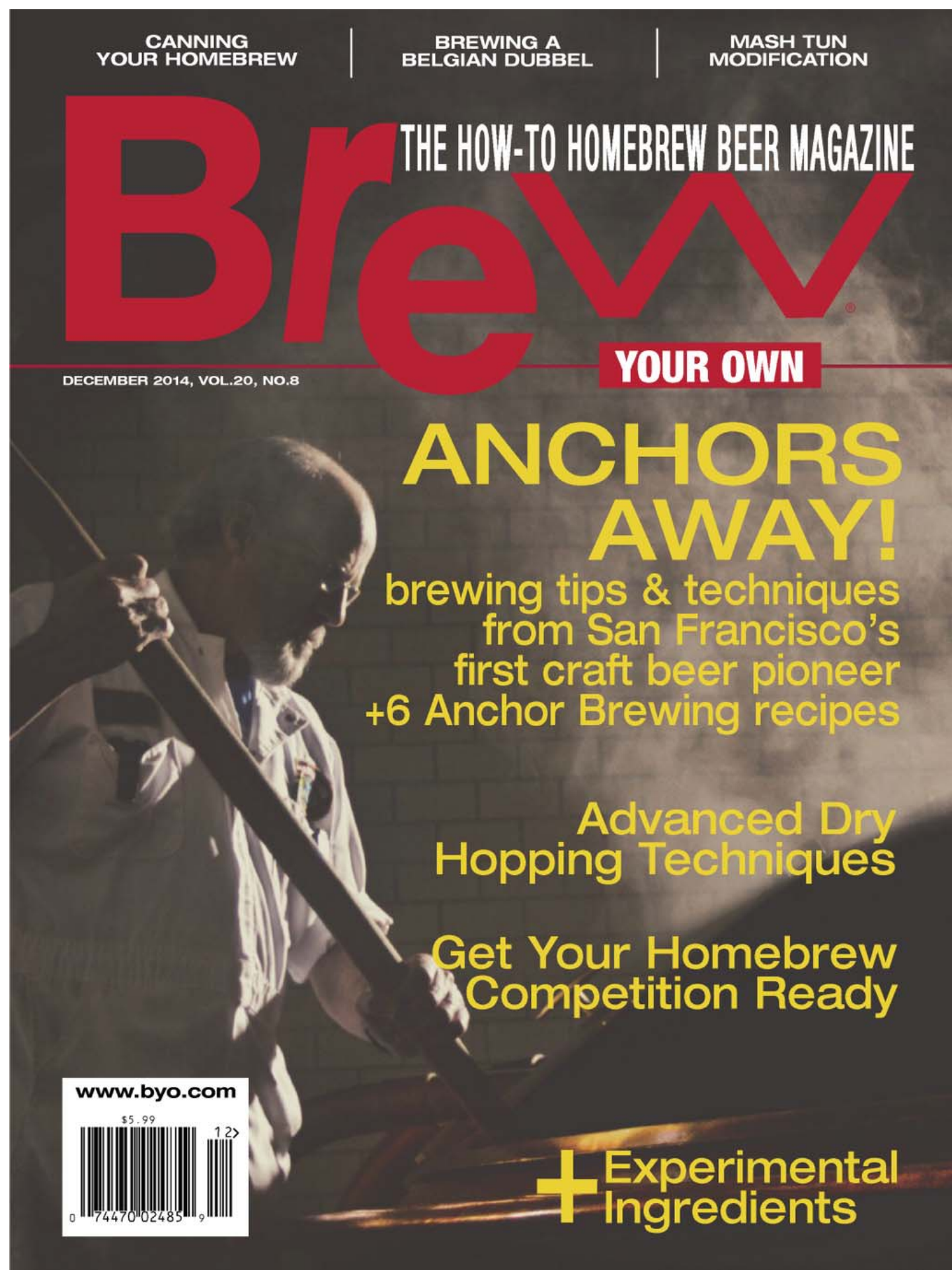
BrewYour

THE HOW-TO HOMEBREW BEER MAGAZINE

DECEMBER 2014, VOL.20, NO.8



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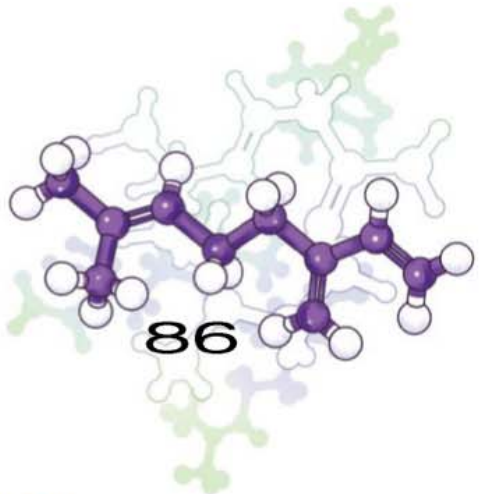

features

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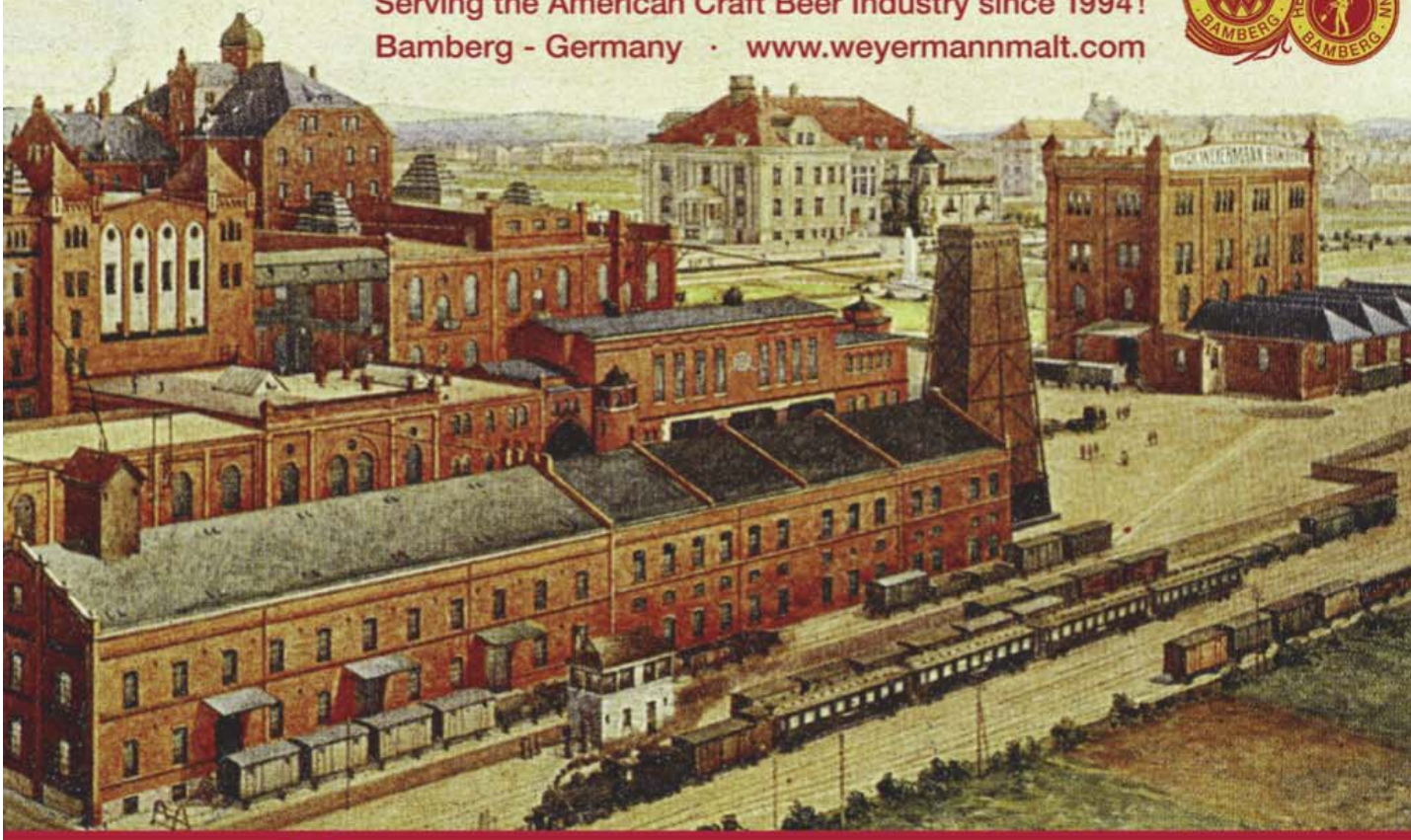

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departments

where to find it

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 US gallon of water, would yield a wort of 1.024.)*

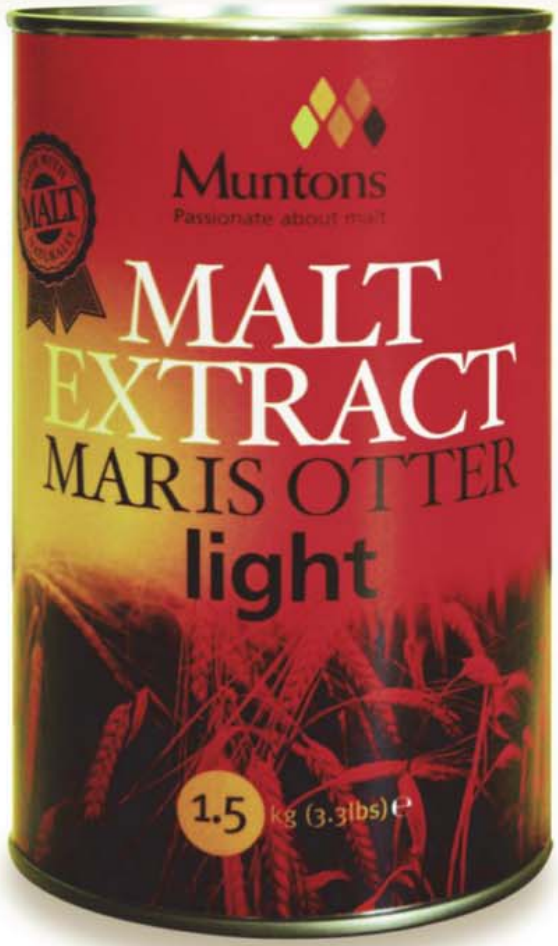
Extract values for malt extract:
liquid malt extract (LME) = 1.033–1.037
dried malt extract (DME) = 1.045

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

Hops:
We calculate IBUs based on 25% hop utilization for a one-hour boil of hop pellets at specific gravities less than 1.050. For post-boil hop stands, we calculate IBUs based on 10% hop utilization for 30-minute hop stands at specific gravities less than 1.050.

Gallons:
We use US gallons whenever gallons are mentioned.

CAN DO!



Developed by Dr G.D.H Bell and his team at Cambridge, England in the 1960s, *Maris Otter* is a two-row barley with unrivalled heritage in the UK brewing industry.

Dr Bell bred *Maris Otter* barley from a cross of *Proctor* and *Pioneer* - two top quality traditional malting barley varieties. To this day, *Maris Otter* seed is only sold to a select group of farmers who are specially chosen to grow the variety.

Soon after its introduction, *Maris Otter* barley malt became a favourite with brewers due to its excellent malting characteristics, low nitrogen content and forgiving brew-house performance.

Maris Otter is still highly prized in today's craft brewing industry providing independent brewers with a rare opportunity to create beers of unparalleled individuality and quality.

And now you can benefit from the unique characteristics of *Maris Otter* in your home brewed beers. Muntons *Maris Otter* liquid Malt Extract is a new addition to the Muntons Malt Extract range available in both 3.3lb cans and bulk malt.

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what's happening at BYO.COM

Become a Homebrew Judge

The Beer Judge Certification Program does more than make you an ace beer taster. It helps you learn more about styles, the brewing process, and beer faults — knowledge that will help you make your own beer better.
http://byo.com/story184

California Common: Style Profile

The beer style California common is typified, but not defined, by Anchor Steam. In this "Style Profile" column, learn how to brew a common or uncommon common.
http://byo.com/story2132

Spruce Bock

After reading the "Tips from the Pros" column on page 20 you should be armed with enough information to brew your own spruce tip beer. How about starting off by giving this spruce bock recipe a try?
http://byo.com/story1405

Experimenting with Hops: Tips from the Pros

Sierra Nevada Brewmaster and craft beer guru, Steve Dresler weighs in on hopping techniques and experiments in this story from deep in the *BYO* archives in 1996.
http://byo.com/story921

Cover Photo: Courtesy of Anchor Brewing Co.

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Volume 20, Number 8: December 2014

WILLIAMSWARN

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In 2011, Master Brewer Ian Williams launched the WilliamsWarn Personal Brewery, along with award winning recipe kits in New Zealand. Homebrewing took a leap forward, allowing the home brewer to make cold, clear, cleanly fermented, perfectly carbonated beer at home in just 7 days. This had never been achieved at home anywhere – professional quality beer in the same time-frame as that of a modern brewery. Following large amounts of international interest, WilliamsWarn has now launched its award winning ingredient kits in the United States through betterbrewing.com and amazon.com. WilliamsWarn brewing equipment will also be available soon.

www.williamswarn.com / www.betterbrewing.com

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THE BREW KITS

Each of the 14 WilliamsWarn brew kits accurately matches a style within the BJCP Style Guidelines. All kits consist of liquid and dry malt extract made in state-of-the-art brewhouses. Only the best strains of yeast from Fermentis and Lallemand are used in each kit. A hard cider kit made from 100% New Zealand apples is also available.

High quality ingredients led the WilliamsWarn Premium Lager kit to a Gold Medal at the 2012 Asia Beer Awards, where Santiago Aon became the first home brewer ever, to beat the big breweries at an international beer competition.

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Because beer brewed in a WilliamsWarn Personal Brewery is fully carbonated, a counter-pressure bottler was developed in order to bottle a brew and then get on with the next batch. The bottler is very easy to operate and can be used to bottle carbonated beverage out of a keg.

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The Personal Brewery is a conical that ferments under pressure and has perfect temperature control. The brew carbonates on the first day and when the beverage is fermented, it's crash cooled to 34°F and then clarified over 2 days. Your conical fermenter then becomes your pressurized serving tank. All-grain brewers and extract brewers alike will appreciate all the control they have during fermentation and serving.

Session IPAs

The session IPA article in the November 2014 issue was informative, and I will now try brewing my favorite beer style at lower ABVs. A statement about wort cooling caught my attention, for I certainly can't cool my wort from boiling to room temperature in 5-10 minutes using my immersion chiller: "Using an immersion wort chiller, typically you should be able to drop the temperature of your beer from boiling temperature to somewhere around room temperature in a 5 to 10 minute timeframe . . ." How is the writer achieving this rate of rapid cooling?.

Kit Grantham
Tucson, Arizona

Story author Steve Bader replies: "Hi, Kit. Your Arizona address explains your question to me. In the Pacific Northwest, we typically have cooler tap water than you would in Tucson. You likely have tap water pushing 80 °F (27 °C), which will not be as efficient as a wort chiller. So your wort chilling times will be slower. The solution would be to adjust the amount of hops used in the wort cooling phase to 10 to 25% less hops depending on how slow your wort chilling happens. If your cooling time is longer, you would extract a bit more hop bitterness than my recipe suggestions. How much longer and how much less hops will be something that only experimentation on your part will determine. The commercial brewers I spoke with for the story were very clear with me that the standard IBU calculations that work pretty well for 60-minute and 30-minute boils are more difficult for this hop bursting method. Another solution, is to do a 'double wort chiller,' where you first have the water from your faucet go into a wort chiller that is in a 3-gallon (11-L) ice bath (mostly ice), and then into the wort chiller in your beer. The advantage to this is that it will cool your wort much faster, and also improve your hot break leaving you with a less cloudy beer."

Pump placement

I really enjoyed reading the "Build a Better Homebrew Pump" article in the November 2014 issue and it got me

contributors

Dave Louw is a software development manager who channels his need to build things into his many hobbies including homebrewing. He enjoys experimenting with processes and ingredients and his homebrewery is constantly in a state of flux.

Dave is a founding member of the San Luis Obispo Brewers club in California and can be found the second Sunday of every month at his local homebrew shop sharing beers with friends. Dave has written many stories for *BYO* in the past, including "Taps on your Truck" in the July-August 2014 issue, as well as "No Chill Brewing" in the September 2014 issue. This time around, on page 58, Dave takes us behind the scenes at San Francisco's legendary Anchor Brewing Company (including six clone recipes).

Christian Lavender is an Austin, Texas-area homebrewer who runs kegerators.com, a site devoted to finding the best prices on kegerators. You can also ask kegerator-related questions on the site and he will answer them. Christian is a frequent contributor to *Brew Your Own*, including "Perfect Pour" — a story about kegging tips in the November 2013 issue, a story in the September 2014 issue about the importance of homebrewing safety, as well as several installments of our "Projects" column. In this issue, starting on page 54, Christian takes a look at some of the overlooked pieces and parts of his homebrewing equipment, like plate chillers and ball locks, and explains how to get them clean and sanitized for the next brew day.

Glenn BurnSilver is a freelance writer who enjoys outdoor activities such as hiking and camping in the backwoods. He has lived in Colorado and Alaska and now resides in Scottsdale, Arizona. Glenn is also an avid record collector and travels to record conventions across the country. He also maintains a music review blog, *Liner Notes*, which can be found at www.burnsilver.com.

Glenn is a longtime and frequent contributor to *Brew Your Own*, including a story in October 2013 about making hopped hard cider, and also a piece on making the most of your next visit to a commercial brewery in December 2013. In this issue, on page 72, Glenn discusses how mobile canning companies are working with homebrewers and homebrew shops to get hobbyists in on the canning craze.

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the best of Brew Your Own

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thinking on ways to improve my current setup. In regards to Figure 2 on page 90, however, I was wondering why the bleeder valves are placed on the outlet side of the pump. If the rationale for a bleeder valve is to remove air pockets and to prevent pump cavitation, I would have assumed that it should have been placed on the inlet side of the pump, like it is in Figure 1. Is there a rationale that the author has for the difference in bleeder valve location?

Marco Trauzzi
via emai

Brew Your Own *Editor Betsy Parks replies: "Hi Marco. The only explanation behind the placement of the pump in the figure in question on page 90 is that we made a mistake. The figure drawing should have been replaced before going to press. My apologies for any confusion. The story author, Christian Lavender, however assures me that he has run systems both ways for years and never have had any issues stressing out the pump. To see the corrected figure, visit Christian's story at http://byo.com/story3167. Thanks for writing in and bringing it to our attention!"*

No chill brewing

I have tried the no wort cooling brew twice (as discussed in your September 2014 issue) with great success. I live in central California where water is at a premium so I really liked the idea. One small issue — on both batches the container I put the wort into (a Speidel fermenter) swelled up when I put the hot wort in and then collapsed on itself as it cooled. I am concerned that this constant swelling and collapsing of the fermenter will at some point cause it to fail. Any suggestions?

Ian Webster
via email

Brew Your Own *Story Author Dave Louw replies: "Hi, Ian. Yeah, the swelling and collapsing is a big problem with packing hot wort into a sealed container when doing no-chill brewing. The steam fills the headspace and expands considerably when hot. Then as the wort cools that shrinks down. The airspace is a much bigger factor than the modest shrinking of the liquid wort. For the containers I use I try to get them as full as possible to minimize headspace, which greatly reduces this expanding/contracting problem. If I were going into another vessel that I couldn't fill completely, and I was going to pitch relatively soon, then I'd put a sterile air filter onto the airlock hole of the fermenter. Steam would go out when hot and fresh, sterile air would come in as it cools."* BYO

BETTER BEER THROUGH BETTER CHEMISTRY

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homebrew nation

READER PROFILE:

Brewer: Jason Rich

Hometown: Claypool, Indiana

Years brewing: 13

Type of brewer: All-grain

Homebrew setup: 5-gallon (19-L) converted cooler, batch sparge.

Currently fermenting: Saison and weizenbock

What's on tap/in the fridge: Belgian quad, crème brûlée stout, hard cider

How I started brewing: There was no good beer in town and I got inspiration from my local homebrew shop, Brewer's Art Supply, in Fort Wayne, Indiana.

My blog/website: The website for my homebrew club, Kosciusko Kettleheads, is www.kettleheads.org

A little about the recipe I'm sharing: My absolute favorite beer season of the year is Christmas. We have access to an unlimited variety of the best and most unique beers of the year from thousands of commercial breweries to help celebrate the season of love and good cheer. The homebrewery should be no different! Nothing fills me with the Christmas spirit more than sitting in front of the tree with a large snifter full of my Gingerbread Squash Christmas Ale. The cheery part of the recipe comes from the spices and "extras." Luckily, I have access to an excellent local spice store. I've found using last year's leftover spices seriously reduce the gingerbreadiness (sure, it's a word), so always buy fresh. I've found over the years that using gourds really contribute very little to the overall beer, whether it's flavor or gravity, so I basically utilize the butternut squash (from my garden) as a vehicle for the brown sugar. In a season full of high alcohol, spirit lifting/liver crushing holiday offerings, my beer fits in nicely. Purists may doubt, but I have fun brewing it and the results are fun, and isn't that why we brew in the first place? Cheers, and Merry Christmas!

reader recipe

Gingerbread Squash Christmas Ale

(5 gallons/19 L all-grain)

OG = 1.062 FG = 1.018
IBU = 17 SRM = 16 ABV = 6%

Ingredients

8.5 lbs. (3.9 kg) Maris Otter 2-row pale ale malt
0.5 lb. (0.23 kg) Special B malt
0.5 lb. (0.23 kg) wheat malt
0.5 lb. (0.23 kg) crystal malt (90 °L)
0.5 lb. (0.23 kg) aromatic malt
4.6 AAU Willamette hops (60 min.) (1 oz./28 g at 4.6% alpha acids)
3 lbs. (1.4 kg) peeled, cubed butternut squash
1 lb. (0.45 kg) dark brown sugar
8 cinnamon sticks
18 whole cloves
24 whole allspice
1 oz. (28 g) grated ginger root
1 tsp. Irish moss (10 min.)
White Labs WLP005 (British Ale) or Wyeast 1187 (Ringwood Ale) yeast
¾ cup corn sugar (if priming)

Step by Step

This recipe is a single infusion mash. Mash in at 154 °F (68 °C), hold for 60 minutes. During the mash, I peel and cube the squash and spread them out on two cookie sheets and I cover them loosely with brown sugar. I bake them at 350 °F (177 °C) for 30 minutes — be careful not to let the sugar scorch. By the end, the squash will be tender and the sugar will be liquid. Dump the whole lot into the kettle (go ahead and taste some, you won't be able to resist anyway) and rack the wort on top of it. Bring it to a boil, being careful not to let the squash/sugar scorch on the bottom of the kettle. Add the hops and boil for 60 minutes. Add the Irish moss with 10 minutes left in the boil.

At the end of the boil, add the dry spices in a hop sack and let them sit for 10 minutes before chilling. (Note that there is no nutmeg in this recipe, which I have found makes this taste more like a pumpkin beer, and that's for Thanksgiving.) There will be a lot of extra solid material in the wort, so take care in siphoning or transferring to the fermenter as clogs in hoses can occur. I make sure to play some classic Christmas music while I pitch, usually Bing and Frank, to get the yeast into the holiday spirit.

what's new?

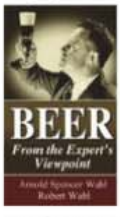
Anti-Bacterial Airlock

The Sterilock® airlock contains a patented nanoseal that allows CO_2 gases to vent while preventing contaminants to enter the fermentation vessel. Also comes with an optional odor-absorbing capsule good for the duration of an average fermentation. The Sterilock® can be sanitized like any airlock and fits in standard bungs and grommets. Since there is no liquid to keep topped up, the Sterilock® is a good choice for long-term aging. Visit www.sterilock.co.uk for more information.

Belgian-Style Yeast Strain

Abbaye is the newest addition to the lineup of Lallemand brewing yeast products. Abbaye yeast was developed for brewing Belgian-style ales including high-gravity beers like dubbel, trippel and quad. Its high ethanol tolerance provides fermentation performance with true-to-style flavor contributions. Complete information is available at www.lallemandyeast.com.

Beer From the Expert's Viewpoint



Originally written in 1937 by brewing chemists Robert Wahl and Arnold Spencer Wahl, *Beer From the Expert's Viewpoint* was designed to educate the new generation of brewmasters that emerged after the repeal of Prohibition in 1933. Before Prohibition, the Wahl-Henius Institute of Fermentology in Chicago was the most well-respected brewing academy and center for brewing research in the US. Over a 50-year history, the Institute educated some of the country's most successful brewmasters and engineered some of the industry's most important scientific breakthroughs. This is the 12th book in BeerBooks.com's Classic Reprint Series. Available at BeerBooks.com for $24.47.

Growler Cleaning Tablets

Filling and emptying growlers is not only fast and effective, but also environmentally friendly. However, they can be tricky to clean if you can't get around to giving that growler a good clean and rinse right away. Craft Meister Growler Cleaning Tablets are a convenient, pre-measured tablet designed specifically for cleaning a half-gallon (2 L) growler. Just fill the growler with hot water, add a tablet, soak for 15–20 minutes, then dump and rinse. Enjoy a spotless, clean growler ready for the next fill. For more information visit www.craftmeister.com. Ask for them at your local homebrew shop or growler filling station.

calendar

November 28
ABQ Beer Holiday Fiesta Home Brew Competition
Albuquerque, New Mexico

All BJCP categories will be accepted into the Holiday Fiesta but the best homebrew in the Christmas/Winter Specialty Spiced Beer (21 B) category will also receive a Best of Show award. Judging will be held December 5-7 and an awards ceremony will take place afterwards. Places will be awarded for the top three beers in each category with the top advancing to Best of Show judging. The entry fee is $6.
Web: www.abqbeer.com/holiday-fiesta-brew-competition/

December 5
Pints and Knights Homebrew Competition
Santa Fe Springs, California

This is the inaugural Pints and Knights Homebrew Competition, hosted by the local Knights of Columbus chapter. It is an AHA/BJCP sanctioned competition with all proceeds used to fund community activities and council programs. Registration closes December 5 and the total entry limit is 210, so get your homebrews in quick. The entry fee is $7. An awards ceremony will be held after judging is complete on December 13.
Web: www.competition.enriquepiceno.com

December 6
Big Beers, Belgians and Barleywines
Vail, Colorado

The 15th Annual Big Beers, Belgians and Barleywines Festival, held January 8–10, is a world class international beer festival with brewmasters' dinners and brewer seminars. In addition, the festival's homebrew competition sponsored by *Brew Your Own* is an AHA/BJCP sanctioned event that attracts hundreds of entries. The Grand Prize winner will have a batch of his or her recipe brewed and served on tap at The Falling Rock Taphouse in Denver and at Dry Dock Brewing in Aurora. They will also have the opportunity to partner with Dry Dock in the ProAm competition at the Great American Beer Festival. The entry fee is $5 and the deadline is December 6.
Web: www.bigbeersfestival.com

homebrew drool systems

Custom Brew

Brian Haslip • Troutdale, Oregon

I utilized my job skills as a field service engineer in the semiconductor industry for the last 20 years and input from my brew club, Oregon Brew Crew, to design a system with a 15-gallon (57-L) heat exchanged recirculating mash system (HERMs) kettle on the top tier, a larger mash tun on the middle tier and a 9-gallon (34-L) boil kettle with tangential input on the bottom. I added control valves and a counterflow wort chiller along with a custom electronic control panel that allows me to adjust gas flow for all three burners, set and monitor timers, turn on/off pumps and valves, and set target temperatures.

Using resistance temperature detectors in the mash tun, a temperature controller opens one of two valves on a delay to maintain a target temperature +/- 2 °F (1 °C). Wort circulation through a copper coil is constant during the mash.

The system has a three-way valve prior in the mash recirculation line. After the mash is complete, I can switch the valve from "recirc" to "xfer" and push my wort directly to the boil kettle. The second pump circulates the wort through the chiller and back into the boil kettle through the tangential input. As the wort is chilled, it creates a whirlpool in the kettle.

The system has two sparge arms. The height of the main circular sparge arm is adjustable and is used during mash recirculation. The second is used when lautering and allows an even transfer of water from the hot liquor tank.

SPICING THINGS UP

by dawson raspuzzi

Spices allow for countless variations and experiments in homebrewing — in styles that require it like pumpkin ales and Belgian wits, to saisons or wheat recipes that you may want to add complexity and your own twist to.

When developing a spiced beer, the first step is to determine what role you want the spice to play. Do you want a subtle taste of coriander for complexity, lemongrass to boost the nose, or are you going for a hibiscus taste that will be the star of the show?

Generally, spices are added with a couple minutes left in the boil or during secondary fermentation. Adding them late to the boil will extract the flavor quickly without blowing off all of the volatiles at the expense of the aroma, as can happen if you add them too early. Some spices, however, are harder to extract flavor from and will need longer in the boil. The other popular option is to add spices in the secondary, which will take longer to extract the flavor and aroma, but allows you to better control the spicing level and adds a fresher flavor and aroma to the beer. If you do this, you'll want to sample the beer periodically after adding your spices to the secondary. The spices will sink to the bottom and when the beer is just right, rack it off the spices and bottle or keg.

As is true with all ingredients, but especially with spices, balance is the key. Consider your entire recipe — it may be that you will want to reduce the amount of hops or specialty malts so they complement the spice instead of compete with it. You also need to be sure that your mix of spices complement each other. Some spices, like ginger or cardamom, can easily steal all of the attention from others like cinnamon and nutmeg in your winter ale if you aren't careful; and all of these spices can easily unbalance a great beer if too much is added.

Trial and error is the best way to determine how much of each spice to add. Start with small additions and work your way up — it is easy to add more of a spice, but not so easy to neutralize one's impact if you add too much. If you don't want to experiment with a full 5-gallon (19-L) batch, try splitting it. If you have 1-gallon (4-L) fermentation jugs, then a single batch of wort can be turned into five different spicing trials. When dealing with very small quantities of spices for your trials, a trick is to dissolve a larger amount of the spice in water and add the liquid mixture. For instance, if you want to add the equivalent of ¼ teaspoon per five gallons (19 L) in a 1-gallon (4-L) trial, then boil 5 oz. (142 g) of water, add ¼ teaspoon and then add 1 oz. (18 g) of the solution to your 1-gallon trial. Take detailed notes of each trial, (spice selections, amounts, times, etc.) so when you find the right combination you can replicate it.

Another spicing option is making an extract of each spice. Jamil Zainasheff suggests in his "Style Profile" column from December 2007 on winter spiced ale to add spices to a half-pint (237 mL) mason jar about half full with vodka and aging it several days. The alcohol acts as a solvent to extract color, flavor and aroma from the spices. Jamil warns, however, that while this works well with many styles it should be used more to tweak the spice character, not as the sole source of spice notes.

Also keep in mind there is a difference in taste and aroma between fresh and dried spices. Try both and see which you prefer, but don't assume they can be substituted for each other if you are trying to replicate a previous recipe. Lastly, like hops, spices can have a different potency depending on the source and climate they are grown in. So, again, bench trials are important!

by marc martin

DEAR REPLICATOR, I THINK I FOUND MY FAVORITE HOLIDAY BEER EVEN THOUGH MOST PEOPLE WOULDN'T THINK THIS IS A BEER STYLE FOR WINTER. LAST THANKSGIVING WE DROVE UP NORTH TO PORTLAND, OREGON TO SPEND THE HOLIDAY WITH RELATIVES. I HAD A FREE DAY TO CHECK OUT SOME OF THE BREWPUBS IN THE CITY AND HAPPENED UPON THE 5TH QUADRANT. ALL THE BEERS WERE GOOD BUT THE STANDOUT WAS THEIR C-SONS GREETINGS ALE. WOW, WHAT A BEER. THEY CALL IT A DOUBLE IPA — HOPPY YES, BUT MALTY TOO. IT WENT WELL WITH THE TURKEY AND I HOPE YOU CAN GET SOME DETAILS SO I CAN TRY TO DUPLICATE IT.

KEVIN TELFORD
SAN DIEGO, CALIFORNIA

I certainly agree that this is not your average mid-winter beer. From personal experience I can tell you that since its release 11 years ago it has become one of the most sought-after seasonal beers here in Portland. The brewery even schedules a special release party for it every year.

While you found this beer at 5th Quadrant, it is really brewed by Lompoc Brewing Company, which has five locations – 5th Quadrant, Oaks Bottom, Hedge House, Lompoc Tavern and The Sidebar, which is right around the corner from 5th Quadrant. 5th Quadrant has the only brewing system and supplies beer to all of the other outlets.

Lompoc Brewing has a rich and colorful history in Portland. The Lompoc family of pubs began as the brainchild of local homebrewer Jerry Fechter. In 2000 he teamed up with Portland publican Don Younger of Horse Brass Tavern fame, to purchase the Old Lompoc Pub (where Jerry had installed the brewing system with a mish-mash of locally sourced equipment four years earlier in a small 440 square foot space at the rear of the building). During the first few years, production was maxed out at 300 barrels per year. In 2004 the Hedge House Pub was added and annual production reached 1,089 barrels, an outstanding feat for a brewery that size.

Looking to expand again, Jerry and Don found a suitable building close to a high bicycle traffic corridor in north Portland and the 5th Quadrant was opened in December of 2005 and the following year a new seven-barrel brewhouse was built inside to complement the original brewery production. Given the growth, Jerry could no longer manage the business and brew the beers too. Seeking a new head brewer, they found Bryan Keilty brewing at McMenamins' Cornelius Pass Road House. A Los Angeles, California native, Bryan began homebrewing in 2003 while living in San Diego after graduating from the Culinary Institute of America in Hyde Park, New York. Following the trail of great craft beers, he moved to Portland in 2006. His first job was bartending with the McMenamins organization but with his brewing background he quickly moved up the ranks. Jerry and Don hired him to brew at the original, small brewery at Old Lompoc Pub for a year and then he was promoted to Head Brewer at the much larger 5th Quadrant facility.

Expansion continued over the years, including two more pubs, a barrel aging room and limited 22 ounce bottling. In March 2011, to keep up with growing demand, the seven-barrel brewhouse was upgraded to a 15 barrel system and soon thereafter all brewing production was shifted to 5th Quadrant.

Bryan continues to supply the demand along with the help of two assistants. Production is projected to reach 3,400 barrels this year and their beers are now distributed throughout the Northwest.

Unfortunately, we all lost our good friend and industry legend Don Younger who passed away in January of 2011. Jerry now is the sole owner of the growing Lompoc Brewing Co. A portrait of Don, painted by local beer writer John Foyston, hangs above the fireplace in The Sidebar Pub and we toast him often.

The C-Sons Greetings Ale began as and offshoot of the very popular C-Note IPA. That beer was first brewed in 2001 at 8% ABV. It was then toned down to 6.9% for two years. It was revived back to its original strength for Christmas of 2003 and 50% more hops were added to the original C-Note recipe. The name comes from the liberal use of "C hops." Because of the amount of dry hops, the nose is amazing and flavor profile can best be described as strong but well balanced.

Bryan offers these tips for successfully brewing this beer: If your water is somewhat soft, add gypsum to increase the hardness and accentuate the hops. Also, allow the beer to condition for at least three weeks for the flavors to fully develop — longer if you can wait.

Kevin, you can have your favorite holiday beer any time of year without making the trek north because now you can "Brew Your Own." For more information about Lompoc Brewing Company and their other fine beers visit their website at www.lompocbrewing.com.

Lompoc Brewing Company's C-Sons Greetings Ale clone
(5 gallons/19 L, all-grain)

OG = 1.078 FG = 1.016 IBU = 96
SRM = 13 ABV = 8.6%

Ingredients

14.25 lbs. (6.5 kg) 2-row pale malt
1.2 lbs. (0.54 kg) crystal malt (75 °L)
1.2 lbs. (0.54 kg) flaked barley
4.2 AAU Centennial hop pellets (first wort hops) (0.4 oz./11 g at 10.5% alpha acids)
3.75 AAU Sterling hop pellets (60 min.) (0.5 oz./14 g at 7.5% alpha acids)
9 AAU Nugget hop pellets (60 min.) (0.7 oz./20 g at 12.8% alpha acids)
6.5 AAU Chinook hop pellets (40 min.) (0.5 oz./14 g at 13% alpha acids)
1.75 AAU Crystal hop pellets (40 min.) (0.5 oz./14 g at 3.5% alpha acids)
5.75 AAU Cascade hop pellets (20 min.) (1 oz./28 g at 5.75% alpha acids)
10.5 AAU Centennial hop pellets (0 min.) (1 oz./28 g at 10.5% alpha acids)
1 oz. (28 g) Cascade hop pellets (dry hop)
1 oz. (28 g) Centennial hop pellets (dry hop)
1 oz. (28 g) Crystal hop pellets (dry hop)
0.5 oz. (14 g) Chinook hop pellets (dry hop)
½ tsp. Irish moss (30 min.)
½ tsp. yeast nutrient (15 min.)
White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) or Safale US-05 yeast
¾ cup of corn sugar (if priming)

Step by Step

This is a single step infusion mash. Mix all of the crushed grains with 5.5 gallons (21 L) of 172 °F (78 °C) water to stabilize at 154 °F (68 °C) for 60 minutes. Slowly sparge with 175 °F (79 °C) water and add the first wort hops to the kettle. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. While boiling, add the hops, Irish moss and yeast nutrient as per the schedule. During the boil, use this time to thoroughly sanitize your fermentation equipment.

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Gently transfer to a carboy, avoiding any splashing to prevent aerating the beer. Add the dry hops for three days and then remove or rack off the dry hops. Allow the beer to condition for an additional week and then bottle or keg. Allow the beer to carbonate and age for three more weeks and enjoy your C-sons Greetings Ale.

Lompoc Brewing Company's C-Sons Greetings Ale clone
(5 gallons/19 L, extract with grains)

OG = 1.078 FG = 1.016 IBU = 96
SRM = 13 ABV = 8.6%

Ingredients

6.6 lbs. (3 kg) Muntons light, unhopped, liquid malt extract
1.3 lbs. (0.59 kg) light dried malt extract
2 lbs. (0.91 kg) 2-row pale malt
1.2 lbs. (0.54 kg) crystal malt (75 °L)
1.2 lbs. (0.54 kg) flaked barley
5.25 AAU Centennial hop pellets (first wort hops) (0.5 oz./14 g at 10.5% alpha acids)
4.5 AAU Sterling hop pellets (60 min.) (0.6 oz./17 g at 7.5% alpha acids)
10.2 AAU Nugget hop pellets (60 min.) (0.8 oz./23 g at 12.8% alpha acids)
6.5 AAU Chinook hop pellets (40 min.) (0.5 oz./14 g at 13% alpha acids)
1.75 AAU Crystal hop pellets (40 min.) (0.5 oz./14 g at 3.5% alpha acids)
5.75 AAU Cascade hop pellets (20 min.) (1 oz./28 g at 5.75% alpha acids)
10.5 AAU Centennial hop pellets (0 min.) (1 oz./28 g at 10.5% alpha acids)
1 oz. (28 g) Cascade hop pellets (dry hop)
1 oz. (28 g) Centennial hop pellets (dry hop)
1 oz. (28 g) Crystal hop pellets (dry hop)
0.5 oz. (14 g) Chinook hop pellets (dry hop)
½ tsp. Irish moss (30 min.)
½ tsp. yeast nutrient (15 min.)
White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) or Safale US-05 yeast
¾ cup of corn sugar (if priming)

Step by Step

Steep the milled grain in 2.5 gallons (9.5 L) of water at 154 °F (68 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (2 L) of hot water. Add the malt extracts and first wort hops to the wort. Bring to a boil and boil 60 minutes, adding the Sterling and Nugget hops once a boil is achieved. While boiling, add the hops, Irish moss and yeast nutrients as per the schedule. During the boil, use this time to thoroughly sanitize your fermentation equipment. When the boil is done, add the wort to 2 gallons (8 L) of cold water in a sanitized fermenter and top off with cold water up to 5 gallons (19 L).

Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Gently transfer to a carboy, avoiding any splashing to prevent aerating the beer. Add the dry hops for three days and then remove or rack off the dry hops. Allow the beer to condition for an additional week and then bottle or keg. Allow the beer to carbonate and age for three more weeks and enjoy your C-sons Greetings Ale.

STORY BEHIND THE LABEL

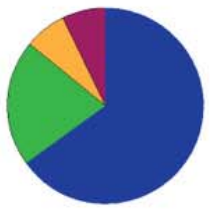
Heath Gelinas
Vernon, Connecticut

I have been homebrewing with my brother, Jason, and his wife, Stacey, since 2010, when we created Bottom-Side-Up Brewing Co. We have over 100 batches under our belt and we try to label, or at least name, each beer. For our homebrewery we created the logo of a turtle on its shell tipping back a pint glass, which we put on each label, and use the slogan "Beer so good your glass is always Bottom-Side-Up." I draw the labels in Inkscape and we put many hours into thinking up and designing them. We try to keep the design of every label relatively consistent and the names of the beers are always a play on words.

Loco Potion is a steam beer and is a play on locomotion, which is why we depict an intoxicated train engineer riding along on a steam locomotive. Jack the RIPA is a rye India pale ale and was the first name that popped into my head — and what's funnier than a Jack-in-the-box dressed up as a serial killer drinking a beer? Trapeze "MONK"eys is a patersbier (loosely translated to fathers beer and traditionally brewed by Trappist monks). The label has two *monk*eys swinging from the rafters of an old church while sipping beer from their chalices.

byo.com brew polls

How Many Homebrew Competitions Have You Entered This Year?



hop profile

Brewer's Gold

Brewer's Gold is a dual-purpose hop developed by Professor E.F. Salmon in Kent, England in the early 20th century. It has been widely used for breeding purposes, and imparts a black currant, resin, spicy flavor and aroma. Alpha acids range between 4.5-6.5%. It is most commonly used in Pilsner, lambic, and saison styles. Possible substitutions are Northdown, Chinook, Galena, and Nugget.

tips from the pros

by Dawson Raspuzzi

Spruce Tips

A revitalized brewing ingredient

SPRUCE TIPS WERE COMMON IN NORDIC AND SCANDINAVIAN BEERS, AND WERE USED BY COLONISTS WHEN HOPS COULD NOT BE SOURCED (THEY ALSO HELPED PREVENT SCURVY). OVER THE PAST DECADE, CRAFT BREWERS HAVE BROUGHT BACK THE USE OF SPRUCE AS AN INGREDIENT IN MANY STYLES OF BEER.

Tim Roberts is the Head Brewer and Production Manager at Yards Brewing Company, in Philadelphia, Pennsylvania. He has been brewing professionally for over 15 years. After working as a cellarman and barman in London for a year, he took a job as a waiter at Dock Street Brew Pub in 1997 and worked his way up to become a brewer there. He joined Yards during its expansion in 2008.

Our Tavern Spruce Ale is a historical recipe that utilizes spruce tips essentially as a substitute for hops. We use 30 lbs. of spruce tips in a 50-barrel batch (~1.5 oz. per 5-gallon/19-L), which are meant to add a certain spiciness to the beer. We don't want that flavor to be over the top and dominate the beer. Rather, we look at it as one component in a fairly complex beer, along with the malt character and molasses. I really think this style of beer needs a firm malt backbone to balance that pine/almost menthol character. In Tavern Spruce, we use a decent amount of crystal malt and roasted barley to back up those flavors.

We use blue spruce clippings from the nearby Indian Orchard Farm, which grows them organically. Yards has partnered with them from the beginning, and as far as I know we have always used blue spruce. They are always added within 24 hours of being clipped, and our brewers pull off the tips from the woodier branches. Then we simply bag them in nylon bags so the needles don't foul any of the equipment.

We add the spruce tips in the kettle during the last 20 minutes of the boil. We used to add them in the last 5 minutes of the boil, then transfer them to the whirlpool, but we feel like the current process gives us a more consistent/predictable result.

My advice for homebrewers is to use the real thing! In my opinion, the extracts make the beer taste like toothpaste. I'd also recommend starting with less than you might think is appropriate. When it comes to additives, I've always believed that less is more. Lastly, as I said earlier, I really do think you want some maltiness in a spruce beer. Even a porter or a stout would work well with it, I think.

Rob Day is the Head Brewer at Alaskan Brewing Co. in Juneau. With a passion for brewing, Rob took the first job he could get at Alaskan 10 years ago as a sales merchandiser and worked his way up to brewer. One of his responsibilities is developing new recipes on the brewery's experimental 1-barrel system.

Our Winter Ale is an English old ale with roughly 100 pounds of spruce tips added into a 300-barrel batch for us. We want it to be fairly pronounced in the nose and throughout the flavor profile. Those are obviously bigger numbers than your average homebrew, but somewhere in that ½- to 1-pound for a barrel (~1.3- to 2.6 oz. per 5-gallon/19-L) would be about right I think. We have also used spruce tips in a tart wheat ale and in the collaboration beer we did with Brew Dogs, which was our Survival Beer based on a Kvass. Basically beers without a high hop or bitter profile have worked best for us.

We add them about 15 minutes before the end of the boil. If you were to add them earlier it would cause a breakdown of the compounds that impart that spruce taste and bring out too much of the sap and piney flavors. Added late, spruce tips add a sweetness — I always think of it as a bubblegum type of flavor and aroma.

We use Sitka spruce tips picked exclusively in Gustavus, Alaska by the whole community there. It becomes a big project for about a week there — with everyone pitching in to pick the tips at their peak. Then they are cold-water rinsed and immediately vacuum-packed and frozen in Gustavus. They look beautiful and fresh when we use them because they haven't been exposed to air since they were gathered.

One of our secrets is that we age some of our spruce tips and then we mix them in with the new ones. We find that if we age them for a year they get a little sweeter and a little less piney, and mixed with the new buds it makes for the best flavor. We use big mesh baskets to soak them into the boil. Also, pick the buds when they are small — the bigger buds have a higher sap content, which can easily overpower the lemony, bubblegum qualities.

Our Spruce Budd Ale is made with nothing more than 2-row malt, Sitka spruce tips, yeast and water. The idea is for a nice, light, effervescent ale that features the spruce exclusively. The aroma is piney-perfumey and the flavor has hints of citrus.

I had always practiced subtlety with herbs and spices in beer, but it seems the more spruce you put in the beer the better it is. I can't overemphasize that point. I have not yet had a batch that I thought could use less spruce. It mostly comes down to how much you can pick and how much beer you are willing to lose to them at the bottom of the kettle. This year we made 30 barrels and used 700 pounds of spruce tips (that is 0.75 lb./gallon or 0.8 kg/L).

I am currently using Wyeast 1968 (London ESB), but any yeast that doesn't distract from the spruce character will work. We have made a batch with California Common yeast and it was fantastic.

We treat spruce tips pretty much like hops, adding them at the beginning, middle and end of the boil. We save half of the spruce tips for the final addition and divide the rest into the first and second additions. We have tried using a mesh bag to contain them, but have decided that we don't get nearly the utilization as we do when we just dump them in. We tried dry hopping one year, but this tested even our extreme patience for extra work to make a great beer.

The best spruce tips to pick are off young trees. You can pick off of a 10-15 year old spruce every year. Ideally, you are picking the buds just as the little brown sheath has fallen off of the new growth. The buds will be super soft with a brilliant, almost lime green color compared to the older, darker, stiffer needles. Once picked, the buds can go directly into your beer, or they can be refrigerated and used within a few days or frozen.

Just like the tips themselves, we find the beer is best when drank fresh as the best of the spruce aromatics start to fade 4-6 weeks after the beer is done.

My only suggestion for homebrewers is use real spruce tips and experiment with styles. BYO

Jack Harris began brewing in 1990 at the Cornelius Pass Roadhouse in Hillsboro, Oregon for McMenamins. Since then he has helped start breweries in Boulder, Colorado and Cannon Beach, Oregon. In 2006 he became co-owner and Brewer at Fort George Brewery and Public House in Astoria, Oregon.

Tropical Brews

Hitting your FG, brewing rauchbier

help me
mr. wizard
by Ashton Lewis

Q HAVE ANY GOOD RECIPES FOR PINEAPPLE OR COCONUT ALE? OR ANY LIGHT BEER RECIPES? I'M NEW SO THE EASIER THE BETTER.

KEVIN HILL
CLEMSON, SOUTH CAROLINA

A Recipes are something I typically steer clear of in my column, but I do like offering ideas about developing a recipe. I also like a bit of food trivia when the opportunity arises. Pineapples have an interesting effect on foods of which some people are unaware, and that is the degradation of proteins. That is because pineapples contain the enzyme bromelain, named after the bromeliad family of plants that include pineapples. If you choose to prepare skewers of meat and include fresh pineapple chunks, make sure to use them quickly, as opposed to storing them in the fridge the day before your big cookout. Bromelain acts to tenderize meat and will turn firm pieces of your favorite protein into mush. The same sort of thing can happen if you choose to add fresh pineapple juice to beer, except instead of making beer mushy it will destroy its foam stability.

I prefer adding fruit to beer instead of wort because the retention of fruity aromas and flavors is better. So if you want to brew a fruity, pineapple wheat beer consider using pasteurized pineapple juice or pineapple puree. A good time to add fruit is after primary fermentation is complete. One pound per gallon (0.45 kg per 4 L) is a good starting point for a beer with reasonable fruitiness. If yeast is still active when the fruit is added, the fruit sugars will quickly be consumed and the perception of fruitiness drops off. If you simply want to drink a homebrew with a nice pineapple kick, there is nothing wrong in my book with adding the pineapple to your beer when it is served.

Coconut is an ingredient that is gaining popularity in brewing, largely because of the success of certain beers like Kona's Coconut Porter. The best way to use coconut seems to be by adding toasted shreds to wort at the end of the boil or by adding the toasted shreds to beer at the end of fermentation like a dry hop addition.

> "I prefer adding fruit to beer instead of wort because the retention of fruity aromas and flavors is better."

The usage rate for a nice hint of coconut in the nose and mouth is ¼ to ½ pound per gallon (0.1 to 0.23 kg per 4 L). Toasting coconut is similar to roasting malt — the longer and hotter the toast, the darker and more intense the flavors. The bottom line is to keep an eye on what is happening in the oven and control the process.

Light beer brewing is not something most homebrewers admit to thinking about, let alone admit to having actually done! That's why my groundbreaking, tongue-in-cheek article in the March 2001 issue about using Beano® as a brewing aid for light beer was written as a gaff. I think only the thickest skinned brewers understood the beauty of the method and actually tried it. Not long ago, light beer was synonymous with very pale, very delicately flavored lagers with low caloric content and not much alcohol. These types of light beers are easy to make fun of and I am sure most of us have chuckled about how light beer is similar to sex in a

canoe. The truth is that brewing super clean, super light beer at home is among the most difficult things to do and not the type of thing that new brewers typically want to attempt.

What you may find fun to brew at home is the nebulous style called session IPA. These beers have many of the attributes of light beer, such as lower alcohol, lower caloric content, drinkability and refreshing character, along with the more interesting flavor notes associated with today's hoppy ales. I suggest doing a bit of reading related to this style (start with the story in the November 2014 issue of *BYO*), seek out some fun new aroma hop varieties to play with and brew some batches in preparation for spring.

Q I HAVE STARTED ALL-GRAIN BREWING AND HAVE BREWED ABOUT FIVE BATCHES SO FAR. I AM STILL TRYING TO FIGURE OUT MY SYSTEM, TAKE GOOD NOTES ON EVERY BATCH AND USE THE NO-SPARGE METHOD. ARE THERE ANY DISADVANTAGES OF HAVING TOO MUCH WATER IN THE MASH? I AM ADDING ALL MY WATER INTO THE MASH SO THAT I DON'T HAVE TO ADD ANY WATER ALONG THE WAY. IN MY LAST BATCH I USED 9 GALLONS (34 L) OF WATER TO 8 POUNDS (3.6 KG) OF GRAIN. MY FINAL GRAVITY (FG) WAS 1.016. I WAS HOPING TO GET 1.012 OR LESS FOR THE STYLE I WAS BREWING. NEXT TIME I AM CONSIDERING ADDING MORE WATER, BUT I AM WONDERING IF IT IS ALRIGHT TO ADD ALL THE WATER TO THE MASH OR SHOULD I ADD SOME WATER LATER TO ADJUST MY FINAL GRAVITY READING?

MARK SPONER
MORRILTON, ARIZONA

A I am definitely a subscriber to the idea that keeping things simple is a benefit to many things that brewers do in the pursuit of great beer. Simplifying things can have a very positive effect on consistency, ease of brewing, and quality, in addition to generally making the whole process of brewing more enjoyable. Some processes are better candidates for simplification than others. I have never really understood why sparging seems like such a great candidate for simplification because it is already pretty simple.

Sparging is used in brewing for the primary purpose of improving the extraction of wort from malt. Even if malt were free, sparging would still make sense because more beer can be brewed from a given weight of malt, thereby reducing the amount of malt that is required in a batch. This may seem trivial on a homebrewing scale, but using less malt per unit volume means a smaller mash tun is required. If you have a mash mixer and lauter tun, now there are two vessel sizes that are influenced by efficiency. The fact is that malt is not free and sparging is used to reduce malt costs, relative vessel size and the size of malt handling equipment; this is all very relevant to commercial operations.

The no sparge homebrew camp argues that the cost associated with sparge equipment and the hassle of sparging outweighs the loss in efficiency when sparging is omitted from the homebrewing process. I do not entirely disagree with this argument, especially if a brewer has limited space and limited equipment. One of the consequences of not sparging is that the wort gravity of the pre-boil wort is often higher than when the mash is sparged, and the water typically added during the sparge needs to go somewhere.

So, a logical thing to consider is what you have proposed and that is to simply add the mash water volume and the sparge water volume used in a conventional recipe all at the same time to the mash. There are a few problems, however, with doing this.

The first is a practical matter; adding all of the water to the malt requires a larger mash tun than when sparge water is used. For many brewers this really may be a trivial point that has no real bearing on the size of equipment used for the job.

My second point is a bit more real. When mashes become progressively thinner, enzyme stability decreases. Most beer in the world is brewed using a mash thickness somewhere between 2.6 parts water to 1 part malt (weight/weight basis) on the thick end of the spectrum to 4 parts water to 1 part malt on the thin end of the spectrum. Your last brew used 9 gallons (34 L) of water (75 pounds/34 kg based on 8.34 pounds/gallon) and 8 pounds (3.6 kg) of malt, or 9.4 parts water to 1 part malt. That is an extremely thin mash and the enzymes in such a mash are much less stable than enzymes in a thicker mash. The rate of the enzymatic reaction is also slower because the concentrations of both enzyme and substrate are reduced as the mash becomes more diluted (for more information on this subject read about Michaelis-Menten kinetics).

This has a direct bearing on your particular problem, and that problem is low wort fermentability. You are successfully extracting wort solids, mainly sugars, from the malt added to the mash, but those wort sugars are not all fermentable, (which they never will be, but in your case this is even more pronounced). The result is a high finish gravity. I suggest using a thicker mash to help stabilize your enzymes. You may also want to use a lower mash temperature. The next time you brew consider using a ratio of water to malt of about 4:1, a mash temperature of 153 °F (67 °C) and a mash time of 60 minutes. Collect your wort using the no-sparge method and then dilute the wort before boiling. Or you can boil the wort immediately after collection and add the water after the boil to adjust the gravity.

The third thing about a very thin mash that may be of

concern is the extraction of more tannins than you would get using a thick mash, but I don't have any references or anecdotal experience to back that up. I put this in as a possibility because many brewers are concerned about tannin extraction and if this were omitted someone would wonder about it.

I do want to touch on something that I see as a bit of a red herring. In your question you indicate that you are considering adding more water in your next batch in order to reduce the final gravity. This method can work, but by adding more water to your batch you will also reduce the original gravity. I think what you really want to do is hit your target original gravity and reduce your final gravity closer to 1.012. The best way to do this is by influencing wort fermentability, and the best way to do that is by adjusting mash temperature and mash thickness. Diluting beer or wort with water to affect the final gravity is nothing more than quite literally watering down the beer, and based on your question I don't believe that is what you wish to do.

Q I RECENTLY MOVED TO SEATTLE AND DO NOT HAVE AIR CONDITIONING IN MY CURRENT HOME SO IT REGULARLY PASSES 80 °F (27 °C) INSIDE DURING THE SUMMER. OUTSIDE OF BUYING AND CUSTOMIZING A FREEZER TO REGULATE TEMPERATURE FOR MOST BEERS, ARE THERE ANY TYPES OF YEAST THAT WOULD THRIVE IN THIS ENVIRONMENT? THE REST OF THE YEAR FERMENTATION TEMPERATURE IS NEARLY PERFECT.

BRADLEY CORRIGAN
SEATTLE, WASHINGTON

A What's that old adage? When the Pacific Northwest presents you with warm, summer weather get outside and enjoy it before the rain returns. Or is that just the hype intended to

ward off the invaders?

Seriously, you state in your question that the temperature is "nearly perfect" for fermentation during all times of the year except for the summer. In my opinion all hobbies deserve a break and it seems to me that your break from brewing should be in the summer. But if you cannot stand to think about such a thing, consider brewing saison, wit, weizen and other styles that have aroma profiles that are enhanced when the fermentation temperature is increased.

Moving beyond the obvious advice, I want to really consider what you have in your climate because this answer is transferrable to other regions that really do have issues. The average August high in Seattle is 76 °F (24 °C) and the average August low is 56 °F (13 °C) according to the Seattle.gov website. On the surface of things I am thinking that you can pretty much brew any type of ale that suits your palate, but let's not focus too much on how perfect your climate is for homebrewing!

One very simple thing you can do is take advantage of this average temperature and use water as a thermal buffer. Simply place your primary fermenter into a large bucket that allows you to fill the larger bucket with water without risking any flow of water into the fermenter. Assuming you placed your fermenter outdoors where the temperature rises and falls during the day, and under the protection of a waterproof box to protect it from radiant heat gain and rain, you could use a very slow water trickle into the outer bucket to create a cooling jacket to remove the heat of fermentation and maintain a relatively constant temperature for your fermenting beer. This method takes advantage of the average August air temperature (which is much cooler than the peak high temperature) and takes advantage of the municipal water temperature.

This line of reasoning should give you some options for brewing in the summer without investing in expensive refrigeration equipment.

Q ON A RECENT BATCH I MASHED AT A VERY HIGH TEMPERATURE (160 °F/71 °C), BUT STILL ENDED UP WITH MORE ATTENUATION THAN I EXPECTED (THE FINISH GRAVITY WAS LOWER THAN EXPECTED BY ABOUT 0.007). I USE THE BREW IN A BAG (BIAB) METHOD, AND SPARGE BY HEATING WATER IN A SECOND KETTLE TO 170 °F (77 °C) AND PLACING THE GRAIN BAG IN THE KETTLE AFTER THE MASH FOR ABOUT 10 MINUTES. DURING THIS SPARGE, THE WORT IN THE MASH KETTLE IS LEFT SITTING AND SLOWLY COOLS. CAN THE COOLING OF THE WORT IN THE MASH KETTLE CREATE MORE FERMENTABLE SUGARS AS IT COOLS DOWN, OR IS THE SUGAR PROFILE "LOCKED IN" AFTER THE HOUR-LONG MASH?

DAN DEVEAU
COLORADO SPRINGS, COLORADO

A Unfortunately, enzymes do not "renature" once they have been heated to the point of thermal inactivation and later cooled. Enzyme denaturation can be likened to cooking an egg, since egg whites and enzymes are both proteins and denaturation is exactly what happens when eggs are cooked. This can be seen when the clear, liquid albumin of the egg irreversibly solidifies and turns opaque when cooked.

I think there are several things going on with this batch and brews like this in general. For starters, your mash temperature was really not that hot. According to Kunze's *Technology Brewing and Malting*, alpha amylase remains active up to about 167 °F (75 °C) and begins to quickly lose activity at 176 °F (80 °C) when it denatures. So mashing at 160 °F (71 °C) is certainly not the end of the world, in fact Kunze cites the optimum temperature range for alpha amylase to be between 162–167 °F (72–75 °C), which is a bit higher than the average zeitgeist of today's brewing collective. While 160 °F (71 °C) is too hot for beta amylase to survive for long (most sources indicate its denaturation temperature to be about 158 °F/70 °C),

there will be enough activity with most of the highly enzymatic North American malts on the market these days to yield wort with normal fermentability.

Beyond the denaturation question, let's consider what happens to wort after wort collection and boiling. Assume an infusion mash is used with a temperature of 154 °F (68 °C) and the wort is run to a kettle or holding vessel without a mash-off step. Also assume that the kettle or holding vessel is not heated until completely filled, not an uncommon scenario for many brewers who infusion mash. The wort in the kettle or holding vessel has a mixture of dextrins and active enzymes and wort fermentability can certainly change during this time period. This is especially true if the mash was short and the concentration of unfermentable dextrins is high at the beginning of this hold period; this is another example of Michaelis-Menten kinetics mentioned in the earlier question from Mark Sponer about sparging.

Now assume that the temperature in the kettle or holding vessel drops during this timeframe. Since the mash temperature in this hypothetical scenario was just a bit above the denaturation temperature of beta amylase and we have the possibility of a short mash, it is well within reason to expect some active beta amylase to end up in this container because enzyme denaturation takes time to occur, is influenced by enzyme concentration and is influenced by mash thickness and substrate concentration. So as the temperature drops below the denaturation temperature these remaining "native" enzymes (meaning that they are not denatured) remain active and continue producing maltose. This same logical argument about time and temperature is exactly the same reasoning that can be used to explain all sorts of things about brewing and food science, from pasteurization to staling.

There is a practical take-home message to this. The first is that brewing mistakes often are less catastrophic than they first may seem. In your case you thought you cooked your goose, so to say, and ended up with wort that was more fermentable than you expected. The second take-home message is that temperature measurement and control is pretty easy given the proper tools, and these are a good thermometer, reliable scale to weigh your malt and a reliable and accurate method of measuring water volume. As long as you know the temperature and weight of the two components of the mash (water and malt/grain) you can control your mash temperature and virtually eliminate losing sleep when the mash temperature is not on target.

Q DURING A RECENT STOP AT SPRINGFIELD BREWING COMPANY I TRIED THE RAUCHBIER. I HAD NEVER TRIED THIS STYLE BEFORE AND WAS A LITTLE SCARED OF THE SMOKE BUT I REALLY ENJOYED IT AND HAD THREE. I WOULD LIKE TO TRY MY HAND AT SOMETHING SIMILAR AND WOULD APPRECIATE ANY TIPS YOU COULD GIVE ME. I DON'T WANT IT TOO SMOKY SO I AM WONDERING HOW MUCH SMOKED MALT TO USE. I HAVE NEVER BREWED A LAGER SO WAS THINKING OF POSSIBLY USING A KÖLSCH YEAST TO GET A CLEANER PROFILE.

DAVE HIXSON
MANCHESTER, MISSOURI

A Thanks for asking about our "I Wanna Rauch" rauchbier! This beer was brewed in collaboration with Keith Wallis as a Pro-Am entry at the Great American Beer Festival. Keith's "I Wanna Rauch" was the Best of Show winner of the "To Helles and Bock" competition judged in March 2014 at The Home Brewery in Ozark, Missouri. As a result we worked with him to brew this tasty lager. This is our second Pro-Am beer and both have been brewed using Keith's recipes. This year was especially exciting for Keith and the SBC brewing team as we won a bronze for our entry, out of a total of 89 beers.

The key to brewing a good rauchbier is balance between the smoked malt and the other beer flavors. While this beer is traditionally brewed with lager yeast, I think a great rauchbier could be brewed using a very clean ale strain, and your suggestion of using Kölsch yeast sounds like a viable plan. The only problem that this type of yeast may cause is cloudiness in the finished beer because these strains have low to medium flocculation properties.

In our beer we used our house lager strain and fermented the beer at 54 °F (12 °C) until the gravity was down to 1.016. At this point we capped our fermenter with a pressure relief valve and allowed the tank pressure to increase to 15 psig. We typically cool our lagers to 38 °F (3 °C) four days after the gravity stops dropping and hold the beer at this temperature for about 10 days and then cool to 32 °F (0 °C) for a few days before filtration. The same cooling curve was used for this beer, and we skipped our normal filtration step since Keith's homebrew was not filtered. When we first put the beer on draught it was a little cloudy but cleared with time. I believe that if we had filtered this beer some of the body and mouthfeel would have been altered in a way that would have detracted from the finished beer.

The star of the show with this style is the smoked malt. Keith's recipe derived about 25% of the extract from Weyermann beechwood-smoked barley malt, about 20% from Weyermann Munich I, about 15% from CaraMunich® I malts and the balance from American pale 2-row malt. The original gravity weighed in at 1.056, the final gravity was 1.010 and the beer was balanced with about 25 IBU of hop bitterness from a single addition of Northern Brewer added 15 minutes into the 75-minute boil. Some rauchbiers I have tasted brewed in the US have a notable bitter note. This beer really had a terrific balance with the hops hanging in the background playing a crucial supporting role and letting the malt characters really shine. BYO

style profile
by Jamil Zainasheff

Belgian Dubbel

Exhibiting a rich, complex malt character

I fondly remember my very first trip to Belgium. I was already passionate about homebrewing and great beer, and I wandered from city to city, brewery to brewery, bar to bar, and bottle shop to bottle shop seeking out new experiences and tastes of classic examples. I was particularly interested in finding examples of Belgian dubbel. It took quite awhile to find any examples at all. When asked, most people had no idea what I meant by dubbel. Sometimes they thought I possibly meant Duvel.

> "Fermentation is really the centerpiece and a dry enough finish helps balance the beer, keeping it from being overly sweet."

Back then, the rest of the world did not have as much of a focus on beer styles as we did in the United States. I am not certain, but I wonder if beer styles are more of a "young country" type of phenomenon? When you brew and sell beers by name for a few hundred years, and then someone lists it as a classic example of a style on the other side of the world, do you really start referring to that beer as Flanders red or do you still call it Rodenbach? The same goes for many other beer styles, although you would think when there are many classic examples, such as Westmalle Dubbel, that say "dubbel" right on the label, you might expect that asking for "dubbel" would not be met with empty stares.

Well, apparently, all of us beer geeks asking again and again has changed the landscape. I find it much easier these days to ask for beer by style. When in Europe, I still try to ask for beers by brewery name, but more and more you can ask by style and the bartender or bottle shop seller will know what you are asking for.

Belgian dubbel ranges from 6 to 7.6% ABV with a rich and complex malt character, some initial sweetness, and moderate fruity esters. Some examples have spicy notes from fermentation, but this should be relatively subtle or completely absent. Any alcohol character should be subtle and smooth. If the first thing you notice is alcohol, that is a bad example of Belgian dubbel. Your first impression should be malt character along with a little malt and possibly alcohol sweetness. While the malt character can have hints of caramel, chocolate or toasted bread, those should not overwhelm the malt character. Fruity esters that come from fermentation and the malt of raisins, plums, cherries, pears, figs, and more should be evident. The body should be medium. Although good examples will have some malt sweetness up front, the beer should finish moderately dry. Even though hops play a role in balancing the overall character of this style, bitterness or hop character should not extend into the finish. Fermentation is really the centerpiece and a dry enough finish helps balance the beer, keeping it from being overly sweet. The color is dark amber to copper, often with ruby highlights when held up to the sun.

The base malt for this style, like most Belgian beer, is continental Pilsner malt. Pilsner malt lends a slightly sweet, grainy malt character to the beer. If you can source it, Belgian Pilsner malt is ideal. If you cannot, do not worry, even the Belgian brewers use other continental Pilsner malts. If you are an extract brewer, try to use an extract made from Pilsner malt. Recipes for this style range from very simple to overly complex. I have made award-winning examples using both. If you want to go with a simpler, more traditional recipe, Pilsner, caramel Munich, and dark Belgian candi syrup is all that you need.

BELGIAN DUBBEL by the numbers

OG:	1.062–1.075 (15.2–18.2 °P)
FG:	1.008–1.018 (2.0–4.6 °P)
SRM:	10–17
IBU:	15–25
ABV:	6–7.6%

Photo by Charles A. Parker/Images Plus

Belgian Dubbel
(5 gallons/19 L, all-grain)
OG = 1.065 FG = 1.012
IBU = 20 SRM = 19 ABV = 7%

Ingredients
11 lbs. (5 kg) continental Pilsner malt (2 °L)
1.1 lbs. (0.5 kg) caramel Munich malt (80 °L)
1.1 lbs. (0.5 kg) dark Belgian candi syrup (90 °L)
4.4 AAU Tettnang pellet hops (60 min.) (1.1 oz./31 g at 4% alpha acid)
Irish moss (15 min.)
White Labs WLP530 (Abbey Ale) or Wyeast 1762 (Belgian Abbey II) yeast
⅔ cup corn sugar (if priming)

Step by Step
Belgian Pilsner malt would be the natural choice for the base malt, but I use what I have on hand, which is Best Malz Pilsen. The caramel Munich 80 I use is from Malteries Franco-Belges. Feel free to substitute any high-quality malt of a similar flavor and color from a different supplier. The dark Belgian candi sugar I use is D-90 from Candi Syrup Inc. My hops are in pellet form and come from Hop Union, Crosby Hop Farm, or Hopsteiner depending on the variety.

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 150 °F (66 °C). Hold the mash at 150 °F (66 °C) until enzymatic conversion is complete. With the low mash temperature, you may need to lengthen the rest time to 90 minutes or more to get full conversion. Infuse the mash with near-boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water. Mix in the candi syrup as you collect the wort. The pre-boil kettle volume should be around 6.5 gallons (25 L) and the gravity should be 1.051. If you prefer to add the candi syrup later in the boil, the pre-boil gravity with just the mash would be 1.045.

The total wort boil time for this recipe is 90 minutes, which helps reduce the S-Methyl Methionine (SMM) present in the lightly kilned Pilsner malt and results in less Dimethyl Sulfide (DMS) in the finished beer. Add the bittering hops with 60 minutes left in the boil. Add Irish moss or other kettle finings if you would like with 15 minutes left in the boil. Chill the wort rapidly to 68 °F (20 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

You will need two packages of liquid yeast or, alternatively, you can make a 2.5 qt. (2.5 L) starter from 1 package. Pitch yeast at 68 °F (20 °C), aerate or oxygenate, and let the temperature rise slowly to 72 °F (22 °C) by the last ⅓ of fermentation. Ferment until the yeast drops clear. With healthy yeast, the bulk of fermentation should be complete in a week, but do not rush it. It is important for the beer to attenuate fully. When finished, carbonate the beer to approximately 2.5 volumes and serve at 45-50 °F (7-10 °C).


The Trappist Westmalle Brewery, which still uses copper boil kettles to brew their beers, makes one of the world's most famous examples of Belgian dubbel.

Belgian Dubbel
(5 gallons/19 L, extract with grains)
OG = 1.065 FG = 1.012
IBU = 20 SRM = 19 ABV = 7%

Ingredients
7.7 lbs. (3.5 kg) Pilsner liquid malt extract (2 °L)
1.1 lbs. (0.5 kg) caramel Munich malt (80 °L)
1.1 lbs. (0.5 kg) dark Belgian candi syrup (90 °L)
4.4 AAU Tettnang pellet hops (60 min.) (1.1 oz./31 g at 4% alpha acid)
Irish moss (15 min.)
White Labs WLP530 (Abbey Ale) or Wyeast 1762 (Belgian Abbey II) yeast
⅔ cup corn sugar (if priming)

Step by Step
I use a Pilsner-type liquid malt extract custom made for my homebrew shop from 100% Durst Pilsner malt, but feel free to substitute any high quality malt extract of a similar flavor and color. Always choose the freshest extract that fits the beer style. Freshness is vital for a great beer. If you cannot get fresh liquid malt extract, it is better to use an appropriate amount of dry malt extract instead, since it does not oxidize nearly as fast and tends to be fresher. My caramel Munich 80 comes from Malteries Franco-Belges. Feel free to substitute any high-quality malt of a similar flavor and color from a different supplier. The dark Belgian candi sugar I use is D-90 from Candi Syrup Inc. My hops are in pellet form and come from Hop Union, Crosby Hop Farm, or Hopsteiner depending on the variety.

Mill or coarsely crack the caramel Munich and place in a grain bag. Avoid packing the grains too tightly in the bag, using more bags if needed. Steep the bag in about 1 gallon (~4 liters) of water at 160 °F (71 °C) for about 60 minutes. Lift the grain bag out of the steeping liquid and rinse with more warm water. Allow the bag to drip into the kettle for a few minutes while you add the malt extract. Do not squeeze the bags. Add the candi syrup, malt extract, and enough water to the steeping liquor to make a pre-boil volume of 6 gallons (23 L) and a gravity of 1.054. Stir thoroughly to help dissolve the extract and bring to a boil.

The total wort boil time is 60 minutes. Add the bittering hops when the wort comes to a boil. Add Irish moss or other kettle finings with 15 minutes left in the boil. Chill the wort rapidly to 68 °F (20 °C), let the break material settle, rack to the fermenter, pitch the yeast and aerate thoroughly.

Follow the fermentation and packaging instructions for the all-grain version of this recipe.

Overly complex recipes can be too malty and the flavors are muddy. Yet, despite that, judges often score them quite high. Specialty malts such as aromatic, melanoidin, caramel Munich, Special B, and biscuit are all fair game in this style. The trick is to build a rich malt character with a balanced malt sweetness, while avoiding an overall muddy, generic maltiness. Good fermentation helps with this, but keep the total specialty malts down below 20% of the total grist.

Caramel malt adds some residual malt sweetness and is an important part of this style, but you do not want a distinct caramel flavor. You should avoid the mid- and lower-color caramel malts (the ones that are 10–40 °L), which can add too much candy-like caramel character. Instead, darker crystal malts (80–150°L) add a dark fruit, raisin-plum note and do not seem as candy-like. It is a good complement to the fermentation character and helps fill out the malt profile of the beer. In general, your crystal malt amounts are going to range from 5 to 10% of the total grist, although exceptions are possible.

I have brewed Belgian dubbel using a wide range of mash temperature, from 148 °F to 158 °F (64 to 70 °C). When brewing a bigger version of this style I target a lower mash temperature to create a more fermentable wort. When brewing a smaller version, I use a higher mash temperature to ensure the resulting beer does not end up too thin in character. A mash temperature around 150 °F to 154 °F (66 °C to 68 °C) is a good starting point. For extract brewers, most light colored extracts attenuate well enough. Whether you are brewing all-grain or extract, you can use a portion of simple sugar such as table sugar or a Belgian-type candi sugar. Keep in mind that you still want a medium body, so do not overdo it on the simple sugars. Generally, 5 to 10% of the grist is plenty. If you want to use lots of Belgian dark candi syrup for character, then you might also need to raise the mash temperature to compensate.

The balance and dry finish of most Belgian ales comes from a combination of alcohols, phenols, carbonation and minimal hops. I prefer to stick with noble hops such as Saaz, Hallertau, or Tettnang. Traditionally, breweries also use Styrian Goldings and in a pinch, other varieties such as Mount Hood, Liberty, or Kent Goldings are fine as well. I prefer a single large charge of low alpha hops near the beginning of the boil. The flavor of that early addition can carry through and will provide a subtle hop character. Nowadays more brewers are experimenting with increased hop character in all beers, but I would avoid going with late additions in this style. The bitterness-to-starting gravity ratio (IBU divided by original gravity) ranges between 0.2 and 0.4, although most brewers will want to target approximately 0.3 unless

you are getting a very dry finish from fermentation.

The characteristic fruity/spicy flavors and aromas of this style come from fermentation, not from the addition of fruits or spices. While some brewers may try to fake a Belgian dubbel by fermenting with their standard house yeast and adding spices, the problem is that spices will never really take the place of proper yeast selection and fermentation. You cannot fake the subtle complexity that comes from fermentation with spice additions. It is better to focus on perfecting fermentation.

There are several great yeast strains for brewing this style, but two of my favorites are White Labs WLP530 (Abbey Ale) and Wyeast 1762 (Belgian Abbey II). Other excellent choices are White Labs WLP500 (Trappist Ale), WLP540 (Abbey IV Ale Yeast), WLP545 (Belgian Strong Ale), WLP550 (Belgian Ale Yeast), Wyeast 3787 (Trappist High Gravity), and Wyeast (1214 Belgian Abbey). You cannot go wrong with any of these yeast strains. When selecting yeast, keep in mind that this style is more about the fruity notes than spicy phenols. Whatever strain you use, remember that your fermentation conditions affect what flavors and aromas the yeast produce. Pitching rate, oxygen level, nutrients, and temperature are like dials on your control panel of fermentation flavor. Getting the right settings is your job as a brewer.

One question that many brewers have about Belgian beers is fermentation temperature. Often homebrewers will say, "Brewery X ferments their beer at XX °F, so that is the fermentation temperature I use." However, that most likely will not be the right temperature for you, if you are trying to make a beer like theirs. Temperature is only one of many fermentation parameters. For example, fermenter height plays a role in flavor development, with very tall fermenters (like big commercial cylindroconical types) suppressing ester and fusel alcohol production. The shape of the brewery's fermenters, their pitching rates, their oxygen levels, their yeast collection and repitching methods may all be different from yours, which changes the production of esters, fusel alcohols and other aspects of fermentation. When you use the same fermentation temperature in your brewery with disregard for the other parameters, you may end up with fruit salad dissolved in paint thinner. Well, maybe not that bad, but pretty darn close. Do not let "how the classic brewery does it" determine your process unless you are using the same equipment and methods. Instead, get to know the beer style intimately and work on adjusting your process until you are making an outstanding example. It might take many tries and a vastly different process for you to achieve those results, but that is the fun of homebrewing.

style profile

With most of these yeasts I recommend pitching at a rate of 0.75 million cells per milliliter per degree Plato (see the pitching rate calculator at www.mrmalty.com for help in calculating this for your beer). Pitch the yeast and allow 12 to 36 hours for the majority of yeast growth, then ramp up the temperature for the rest of fermentation to ensure good attenuation. For example, pitch the yeast at 68 °F (20 °C) and at the end of the next day slowly begin raising the temperature each day. Try to end up at 72 °F (22 °C) by the last ⅓ of fermentation. Depending on the yeast strain and other parameters, you may find a higher or lower temperature or a faster or slower rise in temperature gives you the ideal result, so do not be afraid to tweak things until you get it right.

One concern with any Belgian beer, especially if you use a high percentage of specialty malts, is getting enough attenuation to avoid a finish that is too sweet. Many brewers go with lower and lower mash temperatures in an attempt to achieve this, but that is not always the problem. It is not an issue of long chain dextrins. Those dextrins are not very sweet and they can be present in a dry beer. The important thing is to make sure you ferment out as much of the simpler sugars completely. If you leave a lot of unfermented maltose, then the beer is going to taste sweet, even though it might attenuate well. The key to getting enough attenuation is starting with a healthy pitch of yeast, aerating or oxygenating properly, and controlling fermentation temperatures.

Oxygen is important to yeast health and is necessary for fermentation to reach terminal gravity in a reasonable amount of time. However, too much or too little oxygen can have unintended consequences, so adding the right amount of oxygen is important. That is difficult for many homebrewers, but you should try to control the amount of oxygen added by measuring timing and flow rate. The amount of oxygen required is a balancing act and can result in

excessively high or low esters and fusel alcohols. If you are using air, there is no chance of over-aerating your wort, but there is a chance of under-aerating. If you are using oxygen with a sintered stone, a good starting point for 5 gallons (19 L) is a flow of 1 quart (1 L) per minute for 1 minute. You might go up or down from there, as experience shows you what is right for your brewing. Over aeration can result in solvent-like flavors. Under aeration often results in a lack of attenuation, resulting in too sweet a finish.

If you are having trouble getting a beer with simple sugars in the recipe to attenuate enough, one trick that might help is waiting until fermentation is nearly done before adding the sugar. Waiting until fermentation has started to slow is like telling your kids to finish their dinner before they can have dessert. If you do not do that, sometimes they will fill up on dessert first and have little desire to eat their dinner afterwards. When I do this I dissolve the sugar in just enough boiling water to make a syrup. Once it cools, I add it to the beer. The yeast will consume simple sugars first before they consume maltose. Adding the simple sugars later ensures that the yeast consume as much maltose as possible before the simple sugars.

If your beer is attenuating properly but still tastes sweeter than it should, it might be fermentation-related compounds that are making it seem too sweet. If that is the case, then you need to revisit your fermentation parameters and/or try a different yeast strain. BYO

Related Links:

• Yeast strains play a defining role in shaping the character of Belgian beers. Learn how to select the right yeast strain and take control of your fermentation by varying your pitching rate, aeration level and fermentation temperature: http://byo.com/story1664

• Want more recipes? This story from the November 2000 issue recreates six legendary Belgian beers: http://byo.com/story576

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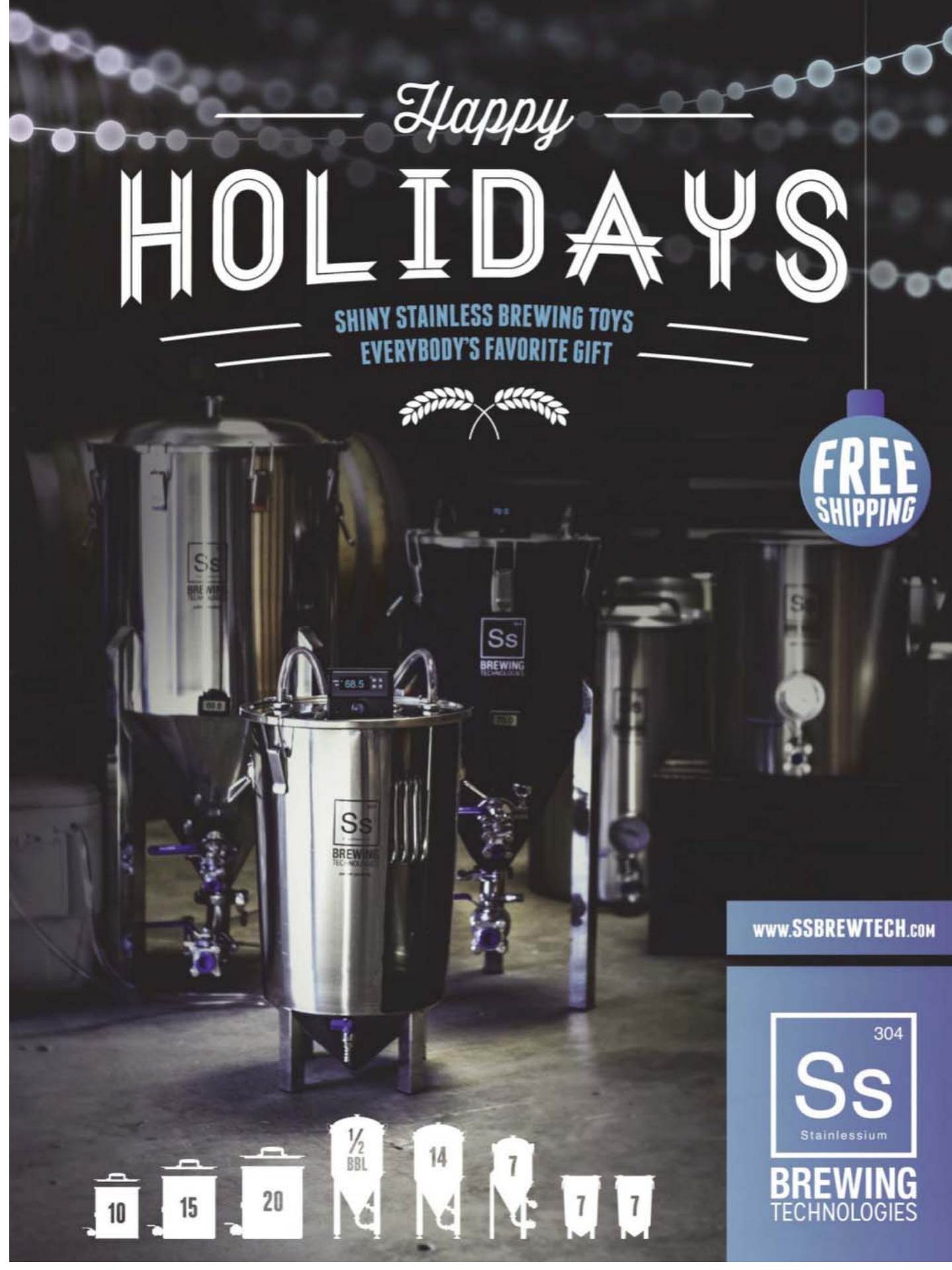
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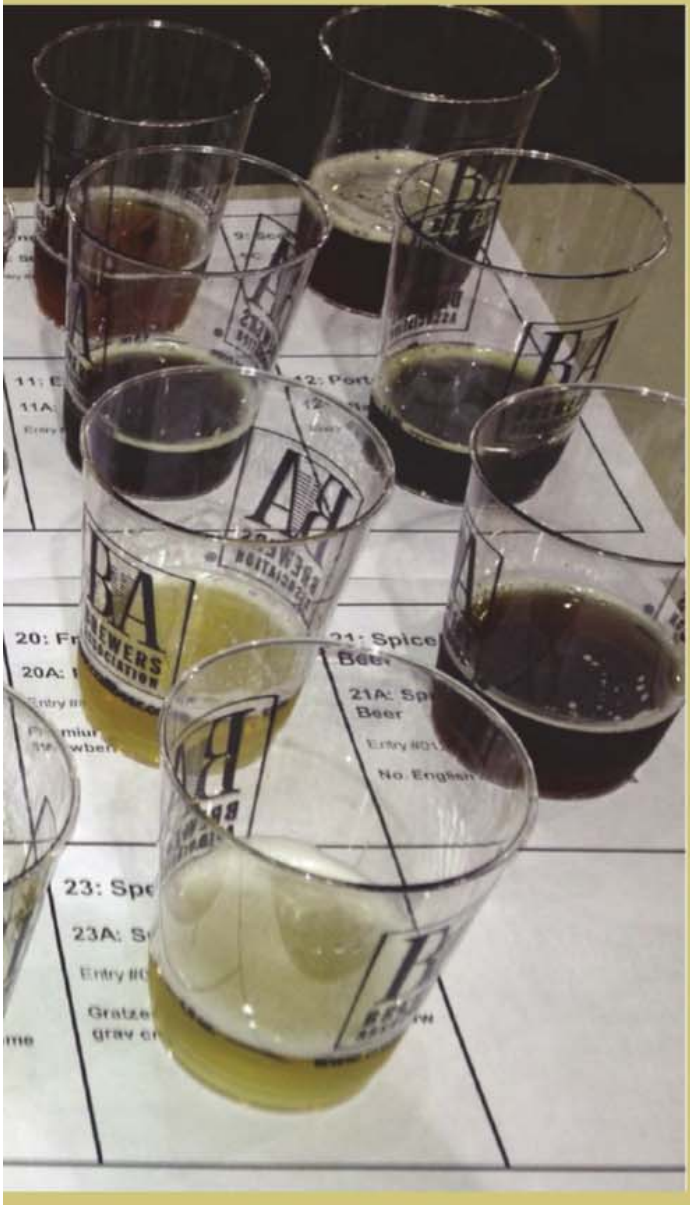
COMPETITION BREWING

Photos by Gordon Strong

RIGHT: A well-run homebrew competition will have judges that leave detailed feedback on your homebrews. Use this information to brew better beers next time.

BOTTOM: Homebrews are judged by a team (often two) judges, who taste and evaulate the beers in a series of flights. A panel of senior judges then chooses the "Best of Show" from the highest scoring homebrews.



Make Medal-Worthy Homebrews

"AWARD-WINNING HOMEBREWER" — not a bad title. But how does one get there? What does it even mean? This article is about homebrew competitions: How they run, why to enter, and how to win. We're also going to look at some myths and misconceptions about competitions so you're a better competition consumer.

Homebrew competitions are for everyone and aren't only about competing and finding the "best" beer or brewer. Winning is fun, but that's not the only reason to enter a competition. Every brewer should work to improve their palate so they can make their own judgments about their beer, but we all have blind spots (flavors we literally can't taste), biases (no such thing as "too bitter" for me . . .), and knowledge gaps (is DMS a Euro-pop band? No? OK, how do I fix it?). One of the greatest contributions competitions make to homebrewers is that they provide a venue to get structured feedback from trained judges who are evaluating beer under controlled conditions, using published guidelines. Competitions can help bridge the gap by giving you the as-objective-as-possible observations of others, can make you a better brewer, and will connect you to your local homebrewing community.

We'll start with what might be the best advice if you want your beer to improve: Enter every beer you want to improve or perfect into multiple competitions. You will soon be well on your way to brewing proficiency, and you'll be able to confidently assert that you're producing "good" beer — free of process flaws, using recipes that create balanced and pleasing flavors, which are consistent with regional or historic beer styles (if that's your thing — but it doesn't have to be).

by **Josh Weikert**

The Competition Environment and the Process

To begin, let me say that every competition is unique and you should always consult the competition information available before entering so you know what to expect. Having said that, there are some general statements I can make about them. Homebrew competitions may range in size from as few as 25 to 30 entries up to an event with more than 1,000 entries. Most, however, fall somewhere in the 150 to 400 entry range, and accept entries for all Beer Judge Certification Program (BJCP) beer, mead, and cider styles. Competition organizers establish the event's rules and guidelines, handle the bottles entered, and coordinate judging. When choosing a competition to enter, consult the Competition Calendar at the BJCP website (www.bjcp.org/compcenter.php). BJCP-sanctioned competitions are a safe bet because they must meet certain standards.

Entries are anonymous and judged fairly (under the same conditions for all beers, in accordance with published rules), by at least two judges (one of whom must be BJCP-certified). Entries are judged to published guidelines (usually the BJCP Style Guidelines).

In all BJCP-sanctioned competitions, feedback must be provided. This guarantees a basic level of predictability in the process. In the absence of these standards, judging runs a greater risk of being biased or arbitrary (judging based solely on the judges' preferences), and/or may provide no real benefit (no feedback provided).

Entrants choose a category and deliver (usually) two bottles to organizers. On judgment day, your entries will be pulled as part of a flight. Judging is done by pairs or teams of judges, in which at least one (and usually all) are BJCP-certified judges. BJCP-certified judges have spent a significant amount of time preparing to successfully pass both a written and tasting exam. They are trained to perceive the elements of beer in key areas (aroma, appearance, flavor, mouthfeel), describe them in writing, and compare the beer to the range of elements that comprise each sub-style. Beers are usually scored on the BJCP scale of 0–50, ranging from the "courtesy-13" (a seriously problematic beer) to the elusive and perfect "50-pointer;" practically speaking, most higher-quality beers land in the high 30s or low 40s. Judges are assessing whether the beer is technically flawed (exhibiting off-flavors), fits the chosen style, and is appealing to drink. They complete a written score sheet which describes their experience and offers feedback that addresses perceived faults. A beer can be technically sound and fit the style guidelines but still not be a "good" beer to drink, in the same way that a building can meet building codes and stand upright but still be ugly to look at.

After scoring, the beers in each category or flight are awarded a place, or not. Where more than one judging team is needed, each team's best beers are then often reevaluated by a group panel with at least one representative from each pair — this is referred to as a "Mini-Best-of-Show" (I'll refer to this going forward as "Mini-BOS") round, and is for placing only; no new scoresheets are generated. So what's the second bottle for? This is to determine the overall Best of Show Beer: A panel of senior judges taste a sample from the second bottle of the winner of each category/flight, to determine which is the "best" beer of the day.

At the end of the day, the winners are announced, the prizes are awarded, and there is much rejoicing.

Getting the Most out of Competitions

If you're going to enter a homebrew competition, you should try to get the most out of your experience. This is mostly about two things: Entering the right category, and understanding your scoresheet.

The first step in finding the right category for your beer is to review the guidelines used by the competition (BJCP or otherwise). Being familiar with the styles and their nuances will mean your beer is compared to similar entries, resulting in a more effective perception and description of your beer. In choosing which category to enter, I urge you to obey this commandment: Enter based on what you made, not what you were trying to make. The judges don't know what you were originally trying to produce. All they're evaluating is whether what you made is nice to drink and how well it fits the style you've chosen. If you added honey to your recipe but it doesn't present in the beer, steer clear of the braggot or specialty categories and just play it straight.

It's also important to know how to effectively read the scoresheets you receive. Each of the sheets you get back should fully describe the beer, as served. The "Overall Impression" section is where you'll find the most important commentary and feedback from the judges, but don't neglect the "sensory" sections; you should be taking note of any areas where your recipe didn't come through for (or overpowered) the judges, as well as any common areas of concern across multiple beers. It's on these score sheets that you might diagnose a recipe issue (if beers come across too harsh in their bitterness — water chemistry?), a process issue (frequent mentions of diacetyl from hot or incomplete fermentations), or other features that are affecting every beer you make (a tendency to overdo roasted malts).

Good judges will do their best to identify both recipe and process fixes for you, but you can use their feedback to conduct your own research as well. For example, reducing diacetyl can be done via process (start cool and finish warm to encourage yeast to "clean up") or recipe (selecting a yeast strain that is less likely to produce diacetyl). The goal is to produce a product that is as close to flawless as possible, to the specifications that you like to drink, and (potentially) as close to the defined style as possible. There are many paths to the top of the mountain, and whenever possible you should investigate them all.

I personally believe the only way to get an accurate review of your homebrewing is to enter every beer you are serious about, and enter each one

more than once. This holds even for non-style-specific beers — nearly all guidelines include "specialty" categories for beers that don't match an existing style, so all beers usually have a home at each competition. At packaging, I always set aside eight bottles specifically for competition, in a cold fridge to preserve them. This helps me calibrate my own evaluations: Do the judges concur with my assessment of a good/bad beer? We're often our own best and worst critics, and competitions let others do the judging. This method serves two purposes: Determining the stability of your beer over time, and accounting for the somewhat erratic results of judging. I don't say this to disparage judges, but rather to acknowledge a simple fact — any judging attempt could be marred by a number of factors, including lack of experience, lack of (or over-) sensitivity to a particular perception, a tendency to judge based on preference rather than by style, or even something as simple as having a cold or chugging coffee right before judging my Munich Helles. Judging is as structured, systematized, and objective as we can make it, but there's still some subjectivity involved. Judges are only human, after all. A 22-point beer with one team of judges may score a 40 with another. If you enter a beer four times, you'll see that it finds an equilibrium somewhere along the spectrum of scores. One judging may be flawed or irrational, but there's an overall rationality to the process — multiple data points are more likely to yield an accurate picture of your beer's quality. So set those bottles aside, pony up the entry fees, and get your report card. It'll make you a more self-aware and better brewer.

How to Win

Some of you are thinking, "That's all well and good, Josh, but I want to walk out of my local competition looking like Michael Phelps at the Olympics." Nothing wrong with that — and placing beer in a large and highly competitive field like War of the Worts in Philadelphia, Pennsylvania (over 1,000 entries) is a great way to validate your efforts. Increasing your odds takes a combination of good recipe formulation, solid brewing, and some savvy entry tactics. Let me say from the start that there are no guarantees: The best beer ever made won't win in competition every time. But there are ways that you can improve your chances.

Recipe formulation matters. In order to win in the "style" (non-specialty) categories, you need to give the judges what they're looking for: German hefe needs banana and clove, stouts must exhibit some roasted barley, and old ales have to at least seem old. Don't be shy with those defining characteristics, and adjust your recipe to feature them. Many brewers adopt a strategy of amping-up their recipes overall in order to make their beer "stand out" on the table — if you brew to the higher end of the range in terms of ABV, IBU, and hop/malt flavors and aromas, you may succeed in making your beer memorable, but you may also run into a judge who appreciates a more-subtle interpretation (it's a risk). I usually recommend keeping recipes on the middle-high end for those characteristics and making sure the key attribute of the style stands out. For example, brew a standard California common, but hammer away with the Northern Brewer hops. In specialty categories the goal is similar, but you're defining what the judges should find — just define it well! In either case, you'll want to ensure that your beer stands out especially in the aroma elements and/or at lower carbonation. Many beers may wait around for a while, in anticipation of a mini-BOS, so for your competition beers you might consider going a touch higher in carbonation to preserve their character.

It isn't just what you enter — it's where. Beers are usually judged in sequence, by subcategory. Over the years I've noticed that beers judged later in the flight tend to place more frequently than earlier beers. The categories generally list the less-assertive styles first, so as you get deeper you get the more complex, aggressive, "full" styles, and they may shine in comparison to lighter beers. I've also judged a number of "average" flights looking for that "winning" beer, and if I haven't found it with just a few left to judge, I'll actively look for a winner,

When entering the "specialty" category (23), be sure to include specific information about your beer so that the judges can better evaluate what you made. Never assume what they know.

which may lead me to find it. Beers opened last are also simply fresher at mini-BOS, potentially resulting in more ribbons. In any case, if you're entering with an eye towards winning, you might focus on brewing the higher-lettered subcategories.

You might also enter beers in multiple and/or less-populous categories. IPAs, with 55 entries, are getting the same three medals as Pilsners with nine, so if you're thinking "medal," your brewing choices factor in. If you have a beer that fits in more than one category (or if you're not sure whether that altbier is more Dusseldorf or North), enter it in all of them. I've had a black IPA that scored in specialty, porter, and stout (at the same competition). And remember, enter the beer you made, not the beer you were trying to make. This is particularly true in Specialty categories, since you describe the beer for the judges. Mention only those features that came through clearly and leave the rest unmentioned. If the judges notice them, they'll be "complexity;" if you say they're there but a judge barely notices them, they're "weak and hardly present."

The last and best piece of advice to producing winning beer is this: Don't beat yourself. Produce clean beer. Judge training tends to produce judges that are fault-hunters — if found, they'll often use that excuse to deny a ribbon to an entry, even if the faults are minor. If they don't, they'll be more likely to let a beer pass through to a mini-BOS. Even one fault can kick a beer out — don't make the judges' choice easier! If you're consistently entering error-free beer that fits the style, you'll end up with scores consistently in the 30+ range, and you can't help but win medals. A "very good" beer will always be in contention.

Myths and Misconceptions

No discussion of competition brewing would be complete without addressing the many misconceptions out there. Much of the dissatisfaction with competitions comes from inaccurate expectations rather than poorly organized or poorly judged competitions. To name a few:

1. "How did my 42-point beer lose to that 35-point beer? Why doesn't the highest score win?" Scores do matter in terms of situating your beer in the spectrum of problematic-to-perfect beers. And a straight point comparison usually does pick the winners when all beers are judged by one team. However, when multiple judging teams are involved, each team advances its best beers to mini-BOS, and the highest scores can't automatically win. If they did, a very generous team's beers would always beat out a more-critical team's, so at mini-BOS scores don't matter as much as how the beers from each team stack up relative to each other.

2. "The judges gave me a 22 — six weeks ago this beer scored 40!" First, beers often do vary dramatically from bottle to bottle. Second, beers can fall off dramatically, especially if they aren't stored in a cold environment. Last — why are you so sure the 22 is the "off" score?

3. "My beer isn't good enough to win at competition." Says who? I've seen lots of novice brewers do well in competition, whether because their beer is better than they thought or they entered an "OK" beer in a weak flight. Enter and find out.

4. "Judging is totally subjective." Yes and no. Yes, there's some subjectivity, but no, judges aren't flying blind. Most judges aren't evaluating based on their preferences, and most consult the guidelines regularly during each tasting flight. Bad judging happens, but that's why multiple entries is a good idea.

5. "Judging is totally random." Anyone who attends the results announcement of a number of competitions in the same geographical area knows this one is false. There are often a group of award-winning names that one hears over and over again, which would be impossible if judging were that subjective/random.

6. "That person entered 20 beers — of course they won nine medals." OK, yes, but most of those beers were the only one by that brewer in each flight. Entering lots of mediocre beers won't result in lots of medals, since each judging is an independent event.

7. "I can't believe the judges at _____ wrote such bad scoresheets — it's a huge/small competition." At any competition you could end up with sub-par judges who are producing substandard scoresheets. I've never found any pattern in when it happens. If you get scoresheets that don't give you your money's worth, email the competition organizers and ask them to pass on your comments to the judges, or email the judges directly (scoresheets should have email addresses or other identifying information).

8. "The judges know exactly what I mean by _____ in my description of my specialty beer." Although less of a problem in an age of smart phones, it's still better to assume that we don't know anything. If you enter "sarsaparilla mead," describe it in terms a small child would understand. Also don't forget that all we get is the style number and any "specialty" information (in specialty categories) you provide — if the name of your beer is "Bob's Raspberry Schwarzbier," don't assume we know it's a schwarzbier with raspberries! Be explicit, and be simplistic — you won't offend us, and your entry will be properly judged more often.

Don't Forget to Have Fun

Competing — and homebrewing, for that matter — is supposed to be fun. Competitions will bring you into contact with your wider homebrewing community, and your successes and failures will make you a better homebrewer. Don't get so hung up on trying to win that you forget that this is a fun hobby! Enter often and you'll improve rapidly while enjoying the friendly rivalries that develop between brewers and clubs in your region. Also, consider studying the BJCP guidelines and becoming a BJCP-certified judge for yourself. And when your name is called and you head up to get your medal or ribbon, take a moment to soak in the applause and encouragement of the crowd — nothing is better to get you through a long brew day or soften the blow of dumping an infected batch, and it will also motivate you. Get brewing, and get competing! BYO

SANITIZING hard to clean HOMEBREW PARTS

Story and Photos by
Christian Lavender

The most frustrating aspect of homebrewing is when a batch goes bad. The only way to improve your chances of avoiding this depressing situation is to maintain the highest degree of sanitation in your homebrewery as possible. No matter how hard you try, and how clean your technique, achieving absolute sterility in a homebrewing (or for that matter most commercial operations) environment is nearly impossible. But many bacteria cannot compete or survive in the beer with rapidly dropping pH, and alcohol formation, so trying to limit the amount of contaminants that get into the fermenter as possible is the goal.

As homebrewers we put a lot of time and effort into cleaning and sanitation. Beginner books and brewing kit instruction sheets are showered with reminders to clean and sanitize every part so that your beer doesn't get contaminated. Most beginner brewing kits are simple to take apart and clean, not taking up too much of your brew day. This practice of cleaning and sanitizing lays a foundation for the brewer to adhere to as they start to upgrade their system.

After running a few batches through my first plastic bucket setup I started to notice the scratches left behind from my stirring spoon. Fermentation equipment, particularly plastic, which can be somewhat porous and easily scratched, can harbor bacteria and be difficult to render sterile. Both siphon hoses and the plastic lines going in and out of your beer kegs suffer from this problem too.

This is why some brewers make the decision to go all stainless. Fighting bacterial infestations, vinegar cultures, and rogue yeasts in your homebrew is lot easier when you can scrub and clean until the equipment shines.

Keeping idle equipment submerged in a sanitizer, or ensuring every surface has sufficient contact time with a sanitizing solution before use is critical.

One factor often overlooked when cleaning and sanitizing homebrew setups is that of the water used. Tap water in modern cities is sometimes good, sometimes terrible. It is wise to do some research and find out how your city water rates when analyzed for bacteria, harmful chemicals, and heavy metals. The quality of the water used in making beer has a very strong connection with the quality of the finished product.

Homebrew cleaning and sanitation may be the most tedious and un-glamorous part of homebrewing, but it is very important. It is nearly as important as drinking the brews! Each homebrewer develops different techniques and has different tools in their homebrew cleaning kit, so make sure to network with others to find out more tricks and tips for maintaining proper homebrew sanitation.

1. Plate Chillers

Unless you're careful with filtering, plate chillers can and do clog up with debris. Any debris that's trapped during transfer needs to be back flushed out by connecting the wort inlet to the water supply. I always back flush my plate chiller when I'm done, and then pump hot Powdered Brewery Wash (PBW) through it (which I do to clean my pump and hoses anyway, so there's no extra work). Then you can soak it in a sanitizer or bake it in the oven to sterilize (see John Palmer's table from *How to Brew* at the bottom of page 57). The bak-

ing process (heat sterilization) kills all microorganisms, not just most as in sanitizing (see photo 1, top left). To be sterilized, items need to be heat-proof at specific temperatures. Glass and metal items are prime candidates for using heat sterilization.

2. Pump Heads

At the end of my brew day I fill the hot liquor tank (HLT) with hot water and cleanser to pump through the system. My system uses two centrifugal magnetic drive pumps to move water and wort around as needed. The final wort transfer is from the kettle to the plate chiller and it passes through the pump. This final push includes some trub and cold break which sometimes get stuck in the pump head. I do use a first level of filtration on the brew kettle, but it doesn't catch everything. The pump head is a great place for bacteria to hide, so I make sure to open the pump heads and thoroughly clean the impeller, o-ring and stainless steel and plastic housings (see photo 2, center). Watch for scratches on your pump head housing and step up to using an all-steel pump head if you have concerns.

3. Ball Lock Valves

This is another one I wish more people had told me about. I have a few different types of three-piece ball lock valves. I clean and sanitize them with a brush, cleansers and sanitizing solution and thought this was all I needed to do. Wrong. There was still something more to clean. To be very honest, I didn't know you had to unscrew the entire valve for complete cleaning! When I did this for the first time I was horrified. The smell was of rotten feet. To imagine my beautiful brew had been flowing

Top: Plate chillers can be sanitized with dry heat in the oven after back flushing with cleaning solution to remove debris.

Middle: Make sure you open your pump heads up and thoroughly clean and sanitize the impeller, o-rings and housings.

Bottom: Ball-lock valves need to be completely disassembled for cleaning.

Top: Threaded connectors, like plate chillers, need to be back flushed with cleaning and sanitizing solution to keep them free of debris and bacteria.

Bottom: Sintered air stones can be tricky to keep clean. Try boiling your stone to keep the porous surface free of debris and then soak it in Star San solution or hot water with Iodophor.

over this foulness made me sick. The three-piece valves are hard to crack open and they should be disassembled monthly for cleaning to maintain bacteria free valves. I have since moved to tri-clamp ball valves that can quickly be disassembled and have no threads (see the photo 3 on page 56, bottom).

4. Threaded Connectors

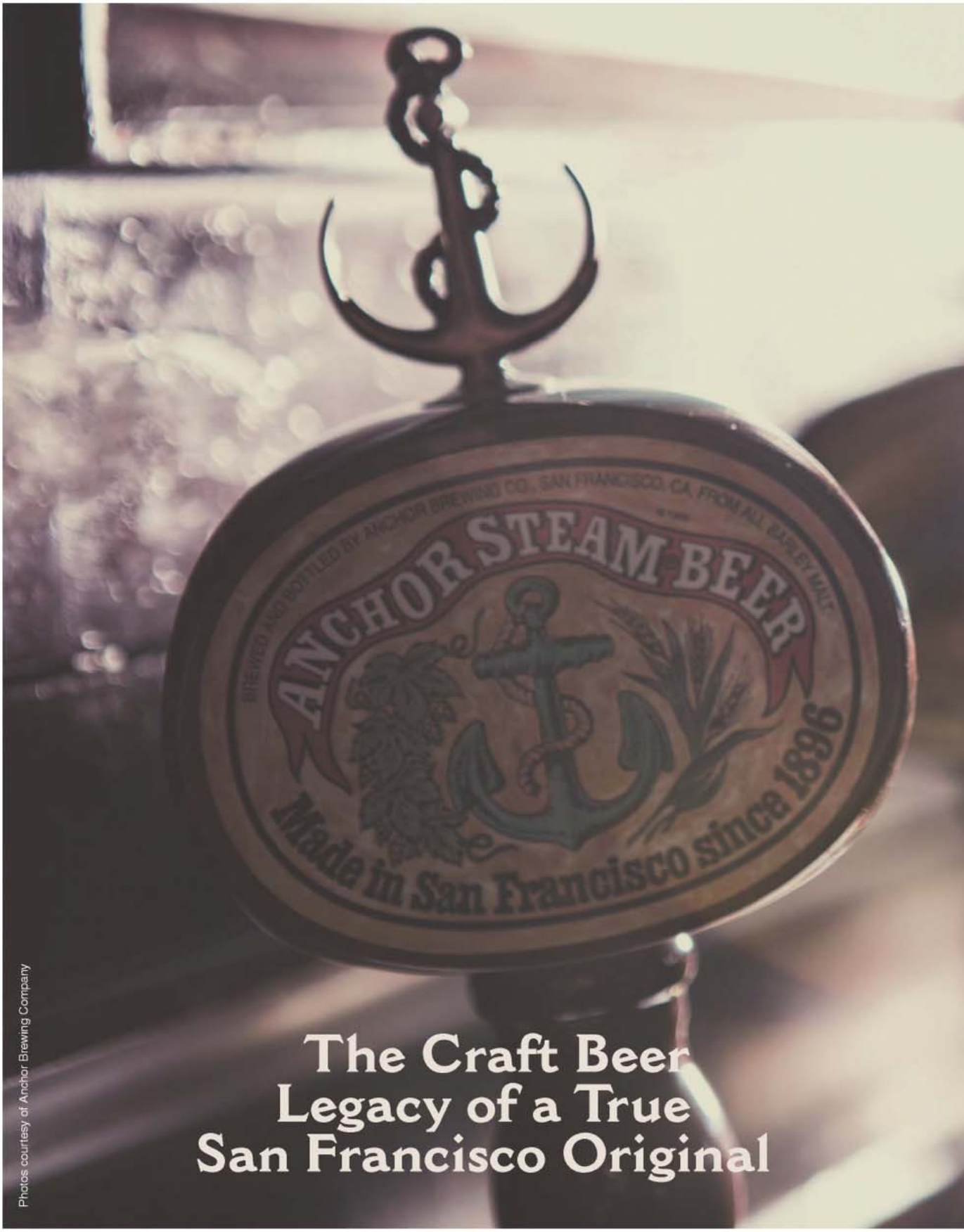
I'm a tinkerer. I just can't leave my homebrew system alone and sometimes modifications are only temporary while I test out a new piece of equipment or technique. This means the connections I use are usually threaded connectors until I am committed to the new arrangement and then can convert them to a more seamless style connector. Having threaded connectors works fine, but they get dirty. I make a habit to pull off all the parts, clean and rewrap with Teflon at least once a month if I am brewing steadily. Back flushing with cleaners and sanitizers between these larger cleanouts will limit bacterial growth (see photo 4 above, top).

5. Sintered Air Stone

I use an inline air stone within my oxygenation assembly. These stones get clogged from time to time. You have to be careful handling air stones too . . . finger grease can gum them up, so imagine what wort can do. Whether you use your stone in an inline aeration, keg lid mount or on a tube/cane you need to boil the stone to keep the porous surface free of debris. Boil in distilled water for 15 minutes (preferably in a pressure cooker). You could also try using an oxidizer to remove the soils. For example, some commercial breweries, such as Springfield Brewing Co. in Springfield, Missouri, use a stabilized peroxide compound added to caustic. A third option is to soak the stone in PBW and then move it into a container with Star San solution or hot water with Iodophor to sanitize.

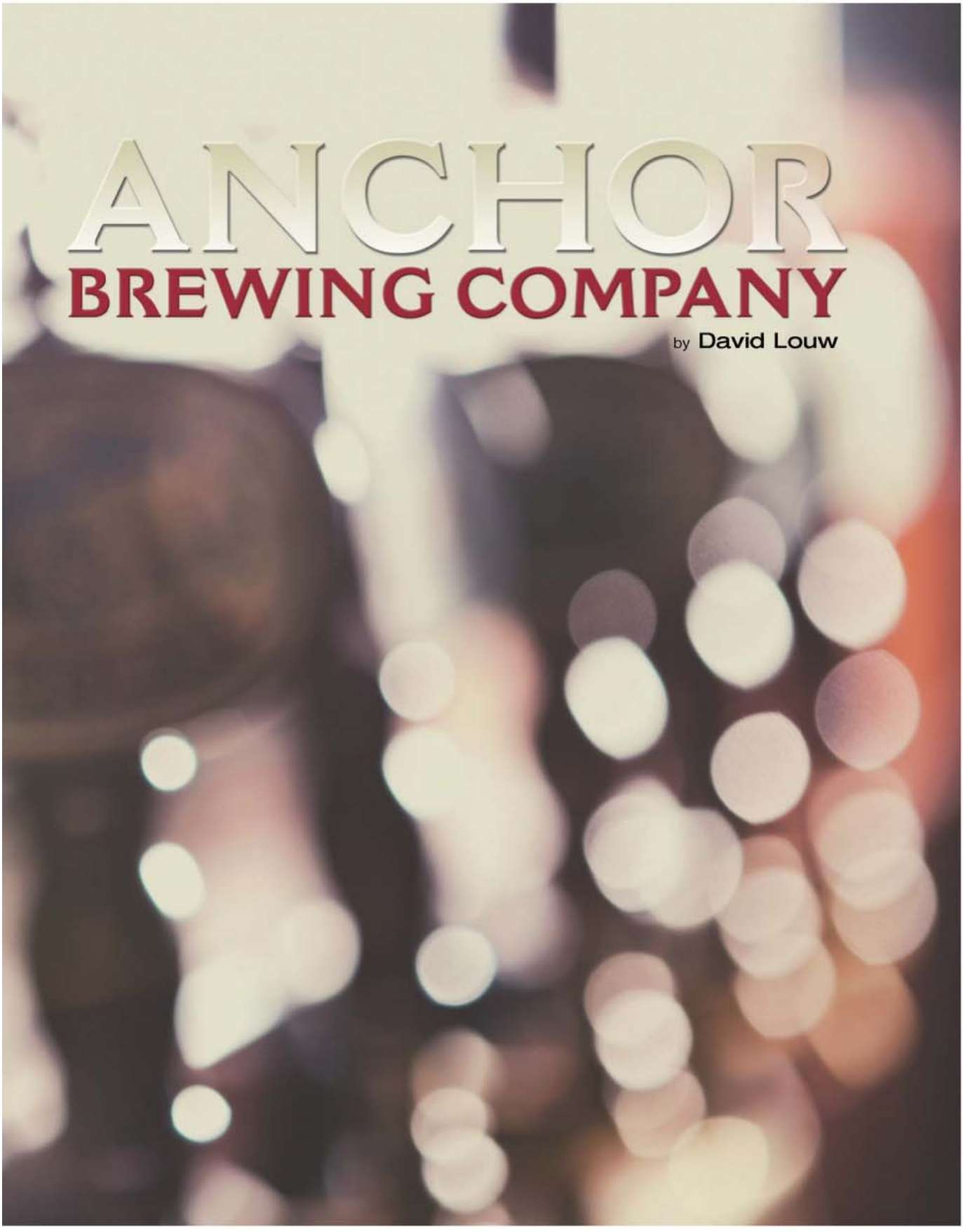
Dry Heat Sterilization	
Oven Temperature	**Duration**
338 °F (170 °C)	60 minutes
320 °F (160 °C)	120 minutes
302 °F (150 °C)	150 minutes
284 °F (140 °C)	180 minutes
250 °F (121 °C)	12 hours

Chart by John Palmer/*How to Brew* (Brewers Publications, 2006)



The Craft Beer Legacy of a True San Francisco Original

Photos courtesy of Anchor Brewing Company



ANCHOR BREWING COMPANY

by David Louw

The genesis of the modern craft beer movement can be traced back to a single moment in time. Legend has it that in San Francisco, California in 1965 Fritz Maytag was enjoying a pint of his favorite beer when the bartender told him that the brewery was about to go out of business. Unwilling to lose access to his beloved Anchor Steam Beer, he quickly pulled together a few thousand dollars and became the majority owner of Anchor Brewing Company.

It was not an obvious choice to go into the brewing business at the time. There were just over a hundred breweries in the United States in 1966 and Anchor was the sole "specialty brewery" according to the industry trade group The Beer Institute. It wasn't until 11 years later in 1977 that Sonoma, California's New Albion would join Anchor in the craft beer market. Those same years saw over half of those hundred breweries merge or go out of business. Needless to say, the climate was not hospitable for starting something different.

I sat down with Anchor's longtime (and recently semi-retired) Brewmaster Mark Carpenter to talk about the history of Anchor and their approach to brewing beers. He and the rest of the crew were extremely generous in sharing what they have learned over the years. Their resourcefulness and innovation fit right in with the homebrewing culture.

History

Anchor Brewing Company's history is unlike that of any other brewery in the country. From its founding in 1896 by German brewers, Anchor followed the peaks and troughs of the overall brewing industry in America up through the significant shifts in customer tastes towards bland macro lagers into the 1960s when Maytag took over.

At that time Anchor was brewing just two beers, the Anchor Steam Beer we know today and a darker version formulated to meet the demand from some local bars with a heavy addition of caramel coloring to each keg. Distribution was almost exclusively within San Francisco and volume was so low that they brewed just once a month. The equipment was in rough shape and the quality needed work so those first few years were dedicated to learning everything they could about the brewing process and getting the fundamentals in order. Anchor emerged from this rebuilding period in 1971 with the first modern bottling of Anchor Steam Beer.

It is difficult for many of us to imagine the brewing landscape at the time but it is worth discussing since it had a huge impact on Anchor's beers. Unlike today when brewers can choose from dozens of hops, a wealth of base and specialty malts, and pitchable quantities of any yeast you could desire, the brewers had to work with very limited choices. Ingredient distributors simply didn't exist to serve the craft market. The available hops were grown for their alpha acids without much consideration to aroma and flavor since they'd be used at such low rates in American lagers. Malts could be imported but doing so was slow and expensive. In a climate of brewery contraction and decreasing selection there weren't yeast labs to provide access to large libraries of choices.

Instead Anchor had to make do with a few key ingredients and then work their process to get the end result they were looking for. In the recipe formulation section later in this story I'll

. . . the brewers managed to invent an impressive set of beers that pioneered many of the core American styles in the market today.

get into more details but these included malts such as domestic 2-row, caramel 40 °L, chocolate, and black patent; hop varieties Northern Brewer and Cascade; and their proprietary yeasts. Armed with creativity and passion, the brewers managed to invent an impressive set of beers that pioneered many of the core American styles in the market today.

Style Innovation

From the early days at Anchor, Maytag and team poured through all the information they could find on historical styles and processes. What they lacked in ingredients and market research, they made up in imagination and tenacity. Let's walk through the ground they broke with each style.

Anchor Steam Beer (1896) - California Common

Anchor Steam Beer is the flagship beer that Anchor carried through history into the modern craft brewing age. The style originated from San Francisco's prevalence of German brewers coupled with a lack of cold fermentation and lagering facilities. The city has a naturally temperate climate thanks to its proximity to the Pacific Ocean and so while unable to hit the ideal temperatures for traditional lager fermentations they averaged close to 60 °F (15 °C) ambient temperature for much of the year.

There are conflicting stories as to the source of the term "steam" but it appears this either had to do with the vigorous kräusen that floats off the top of the fermenting beer or the spray from the highly carbonated kegs that were tapped at near room temperature in bars around the city. In any case the beer Anchor brews essentially defines the California common style.

A combination of 2-row and caramel 40 °L provides a malty beer with enough backbone to carry the firm bitterness from the signature minty and rustic Northern Brewer

Open Fermentation

Anchor still uses an open fermentation for most of their beers. In fact up until the recent introduction of a few cylindroconicals, all Anchor beers were fermented in one of two types of fermenters. The flagship Anchor Steam Beer is chilled with heat exchangers and then pumped into large shallow fermenters. These coolship-like vessels are housed in a scrupulously clean room in the brewery. The beer is less than two feet at its deepest and this configuration allows the famously foggy cool San Francisco air to keep the temperature under control. When extra chilling is needed the brewery pumps filtered 61 °F (16 °C) air into the room.

Ales are fermented in deeper fermenters that are equipped with glycol lines to maintain ideal temperatures. They are a highly custom fabrication shaped roughly like open topped cubes with perhaps a 2:1 width to depth ratio. I didn't get a precise measurement but would estimate they were around six feet deep.

Steam Beer and ales spend three days in open fermentation and the temperatures are allowed to ramp over that time. The beer is then dropped out from below the kräusen and sent to closed vessels for cellaring.

Anchor has a full laboratory and plates all of their beers so they'd know if there were any problems from contamination. It's possible that the sterile filtering and pasteurizing step before packaging is playing a key role in long term stability, though.

Anchor's experience should translate well to open fermentation on the homebrew scale. The keys are to focus on producing extremely sanitary wort, cleaning and sanitizing everything the wort comes in contact with, and pitching a known pure and viable yeast strain. A bucket can be used as a fermentation vessel, and if you're paranoid about contamination from fruit flies you can stretch some cheesecloth over the top. To replicate Anchor's process you would rack to a closed vessel with an airlock such as a carboy after three to four days and do any dry hopping there.

hops. Since Anchor ferments well above typical lager temperatures, the yeast adds a moderately low fruity ester character that complements the malt and hops. The end product is moderately dry and highly quaffable.

Anchor Porter (1972) - Robust Porter

As mentioned earlier, San Francisco bars wanted to have a dark beer on tap and the previous owners met that need by dosing Anchor Steam Beer kegs with caramel coloring. Once they'd gotten their core quality in order Fritz Maytag looked to retire this questionable beer and replace it with something they'd be proud to produce. In response they formulated Anchor Porter, a beer that derives its color from significant amounts of black and chocolate malts. As a testament to the historical importance of Anchor beyond just the American craft beer movement, at the time of its release it was the only porter brewed anywhere in the world.

Anchor Porter balances roasty and chocolate notes against a solid caramel malt addition. Much like adding sugar to your coffee the end result has a balanced and wonderfully rich toffee character. Anchor stuck with the same Northern Brewer hops as their flagship Anchor Steam Beer, which in this case provides a firm bitterness preventing the beer from being cloying.

This beer was the first ale introduced to the brewery and so they brought in a new yeast strain. Due to their use of open fermenters and the generally English approach to the style, they went with a true top-cropping yeast strain, which to this day is still their choice for most of their ales.

Liberty Ale (1975) - American IPA

1975 was a big year for Anchor as they rolled out three new beers. Perhaps the most influential of those is still having an impact today: Liberty Ale. Imagine the guts it took to release a 45+ IBU citrus and floral hop-forward beer into a market of gently flavored American lagers.

Cascade hops had only been recently developed and released as a relatively high alpha variety. No other beer had showcased their aroma and flavor. Not only did Anchor put them in for bittering, flavor, and aroma additions during the boil, they pioneered the practice of dry hopping with citrusy American varieties that is so prevalent today.

The grain bill is simply 2-row domestic pale malt. This establishes a clean base and ferments to a dry finish, staying out of the way of the hops. Interestingly, Liberty Ale was the early precursor to today's Single Malt Single Hop (SMaSH) beers that have been a recent fad with homebrewers and craft brewers alike. The characterful ale yeast provides enough complexity to keep the beer from being one-dimensional.

Old Foghorn (1975) - American Barleywine

As if Liberty Ale weren't provocative enough, Anchor further pushed the limits by adapting the English barleywine style into their Old Foghorn. What an amazing sight it must have been to watch patrons in 1975 sip their first pint of a 9% ABV malt monster with a bright Cascade hop finish.

Executing such a big beer on a brew system that had been designed for more modest batches was definitely a challenge. Utilizing the English approach to brewing large beers, Anchor collected just the first running wort from the mash without sparging. Many years later they expanded this process to do a full parti-gyle brew and use the second runnings for Anchor Small Beer. The end result was a complex malt forward beer that stood up to aging and was as far as imaginable from the light macro lagers that saturated the market. Read more about parti-gyle brewing in the sidebar on page 69.

Our Special Ale/Christmas Ale (1975) - Seasonal

To round out 1975 Anchor released their first seasonal beer, Our Special Ale. The idea was based on the tradition of breweries making a special release for their customers for Christmas. The inaugural batch was a dry hopped English-style ale. Each year the recipe changed slightly. In 1987, though, it made a big change to become a winter warmer accentuated with the spices that we associate with holiday baking. In total, it is likely the longest running seasonal beer available in America.

While Brewmaster Mark Carpenter was quite willing to share information about other beers in their lineup, he clammed up when it came to Our Special Ale. He explained that Anchor Brewing is like an extended family and everyone in that family is let in on the secrets of this recipe. Over the years many homebrewers have guessed at the recipe and without giving more information, Mark confirmed that a few have come close.

He was willing to share that the spicing changes each year. At the start of fall the brewers get together and talk about what they've liked about previous years and new ideas they want to try. It surprised me to hear that they don't do any pilot batches and instead commit to a full size brew based on their estimates of the outcome. The reason that's possible is that they've been brewing this for almost three decades and have become expert at knowing what to expect. If anything is wrong with the balance they compensate for it on subsequent brewings and blend the batches to achieve their final result.

The final tidbit that Mark was willing to share is that the recipe doesn't include allspice. Also, they tried Frankincense once and, um, yeah, they don't do that anymore.

Summer Beer (1984) - American Wheat Ale

Anchor's first concession to the tastes of the American light lager drinker came in 1984 with the introduction of the very first American wheat ale, Anchor Summer Beer. While taking inspiration for the grain bill from the various European wheat beer styles, they paired it with their clean but slightly fruity ale yeast to make a refreshing but satisfying craft beer. As the name implies, this beer is the perfect accompaniment to warm summer

Clone Recipes

Anchor Steam Beer clone
(5 gallons/19 L, all-grain)

OG = 1.050 FG = 1.013
IBU = 30 SRM = 9 ABV = 4.9%

Ingredients

9 lbs. 2 oz. (4.1 kg) 2-row pale malt
1 lb. 5 oz. (0.6 kg) caramel malt (40 °L)
4.8 AAU US Northern Brewer pellet hops (60 min.) (0.5 oz./14 g at 9.6% alpha acids)
2.4 AAU US Northern Brewer pellet hops (20 min.) (0.25 oz./7 g at 9.6% alpha acids)
0.5 oz. (14 g) US Northern Brewer pellet hops (0 min.)
White Labs WLP810 (San Francisco Lager) or Wyeast 2112 (California Lager) yeast
0.25 oz. (7 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Mill the grains and mix with 3.92 gallons (14.8 L) of 158 °F (70 °C) strike water and optional gypsum (see ingredients) to reach a mash temperature of 149 °F (65 °C). Hold this temperature for 60 minutes. Vorlauf until your runnings are clear. Sparge the grains with 3.33 gallons (12.6 L) of 168 °F (76 °C) water and top up if necessary to obtain 6 gallons (23 L) of 1.041 SG wort. Boil the wort for 60 minutes, adding hops according to the ingredients list.

After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 59 °F (15 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast. Ferment at 61 °F (16 °C) for 7 days before raising the temperature to 66 °F (19 °C) for three days for a diacetyl rest. Once the beer reaches terminal gravity (approximately 14 days total), bottle or keg the beer and carbonate. Store cold for approximately two weeks before serving.

Anchor Steam Beer clone
(5 gallons/19 L, extract with grains)

OG = 1.050 FG = 1.013
IBU = 30 SRM = 9 ABV = 4.9%

Ingredients

6.25 lbs. (2.8 kg) golden liquid malt extract
1 lb. 5 oz. (0.6 kg) caramel malt (40 °L)
4.8 AAU US Northern Brewer pellet hops (60 min.) (0.5 oz./14 g at 9.6% alpha acids)
2.4 AAU US Northern Brewer pellet hops (20 min.) (0.25 oz./7 g at 9.6% alpha acids)
0.5 oz. (14 g) Northern Brewer pellet hops (0 min.)
White Labs WLP810 (San Francisco Lager) or Wyeast 2112 (California Lager) yeast
0.25 oz. (7 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Place the milled grains in a muslin brewing bag and steep in 3 quarts (2.8 L) of 149 °F (65 °C) water for 15 minutes. Remove the grain and rinse with 1 gallon (3.8 L) of hot water. Add water and optional gypsum (see ingredients list) to reach a volume of 5.6 gallons (21.2 L) and heat to boiling. Turn off the heat, add the liquid malt extract, and stir until completely dissolved. Top up with water if necessary to obtain 6 gallons (23 L) of 1.041 SG wort. Boil for 60 minutes, adding hops according to the ingredients list.

After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 59 °F (15 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast. Ferment at 61 °F (16 °C) for 7 days before raising to 66 °F (19 °C) for three days for a diacetyl rest. Once the beer reaches terminal gravity (approximately 14 days total) bottle or keg the beer and carbonate. Store cold for approximately two weeks before serving.

Clone Recipes

Anchor California Lager clone
(5 gallons/19 L, all-grain)

OG = 1.047 FG = 1.012
IBU = 32 SRM = 4 ABV = 4.8%

Ingredients

10 lbs. (4.54 kg) 2-row pale malt
4.9 AAU Cluster pellet hops (60 min.) (0.65 oz./18 g at 7.5% alpha acids)
2.6 AAU Cluster pellet hops (30 min.) (0.35 oz./10 g at 7.5% alpha acids)
White Labs WLP830 (German Lager) or Wyeast 2206 (Bavarian Lager) or Fermentis Saflager S-23 yeast
0.25 oz. (7 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Mill the grains and mix with 3.75 gallons (14 L) of 157 °F (69 °C) strike water and optional gypsum (see ingredients) to reach a mash temperature of 149 °F (65 °C). Hold this temperature for 60 minutes. Vorlauf until your runnings are clear. Sparge the grains with 3.45 gallons (13 L) of 168 °F (76 °C) water and top up if necessary to obtain 6 gallons (23 L) of 1.039 SG wort. Boil for 60 minutes, adding hops according to the ingredients list.

After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 48 °F (9 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast. Ferment at 50 °F (10 °C) for 7 days before raising to 60 °F (16 °C) for three days for a diacetyl rest. Slowly lower the beer to 34 °F (1 °C).

Once at terminal gravity (approximately 14 days total) bottle or keg the beer and carbonate. Lager at 34 °F (1 °C) for approximately one month before serving.

Anchor California Lager clone
(5 gallons/19 L, extract only)

OG = 1.047 FG = 1.012
IBU = 32 SRM = 5 ABV = 4.8%

Ingredients

6.6 lbs. (3 kg) golden liquid malt extract
4.9 AAU Cluster pellet hops (60 min.) (0.65 oz./18 g at 7.5% alpha acids)
2.6 AAU Cluster pellet hops (30 min.) (0.35 oz./10 g at 7.5% alpha acids)
White Labs WLP830 (German Lager) or Wyeast 2206 (Bavarian Lager) or Fermentis Saflager S-23 yeast
0.2 oz. (6 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Bring 5.5 gallons (21 L) of water and optional gypsum (see ingredients list) to a boil, turn off the flame, and stir in the liquid malt extract until completely dissolved. Top up with water if necessary to obtain 6 gallons (23 L) of 1.039 SG wort. Boil for 60 minutes, adding hops according to the ingredients list.

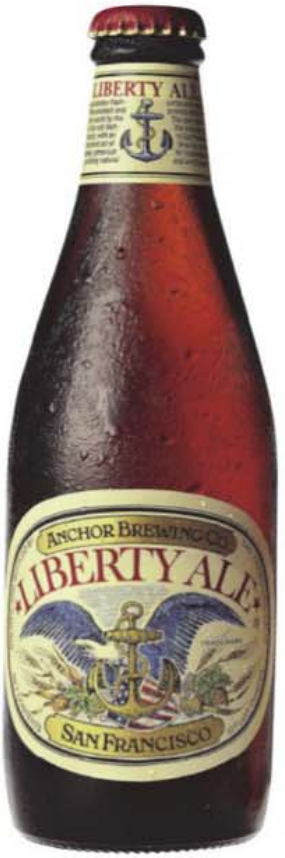
After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 48 °F (9 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast. Ferment at 50 °F (10 °C) for 7 days before raising to 60 °F (16 °C) for three days for a diacetyl rest. Slowly lower the beer to 34 °F (1 °C).

Once the beer reaches terminal gravity (approximately 14 days total) bottle or keg the beer and carbonate. Lager at 34 °F (1 °C) for approximately one month before serving.

Tips for Success:

Be sure to pitch enough clean, healthy yeast for this cooler fermentation, and it is a good idea to use a yeast starter. If you have not made a yeast starter before, check out *BYO*'s step-by-step video at: www.youtube.com/watch?v=aAssRh_O6fs. If your fermentation seems slow in the first 24 hours, raise the temperature up a degree or two. *BYO*'s "Style Profile" author Jamil Zainasheff explains: "The idea is to reduce the diacetyl precursor alpha-acetolactate, which the yeast create during the early phase of fermentation. Once the growth phase of fermentation is complete, it is important that fermentation be as vigorous as possible. It may never be as robust as fermentation at ale temperatures, but it is important to have enough activity to blow off aromatic sulfurs and other unpleasant compounds."

Clone Recipes



Anchor Liberty Ale clone
(5 gallons/19 L, all-grain)

OG = 1.059 FG = 1.011
IBU = 48 SRM = 4 ABV = 5.9%

Ingredients

12.5 lbs. (5.7 kg) 2-row pale malt
4.1 AAU Cascade pellet hops (60 min.) (0.5 oz./14 g at 8.2% alpha acids)
6.2 AAU Cascade pellet hops (45 min.) (0.75 oz./21 g at 8.2% alpha acids)
0.5 oz. (14 g) Cascade pellet hops (0 min.)
1 oz. (28 g) Cascade pellet hops (dry hop)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.3 oz. (8 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Mill the grains and mix with 4.7 gallons (17.8 L) of 158 °F (70 °C) strike water and optional gypsum (see ingredients list) to reach a mash temperature of 149 °F (65 °C). Hold this temperature for 60 minutes. Vorlauf until your runnings are clear. Sparge the grains with 2.8 gallons (10.6 L) of 168 °F (75 °C) water and top up with water if necessary to obtain 6 gallons (23 L) of 1.049 SG wort. Boil for 60 minutes, adding hops according to the ingredients list.

After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch yeast.

Ferment at 67 °F (19 °C) for 4 days. Add the dry hops and raise to 72 °F (22 °C) for three days. Once the beer reaches terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate.

Anchor Liberty Ale clone
(5 gallons/19 L, extract only)

OG = 1.059 FG = 1.011
IBU = 48 SRM = 5 ABV = 5.9%

Ingredients

8 lbs. 3 oz. (3.7 kg) golden liquid malt extract
4.1 AAU Cascade pellet hops (60 min.) (0.5 oz./14 g at 8.2% alpha acids)
6.2 AAU Cascade pellet hops (45 min.) (0.75 oz./21 g at 8.2% alpha acids)
0.5 oz. (14 g) Cascade pellet hops (0 min.)
1 oz. (28 g) Cascade pellet hops (dry hop)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.2 oz. (6 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Bring 5.4 gallons (20.4 L) of water and optional gypsum (see ingredients list) to boil, turn off the flame, and stir in the liquid malt extract until completely dissolved. Top up with water if necessary to obtain 6 gallons (23 L) of 1.049 SG wort.

Boil for 60 minutes, adding hops according to the ingredients list. After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast.

Ferment at 67 °F (19 °C) for 4 days. Add the dry hops and raise to 72 °F (22 °C) for three days. Once the beer reaches terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate.

Tips for Success:

Anchor's ales spend three days in open fermentation and the temperatures are allowed to ramp over that time. If you want to do an open fermentation at home, focus on producing extremely sanitary wort, cleaning and sanitizing everything the wort comes in contact with, and pitching a known pure and viable yeast strain. A fermentation vessel such as a bucket can be used, and if you're paranoid about contamination from fruit flies you can stretch some cheesecloth over the top. To replicate Anchor's process you would rack to a closed vessel with an airlock such as a carboy after three to four days and do any dry hopping there.

Clone Recipes

Anchor Porter clone
(5 gallons/19 L, all-grain)

OG = 1.070 FG = 1.022
IBU = 42 SRM = 45 ABV = 6.7%

Ingredients

11 lbs. 14 oz. (5.4 kg) 2-row pale malt
1.5 lbs. (0.68 kg) caramel malt (40 °L)
12 oz. (0.35 kg) black malt
12 oz. (0.35 kg) chocolate malt
6.7 AAU US Northern Brewer pellet hops (60 min.) (0.7 oz./20 g at 9.6% alpha acids)
3.4 AAU US Northern Brewer pellet hops (30 min.) (0.35 oz./10 g at 9.6% alpha acids)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.3 oz. (8 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Mill the grains and mix with 5.6 gallons (21.2 L) of 157 °F (69 °C) strike water and optional gypsum (see ingredients list) to reach a mash temperature of 149 °F (65 °C). Hold this temperature for 60 minutes. Vorlauf until your runnings are clear. Sparge the grains with 2.2 gallons (8.3 L) of 168 °F (75 °C) water and top up if necessary to obtain 6 gallons (23 L) of 1.058 SG wort.

Boil for 60 minutes, adding hops according to the ingredients list. After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast.

Ferment at 67 °F (19 °C) for 4 days. Raise the temperature to 72 °F (22 °C) and hold for three days. Once the beer reaches terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate.

Anchor Porter clone
(5 gallons/19 L, extract with grains)

OG = 1.070 FG = 1.022
IBU = 42 SRM = 45 ABV = 6.7%

Ingredients

7.75 lbs. (3.5 kg) golden liquid malt extract
1.5 lbs. (0.68 kg) caramel malt (40 °L)
12 oz. (0.35 kg) black malt
12 oz. (0.35 kg) chocolate malt
6.7 AAU US Northern Brewer pellet hops (60 min.) (0.7 oz./20 g at 9.6% alpha acids)
3.4 AAU US Northern Brewer pellet hops (30 min.) (0.35 oz./10 g at 9.6% alpha acids)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.2 oz. (6 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Place the milled grains in a muslin bag and steep in 6 quarts (5.6 L) of 149 °F (65 °C) water for 15 minutes. Remove the grain and rinse with 1 gallon (3.8 L) of hot water. Add water and optional gypsum (see ingredients list) to reach a volume of 5.4 gallons (20.4 L) and heat to boiling. Turn off the heat, add the liquid malt extract, and stir until completely dissolved. Top up with water if necessary to obtain 6 gallons (23 L) of 1.058 SG wort.

Boil for 60 minutes, adding hops according to the ingredients list. After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast.

Ferment at 67 °F (19 °C) for 4 days. Raise the temperature to 72 °F (22 °C) and hold for three days. Once the beer reaches terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate.

Tips for Success:

Like Liberty ale (see recipe on page 65), Anchor Porter is brewed using an open fermentation. If you want to to this at home, maintain extremely clean and sanitary conditions in your homebrewery to prevent contamination. A fermentation vessel such as a bucket can be used, and if you're paranoid about contamination from fruit flies you can stretch some cheesecloth over the top. To replicate Anchor's process you would rack to a closed vessel with an airlock such as a carboy after three to four days.

Clone Recipes

Anchor Old Foghorn clone
(1st Runnings)
(5 gallons/19 L, all-grain)

OG = 1.099 FG = 1.030
IBU = 43 SRM = 22 ABV = 10%

Old Foghorn is brewed using the parti-gyle method, which is brewing two batches of beer by separating the first and second runnings to create two distinct beers — one high gravity, one lower gravity. Old Foghorn is the beer made from the first runnings. Small Beer (recipe on page 68) is the beer made from the second runnings.

Ingredients

22.5 lbs. (10.2 kg) 2-row pale malt
5 lbs. 3 oz. (2.4 kg) caramel malt (40 °L)
6.8 AAU Cascade pellet hops (60 min.) (1.5 oz./42 g at 4.5% alpha acids)
4.5 AAU Cascade pellet hops (30 min.) (1 oz./28 g at 4.5% alpha acids)
1 oz. (28 g) Cascade pellet hops (dry hop)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.25 oz. (7 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Mill grains and mix with 10.1 gallons (38.2 L) of 157 °F (69 °C) strike water and optional gypsum (see ingredients list) to reach a mash temperature of 149 °F (65 °C). Hold this temperature for 60 minutes. Vorlauf until your runnings are clear. Collect the first runnings without sparging and top up if necessary to obtain 7 gallons (26.5 L) of 1.071 SG wort. Boil for 120 minutes, adding hops according to the ingredients list. After the boil, turn of the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch yeast. Ferment at 67 °F (19 °C) for 4 days. Add dry hops and raise to 72 °F (22 °C) for three days. Once at terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate. Age for 6–12 months before serving.

Anchor Old Foghorn clone
(5 gallons/19 L, extract with grains)

OG = 1.099 FG = 1.030
IBU = 43 SRM = 20 ABV = 10%

Ingredients

12 lbs. (5.4 kg) golden liquid malt extract
3 lbs. (2.4 kg) caramel malt (40 °L)
6.8 AAU Cascade pellet hops (60 min.) (1.5 oz./42 g at 4.5% alpha acids)
4.5 AAU Cascade pellet hops (30 min.) (1 oz./28 g at 4.5% alpha acids)
1 oz. (28 g) Cascade pellet hops (dry hop)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.25 oz. (7 g) gypsum (optional if using very low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

Place the milled grains in a muslin bag and steep in 10 quarts (9.4 L) of 149 °F (65 °C) water for 15 minutes. Remove the grain and rinse with 1 gallon (3.8 L) of hot water. Add water and optional gypsum (see ingredients list) to reach a volume of 5.25 gallons (19.9 L) and heat to boiling. Turn off the heat, add the liquid malt extract, and stir until completely dissolved. Top up with water if necessary to obtain 6 gallons (23 L) of 1.082 wort. Boil for 60 minutes, adding hops according to the ingredients list. After the boil, turn of the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch yeast. Ferment at 67 °F (19 °C) for 4 days. Add dry hops and raise to 72 °F (22 °C) for three days. Once at terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate. Age for 6–12 months before serving.

Tips for Success:

See the sidebar in this story on page 69 about parti-gyle brewing. You will definitely need a large mash tun in order to pull this off or you can scale this recipe down to make a smaller quantity. The combination of the high gravity and lack of sparging means that you can expect a much lower than usual efficiency from this batch. Read more on estimating mash tun space in this Mr. Wizard column at http://byo.com/story2826

Clone Recipes

Anchor Small Beer clone
(2nd Runnings)
(5 gallons/19 L, all-grain)

OG = 1.032 FG = 1.005
IBU = 30 SRM = 7 ABV = 3.3%

This beer is brewed using the second runnings from a batch of Old Foghorn (page 67). Estimating the efficiency in such a scenario is quite challenging so be prepared to make some gravity adjustments upwards with dried malt extract or downwards by dumping some wort and topping off with water.

Ingredients

22.5 lbs. (10.2 kg) 2-row pale malt
5 lbs. 3 oz. (2.4 kg) caramel malt (40 °L)
5.9 AAU US Golding pellet hops (60 min.) (0.9 oz./26 g at 6.5% alpha acids)
2.6 AAU US Golding pellet hops (30 min.) (0.4 oz./11 g at 6.5% alpha acids)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.2 oz. (6 g) gypsum (optional if using very low mineral water)
⅝ cup corn sugar (if priming)

Step by Step

Start with the spent grain bed in the mash tun from a batch of Old Foghorn (recipe on page 67). Sparge with 6 gallons (22.7 L) of 168 °F (75 °C) water and top up with water if necessary to obtain 6 gallons (23 L) of 1.027 SG wort. Add the optional gypsum (see ingredients list) and boil for 60 minutes, adding hops according to the ingredients list. After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast. Ferment at 67 °F (19 °C) for 4 days. Add dry hops and raise to 72 °F (22 °C) for three days. Once at terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate.

Anchor Small Beer clone
(5 gallons/19 L, extract with grains)

OG = 1.032 FG = 1.005
IBU = 30 SRM = 7 ABV = 3.3%

Small Beer is brewed using the parti-gyle method of brewing. Because this requires that the wort be made with grains, a true parti-gyle brewed with extract is not possible. This recipe is provided simply for extract brewers who are interested in brewing Anchor Small Beer independently.

Ingredients

3 lbs. (1.36 kg) light dried malt extract
1 lb. 3 oz. (0.54 kg) caramel malt (40 °L)
5.9 AAU US Golding pellet hops (60 min.) (0.9 oz./26 g at 6.5% alpha acids)
2.6 AAU US Golding pellet hops (30 min.) (0.4 oz./11 g at 6.5% alpha acids)
White Labs WLP051 (California Ale V) or Wyeast 1272 (American Ale II) yeast
0.2 oz. (6 g) gypsum (optional if using very low mineral water)
⅝ cup corn sugar (if priming)

Step by Step

Place the milled grains in a muslin bag and steep in 4 quarts (3.8 L) of 149 °F (65 °C) water for 15 minutes. Remove the grain and rinse with 1 gallon (3.8 L) of hot water. Add water and optional gypsum (see ingredients list) to reach a volume of 5.25 gallons (19.9 L) and heat to boiling. Turn off the heat, add the liquid malt extract, and stir until completely dissolved. Top up with water if necessary to obtain 6 gallons (23 L) of 1.027 SG wort. Boil for 60 minutes, adding hops according to the ingredients list. After the boil, turn off the heat and chill the wort to slightly below fermentation temperature, about 65 °F (18 °C). Aerate the wort with pure oxygen or filtered air and pitch the yeast. Ferment at 67 °F (19 °C) for 4 days. Add the dry hops and raise to 72 °F (22 °C) for three days. Once at terminal gravity (approximately 7 days total) bottle or keg the beer and carbonate.

weather activities.

It wasn't long after the release of this beer that other craft breweries picked up on the trend and we saw the first commercial batches of Widmer and Pyramid hefeweizens.

Beyond

In the past several years since Maytag sold Anchor, the brewery has taken a turn back towards its most adventurous ways. While it's too early to tell which of their new beers will become classics, it's clear that Anchor still possesses the magic that helped spawn the craft beer movement.

Several beers have jumped right into their seasonal rotations but the most experimental have been part of the Zymaster Series. The first in that series was Anchor California Lager, an homage to the first true lager brewed in California back in 1875. Anchor reached into its toolkit to come up with a recipe that would likely reflect what that beer would have tasted like.

A foundation of domestic 2-row malt is paired with traditional American Cluster hops and a clean fermenting German lager yeast strain. Once again you see surprising simplicity in the beer rather than a kitchen sink of ingredients.

How Anchor Brews

We can learn a lot about how to brew beers like Anchor by looking at their process, ingredients, and philosophy. Anchor's unique place in craft brewing history has had a significant impact on all of those factors.

When Fritz Maytag took over Anchor it wasn't as simple as posting on ProBrewer in order to hire a crew to run the brewery. The fresh faces he brought on board enjoyed drinking beer but had no brewing experience on either a homebrew or commercial scale. After a crash course on the equipment and process from the previous owner they were largely left to figure things out for themselves.

Wort Production

Wort production starts with malt stored in one of their six silos. Four are dedicated to domestic 2-row malt and

Parti-gyle Style

Anchor's brewhouse wasn't designed for brewing large batches of high gravity beers. In order to hit their target for Old Foghorn Barleywine they reach for a traditional English technique of using just the first runnings from a very large mash without sparging. This yields a much smaller volume of wort so they collect the first runnings from three mashes to reach their full volume.

Of course skipping the sparge leaves a lot of sugar in the spent grains that would be a shame to waste. So once again they looked to English brewers for a solution. That's where parti-gyle brewing comes in. By sparging the mash and collecting these second runnings the remaining sugar can be used to make a lower gravity beer. Anchor started doing this very process to produce Anchor Small Beer in 1987.

The result of parti-gyle is two very different worts. The first runnings are high gravity, deep in color, and rich in flavor. The second runnings are much lower gravity, lighter in color, and often a bit thin or astringent. You can use this to your advantage as you make a much more quaffable session beer to go along with your barleywine.

Historically, beers would be made from first runnings, second runnings, and sometimes a combination of the two in order to make multiple strength beers out of the same mash. In some cases brewers would add more specialty grain and perform an abbreviated mash before the second runnings to increase the body and complexity.

When attempting this at home the big challenge is estimating the gravity of the first and second runnings. To do this you need to consider the two aspects of total extract efficiency: How much starch is converted into soluble sugar and how well you're able to rinse the sugar from the grains. Parti-gyle brewing doesn't affect the starch conversion rate so that's what you normally get based on your grain crush, water chemistry, enzymes, and so on. In the ideal case your rinsing efficiency for the first runnings is equal to the portion of the total wort you're able to drain out of the mash tun. In other words, if you assume the converted sugar is evenly distributed in the mash wort then you only drain out the portion of sugar in the portion of total wort you run off. But don't you run off all the wort from your mash? Well no, there's always wort left in the grains and many mash tuns have dead space that you can't drain. In general about 1 pint (0.125 gallons/0.5 L) of wort is retained in each pound of grain.

Let's go through an example to see how this works in practice. Imagine a mash of 10 lbs. (4.5 kg) of two-row malt with 15 quarts (3.75 gallons/14 L) of water in a tun that has 0.25 gallons (1 L) of dead space. If you managed to convert 90% of the starches into soluble sugar, the wort in the mash tun would be 1.089 SG. Calculating the gravity of the first runnings is easy because you're just going to drain out the wort without diluting it with any water additions. Of the 3.75 gallons (14 L) that go into the mash tun, 1.25 gallons (5 L) is absorbed in the grain and 0.25 gallons (1 L) is trapped in the dead space for a total of 1.5 gallons (6 L). That means that you will collect 2.25 gallons (8.5 L) of 1.089 SG first runnings.

That 1.5 gallons (6 L) of wort that's still in the mash tun is also at 1.089 SG and you're going to get that sugar out by diluting, stirring, and draining. For those second runnings, note that you've already saturated the grains and filled the dead space. So the volume of wort you run off will equal the volume of water you add (this should be familiar to batch spargers.) Imagining you wanted to reach start of boil volume of 6 gallons (23 L) you would add 6 gallons (23 L) of water and stir the mash well before vorlaufing to clarify the runnings. That 1.5 gallon (6 L) of 1.089 SG wort combines with the 6 gallons (23 L) you added for a total of 7.5 gallons (28 L). Using a basic dilution calculation gets you (1.5 gallons * 1.089 SG) / 7.5 gallons = 1.018 SG. So you can expect to get 6 gallons (23 L) of 1.018 SG second runnings.

The rest of the brewing process is the same as any other batch.

Time and again Anchor has stuck with simple recipe formulation even when more ingredients became available.

the other two are typically dedicated to caramel 40 °L or Munich malt. All other grains come in sack form.

The malt is milled and mixed with strike water to a target temperature of about 118 °F (48 °C). The mash is then stepped through three rests at 122 °F, 145 °F, and 156 °F (50 °C, 63 °C, and 69 °C) before mashing out and being pumped over to the lauter tun. There the mash is continuously sparged and the runnings are collected into a holding tank until the brew kettle is free. Anchor maintains a grand setup with its distinctive copper faucets. The wort passes through it between the holding tank and kettle. The wort is then boiled vigorously for 60–120 minutes before being sent through a heat exchanger to bring it down to pitching temperature.

Fermentation and Cellaring

Currently Anchor has three different fermentation systems: The shallow open coolships used for Anchor Steam Beer that depend on ambient air cooling for temperature control, two deep open-topped ale fermenters with glycol cooling, and a few new cylindroconical fermenters that have been more recently added for capacity in fermenting lagers and ales.

Fermentation of Anchor Steam Beer is controlled simply with 61 °F (16 °C) air in the coolship room. Fermentation activity raises the temperature to nearly 72 °F (22 °C) at the peak in the middle of the second day before it drops back down. Ales are pitched at 60 °F (16 °C) and are allowed to rise up to the mid 70s (~23 °C) before glycol cooling is used to bring them under control. The ales are in much deeper fermenters so it wouldn't be practical to just rely on air-cooling.

The beers spend three days in primary before the yeast drops and the beer is sent to cellar in a myriad of tanks on the lower floor of the brewery. Anchor has been conservative in introducing the cylindroconicals and as of now still uses them just for primary fermentation and matures the beer in the cellar like with their open fermented beers. This is when dry hopped beers get their additions in the form of whole cone hops in large mesh sacks.

Anchor utilizes kräusening (adding 15–20% of actively fermenting beer to a batch) in order to generate carbonation in Anchor Steam Beer. For other beers, the brewery simply bungs the beer when it is a few points from its terminal gravity and lets the final fermentation do the job.

Filtering and Packaging

Anchor follows a three-step regimen on all its beers (bottled and kegged). First the beers go through a centrifuge to get rid of the majority of the sediment. Then they pass through a plate filter to remove the finer particulates. Finally the beer is flash pasteurized to ensure that it is sterile and stable for distribution.

I was surprised to hear that even the draft beer was pasteurized as that's not a common industry practice, but Mark said that it had been done this way for a long time. As with many things at Anchor, tradition trumps following trends.

Anchor packages their beer in kegs, 12-ounce bottles, 22-oz. bottles, specialty bottles (e.g. magnums for Christmas Ale), and cans. Cans are a relatively recent change and up until recently they were relying on a mobile canning service. During my visit they were dialing in their new on-site canning line so you can expect to see more of their products in this packaging in the future.

Ingredients

In the early days the selection of brewing ingredients was a small fraction of what we have today. When you look at the recipes (starting on page 63) you'll see this had a large influence on their formulation approach.

The bulk of the grain bill for almost all of Anchor's beers is domestic 2-row malt. They vary the exact supplier over time and they don't sweat the small differences among the malting houses. To this they are typically adding caramel 40, malted wheat,

black malt, and/or chocolate malt. Few other character malts make an appearance, which makes sense because they simply weren't readily available in the 1970s. When they do appear, they are typically in the beers formulated much more recently.

Anchor utilizes two main yeast strains for almost all of their beers. The distinctive Anchor Steam Beer yeast represents the types of lager yeasts that handled the higher temperatures of uncontrolled fermentations in San Francisco historically. The ale yeast was a top fermenting strain sourced in the 1970s from another brewery. Both have been repitched many generations and have adapted to the brewery environment. It's only been recently with the Zymaster Series that additional strains have been brought in.

For process and flavor reasons, Anchor uses whole cone hops for all additions in the boil and during dry hopping. All of the varieties are American grown except the Nelson Sauvin that is sourced from New Zealand. Prominently featured hops include Northern Brewer, Cascade, and Cluster, but more recently Citra® and Nelson Sauvin have been incorporated in new recipes.

Finally, the water is simply carbon-filtered tap water from the San Francisco municipal supply. SF water is very low in minerals thanks to its sourcing at Hetch Hetchy Reservoir, capturing snowmelt in a granite valley. Most beers get a modest addition of gypsum to raise the calcium and sulfate levels a little bit.

Brewing Like Anchor at Home

Translating Anchor's brewing approach to homebewing is quite straightforward. Time and again Anchor has stuck with simple recipe formulation even when more ingredients became available. As you approach each beer think through the simplest set of ingredients and process to yield the result and you'll be pretty close. Anchor lists each beer's ingredients on their website but they don't provide quantities so that's where you have to do a bit of observation and experimentation.

From an ingredient sourcing standpoint you shouldn't have any trouble. Every homebrew shop should be able to get you these classic malts. Both White Labs and Wyeast provide strains for their Anchor Steam Beer and ale yeasts. The hop varieties are readily available and you can decide whether you want to go with whole cone or pellets based on your experience and equipment. Water can be built up from reverse osmosis with a gypsum addition of about 1 gram per gallon of brewing water.

The process, on the other hand, does provide some challenges in some areas: Color, fermentation, and filtering/pasteurizing. Mark provided me with Anchor's lab measured color levels for several of their beers. What I found when I put together the recipes, though, is that they were picking up a modest color contribution on many of their beers from somewhere other than just the specialty grains. This was especially true with Anchor Steam Beer, which would have required caramel 40 °L to be more than 25% of the grain bill in order to hit the measured 14 SRM. Mark assured me that they used roughly half that amount, which by the numbers only gets the beer to 9 SRM. It's possible that the hot wort aeration through the grant or the pasteurization is adding some of the additional color.

For fermentation you can experiment with the wide fermentation temperature ramps that Anchor uses starting in the low 60s (~16 °C) and letting the beer rise to the 70s (~21 °C) but remember that they are using open fermenters and extremely viable yeast. I found decent results from picking a compromise fermentation temperature and then just ramping after a few days to ensure the yeast cleaned things up and finished strong.

Finally, it's unlikely you will have the equipment or desire to do filtering at home. You can use fining agents as well as cold aging to clarify the beer but in the end you can still expect the beers will be slightly different, as you haven't stripped out all the things Anchor does. Flash pasteurization is even less common on the homebrew scale. Mark believes it has a minimal impact on the flavor of the beer but it's yet another difference we won't be able to fully emulate.

So in summary, cut yourself a little bit of leeway with these beers. Remember that Anchor wasn't out to clone existing beers when they came up with their process or recipe. They were simply trying to make the best beers they could for their customers.

Notes About Recipes

I made a few key decisions in the clone recipes for this story. I assumed that since the malts are well modified that a multi-step mash wasn't necessary to achieve similar results. Instead I substituted a single step at 149 °F (65 °C) for 60 minutes on all the beers.

As mentioned earlier, I decided against letting the fermentation temperature climb and drop so dramatically so I picked 61 °F (16 °C) for Anchor Steam Beer and 67 °F (19 °C) for the ales. In both cases, after a few days I ramped the temperatures by 5 °F (3 °C) to encourage the yeast to finish out strong.

For the yeast, neither the Anchor Steam Beer nor the ale strains are readily available as dried products from the two major dry yeast companies. If you need a dry yeast source you'll need to experiment to determine acceptable substitutes.

I have omitted the kräusening or bunging procedures as they are much more feasible in a production brewery setting where actively fermenting wort is readily available and terminal gravities are consistent.

Anchor Legacy

It's hard to overstate the importance of Anchor Brewing Company on today's craft beer renaissance. Fritz Maytag and the rest of the original Anchor crew revived a dying industry and seeded it with many of the core styles that we all enjoy. Homebrewers can take both inspiration and practical lessons from their work. If you ever get the chance meet any of them or tour the brewery, make sure to share your appreciation for the impact of their life's work. BYO

CAN DO!

Mobile canning companies support growing beer trend

by **Glenn BurnSilver**

THERE WAS A TIME when just the thought of drinking canned beer was enough to make one cringe. That philosophy has changed in the last 10 years as craft breweries are embracing the reality that canned beer is better. In fact, as of press time, according to CraftCans.com, 1,484 beers covering 94 styles at 413 breweries in 49 states plus Washington D.C. are being canned. (Only West Virginia lacks local craft beer in a can. . . for now.)

There are multiple reasons for this canned beer growth. First, unlike not so long ago, aluminum cans are now lined with a special coating that keeps the beverage from touching the metal. No contact means no strange flavors. Second, it has been scientifically proven that beer in cans remains fresher longer. With no exposure to sunlight and less oxidization from leaking bottle caps and "head space" (that little pocket of air at the top of each bottle), canned beer remains at its peak flavor, and it will last longer on the shelf. Third, discerning beer drinkers, simply put, want to drink better beer.

Now the revolution comes home — literally. Small-scale canning units make the possibility of homebrewers canning their beers, well, possible.

That's easier said than done, however. Those who are independently wealthy or flush with disposable income can drop the thousands of dollars needed for a home canning unit. Nice, but most homebrewers will have to settle for special canning events organized by homebrew shops, brew clubs and local breweries where a mobile canner shows up, unloads, and starts canning.

Growing Trend

Approximately two dozen mobile canners operate in the United States, with locations in Colorado, California, Washington, Oregon, Pennsylvania, Michigan, New


Photos by Josh Lopez

Mexico, Georgia, Ohio, Virginia and Texas, to name a few. These canners typically work with smaller breweries that can't afford a full-scale canning unit, or don't produce quite enough beer to justify the cost — anywhere from $120,000 to $500,000 for the canning machine, plus the often necessary stockpile of pre-printed cans running approximately $30,000 per truck load (about 210,000 cans). Add storage space and costs and, well, mobile canning makes good economic sense for a lot of reasons.

While most canners prefer clients wanting to can 50, 100 or more barrels in a single session, some will venture forth into the homebrew community to can beer at special events. In Washington, Northwest Canning has canned for homebrewers on multiple occasions, including at a Wingman Brewery event. Colorado's Mobile Canning Solutions has parked at Oskar Blues (instigators of the canned beer revolution with Dale's Pale Ale) once a year to do likewise.

We Can Mobile Canning, from Danville, Pennsylvania, develops canning equipment to complement their mobile canning operation, has done similarly, including filling hundreds of 12-ounce cans with homebrew at two National Homebrew Day events hosted by Keystone Homebrew Supply in Montgomeryville, Pennsylvania. The team filled everything from beer, cider, wine and mixed cocktails to something called "Jungle Juice."

"I'm not exactly sure what that was," We Can founder and "Head Six Packer" Pete Rickert, Jr. says with a light laugh. "I guess it's pretty potent stuff."

Rickert has been canning beer (mostly) since 2012, and — like many of his compatriot canners scattered around the country — primarily helps smaller, independent breweries get their product on the shelf. This is a growing trend in the industry and, coupled with the fact that 413 breweries currently can (with more making the switch almost daily), it makes sense that homebrewers should want to follow their favorite brews down the canning path.

"These guys who brew beer at home, they think, 'I can put my beer in a can, that's awesome,'" Rickert says. "Most of the (commercial) brewers we work with started as homebrewers. So being part of that homebrew community makes good sense. We're not there to make money; we're there to build relationships."

Bring in the Cans

Homebrewers looking to can their beer need to do a little legwork before they call a mobile canning company. While the increase in mobile canning operations makes the odds of canning homebrew more likely, an organized event makes the most sense for everyone. The first thing to do is find a local brewer supply shop, or brewery that cans beer, and see if those establishments would be willing to host a mobile canner for a day. A larger homebrew club might also be able to organize an "in-house" canning event (though inviting the public could generate new members too).

The key to homebrew canning success, and the chance to repeat the event, is that no matter who does the organizing, it's important to ensure that enough homebrewers show up with beer ready to can so that it's worthwhile for the mobile canner to make the trip — and consider coming back. Most companies I spoke to for this story agree that a minimum of 25 5-gallon (19-L) batches makes a canning event worthwhile.

Typically, mobile canners charge $25-40 for a 5-gallon (19-L) batch, with volume discounts for larger batches. This includes the plain silver cans, and in some cases six-pack holders. Most canners prefer 16-ounce cans for ease of filling, though 12-ounce cans can be used too.

Canning Prep 101

Unlike the straight-forward and well-engrained approach to home bottling, the preparation for canning beer requires some extra work — not much — but it varies depending on the canner's preferences. That said, it's best to check well in advance with the canner or event organizer and prepare accordingly. Some mobile canners prefer the beer be primed and uncarbonated, the same as when preparing to bottle at home, while others want beer that's kegged in Corny or Sanky kegs and carbonated. For the latter option, it's essential the beer hovers at near freezing for easier and more efficient canning.

Mobile canning units most often work with 16-oz. unprinted aluminum cans, but may also use 12-oz. cans. The cost to can a 5-gallon (19-L) batch of homebrew is around $25 to $40.

"It's got to be cold. Forty degrees is not cold; 35 degrees or colder is cold," Rickert says emphatically. "The warmer the beer the higher the carbonation level and the more foam you're going to create. We've run into that problem — a lot of beers that were way over carbonated and not cold enough." This combination results in low fills from excessive foam, high beer loss and poor quality. Most fillers work better after the machine is cooled by cold beer and this takes time. Usually the first few cases run less than smooth. The losses at start-up can be high enough that the yield would have to be much lower than hand filling. Oskar Blues has a device used to help with this that they have named the Crowler, which is a one-head can filler.

To ensure ease of canning, Rickert recommends brewers try and get the beer on location and into a cooler at least a couple of days ahead of time so it can properly chill and settle out before the canning starts.

"It doesn't really work very well when a guy's been driving from two hours away with a keg bouncing around in the back (even if it's been on ice)," Rickert adds.

Pat Hartman, Mobile Canning Systems Co-Founder, doesn't believe in this cold and carbonated practice and is in the minority of canners interviewed for this article. The warmer a keg is, the foamier it will be, and canning foam just doesn't translate into efficient use of beer or equipment. Hartman explains that when brewers show up with finished, warm beer that has been primed as if for bottling there is less chance of dealing with turbulent beer and, perhaps more importantly, less beer loss in the canning process.

"You can't regulate the temperature very well (for kegged beer)," Hartman says. "If you have warm beer you have more foam because the gas wants to escape. We don't (can carbonated beer) because we're only doing five gallons. You'll waste one or two beers, and that's adds up for a homebrewer."

To be clear, if a brewer is unable to keg and carbonate their beer, all the mobile canning operators say they will still can the beer. Doing it Hartman's way allows the brew some time for can-aging, much as homebrew would bottle-age in glass containers. Note, however, that canning flat beer can result in high air pick-up (just like bottling) since low dissolved oxygen (DO) is only achieved when the lid is placed on foam — fresh, viable yeast is as key to can-conditioning as with bottle-conditioning.

"Do a (run) of tall boys, take it home and let it do its thing," Hartman says. "It's just like bottles or anything else you condition." The main difference in the final product is that the carbonated beer is ready to drink immediately while the aging beers typically takes several weeks or more depending on style.

Shelf life can vary in both processes. For example, New Belgium experienced stability issues when they were canning with a $300,000 small canner and had to begin can-conditioning to combat the problem; Fat Tire in the bottle had better stability and it had not been bottle-conditioned. (They now operate a high-speed KHS can filler and may no longer be can-conditioning). Small-scale can fillers do not operate like high speed machines (600+ cpm) and oxygen pick-up is often much higher than brewers expect. This is why many craft beers in cans contain yeast. If carbonated beer does not FOB (foam on beer) properly during filling high air pick-up should be expected, and if the beer is very bright with little yeast, oxidation should be expected. Can-aged beer does compare well to bottles, however. It does run a small risk of exploding (which would be most likely a can seam rupturing), though, just like over carbonated bottles.

"As far as I know there have been no cans to explode. I ask people to let me know, but no one's said anything," said Rickert. He adds (with a laugh) that if you can this way and a homebrew gushes in your face, don't hold him responsible.

Hartman confirms cans are more resilient than bottles and the aluminum can "stretch" a long way before being compromised. Like Rickert, he's not heard of any beers exploding. Just be aware of the risk just as you would for bottling, and remember to be careful not to overcarbonate your homebrew.

Novel Approach

For now, the idea of canning homebrew remains a novelty — something different for the homebrewer to try — but also pretty cool too. The upsides, besides the locked-in freshness, include the fact the beer can more easily be shipped to friends, taken on adventures in the great outdoors (cans are lighter to pack for camping than bottles) and are safer for outdoor festivals and concerts or drinking poolside where glass bottles are forbidden. Add to that the increasing number of craft breweries using cans, and these are just a few reasons why the home canning trend can only expand. Justin Brandt, owner of Northwest Canning has seen such a great response at canning events conducted at brew shops and breweries that he's actively looking for a Portland, Oregon storefront that will specialize in canning homebrew.

"It's more about the opportunity," Brandt says. "We obviously make a living canning for commercial brewers, so it doesn't make much sense for us to can homebrew. That being said, we do it because we want to support the homebrewer. There's a market for canning homebrewer's beer. It's not huge, but it's there."

Eventually, affordable home conning units will probably be created — if demand seems to warrant it. In the meantime, those not living close to Brandt's Portland-shop-to-be will have to remain content with mobile canners making themselves available for homebrewers.

"Bottling might take an hour or two hours, and it's labor intensive," Brandt adds. "We can get you in and out in five minutes."

This savings leaves more time for enjoying the fruits of those labors, big and small: A delicious, and now canned, homebrew. BYO

Related Links:

• Want to see some homebrew canning in action? Check out homebrewer Michael Horn's YouTube video: https://www.youtube.com/watch?v=6LUkyN8p-6Y

• Prime your homebrew properly before you show up to the next mobile canning event: http://byo.com/story1703

by Drew Beechum and Denny Conn

experimental BREWING

Make Beer with Unusual Ingredients

Photo by Eric Gaddy

Editor's Note: The following is an excerpt from the newly released book Experimental Homebrewing *(Voyageur Press, 2014). The recipes that appear in this excerpt have been formatted from their original appearance to reflect* Brew Your Own*'s recipe standardization (see page 4 of this issue).*

To say homebrewers are a creative group is an understatement. We've all seen posts like this on brewing forums: "I want to brew a Dijon mustard red wine celery beer. How much red wine should I use? Should I add the celery to the boil or dry celery in secondary?" Just as you're about to post an answer to the effect of, "On what planet would this be considered a good idea?" someone will post a reply saying, "Well, when I used Dijon mustard, red wine and celery, I did it like this." So, in the spirit of keeping an open mind, let's look at some ingredients you may not have considered and the ways they can be used in your beer.

Get Your Produce On

Fruits and vegetables exist primarily for one purpose: to ensure the spreading of a plant's genetic material (seeds). Lucky for us, they do so in packages that exhibit diverse flavors and aromas. The trick is how to get the flavors and aromas into your beer.

Needless to say, you should start with the best sources of produce. Hit the farmers market late in the day to strike a deal and choose produce not for looks, but for flavor. If the brew day is imminent, look for fruit so ripe it's about to turn south. Don't have a farmers market handy? Don't fret. Despite the fresh is best mantra of the culinary media, individually quick frozen (IQF) techniques have ratcheted up the quality of frozen fruits and vegetables in the past decade. When a particular fruit or vegetable is out of season, frozen is not only easier, it's also cheaper and tastes better than those god awful specimens that fly thousands of miles and are picked by dint of being able to survive the trip. Before we get into the how much question, let's tackle how to use produce:

Photo courtesy of Shutterstock.com/stockcreations

1. You must wash your produce. Some fruits and vegetables, like apples and cucumbers, come coated in a food-grade wax that serves both as a protectant and beautifier. The rule of thumb is if it's pretty and glossy, it's coated. Simply wash with cold water and use a clean produce brush on your shellacked produce.

2. If the produce is large, or if the flesh isn't exposed, it's time to chop. Use a clean knife and cutting board and tackle the fruit or veg. Don't worry about cutting a perfect brunoise — give everything a good chop to get it into ½ to 1-inch pieces.

3. Unless you're dealing with fresh, leafy items, give everything a freeze. The average home freezer is horribly inefficient and we're going to take advantage of that. When water in the produce is frozen slowly, it has time to form large crystals. These crystals pierce the cell walls of your produce. When you thaw and the crystals disappear, the juices and other interior goo will rush out of the mangled cells, giving you better flavor extraction. Vacuum packing will help encourage full goo-ification of your source matter. Alternatively, if you have a home juice machine that works by pulverizing the produce, you can create your own fruit and vegetable juice for use. Just make sure the machine is cleaned and sanitized before using (or freeze the juice before adding it).

Note: If you feel the need to sanitize the fruit before adding it, avoid heating it. That can set the pectin in the fruit and make it a gooey mess in your beer. Instead, soak the fruit in vodka to sanitize it. Or give the fruit a light spray of a sanitizer like Star San if you must. However, the two of us usually depend on the alcohol content and lowered pH of the fermented beer to keep things safe.

4. That's it for the prep work for almost all fruits and non-starchy vegetables. We'll cover the exceptions in a moment, but let's finish this happy path with a trip to the fermenter. Although you may not normally use a secondary fermenter, this is one time that a secondary can be valuable. Adding fruit will often trigger a true secondary fermentation. Using another primary fermenter for your secondary is not a bad idea. Be sure that whatever venting mechanism you're using — airlock, blowoff tube, etc — won't clog. If your excitable ferment throws raspberry flesh into the airlock port, it could jam the airlock, creating a truly explosive situation. You do not want to come home to a wall full of glass shards or a

ceiling full of Raspberry Imperial Stout! Note: Some folks like to use big mesh bags to hold their additions to retain clarity. However, we generally prefer to add the produce directly. If you want clear beer, then you'll need to be vigilant and patient enough to allow the beer to settle or be annoyed enough to filter. Truth be told, mesh bags won't spare you this pain either.

Other Produce Process

Citrus zest is a great way to add citrus fruit flavor. In fact, almost the entire orange flavor that we picture when we think of a fresh orange is locked in essential oils like limonene in the outer peel.

Use a fruit zester or microplane grater to create citrus zest. Start with the zest of two fruits before adjusting up or down. It can either go in during the last 2–3 minutes of the boil or be added to the fermenter after fermentation has died down.

Remember that the zest is the outermost part of the fruit rind, where the oils are concentrated, and not the white, bitter pith. However, you can take a cue from brewers like Mark Jilg of Craftsman Brewing, who uses the whole orange — including the pith — to provide an extra bitterness to his fruity and hoppy Orange Grove Pale Ale.

Dried fruits and vegetables can be another great way to skip the annoyance of fresh produce, and they don't add any moisture to the brew! Using them is as simple as opening a bag and dumping them into the beer. You're effectively using the beer to rehydrate them and create an alcoholic tincture.

Be careful when buying dried fruit; make sure to grab unsulfured varieties. You don't want to add sulfur compounds to your beer, do you? From a visual perspective, the unsulfured version isn't as bright and fresh-looking, but fortunately you'll be drinking it, not staring at it. With dried vegetables, make sure you're buying dehydrated vegetables and not oil- and salt-coated roasted vegetables. That would be bad juju for your beer.

Roots like potatoes, carrots, beets, or parsnips should be cooked first and smashed to ensure complete access to their goodness. Mashing starchy vegetables helps you avoid flooding your beer with starches.

Produce Quantity

Now you get to see why we seemed so obsessive about cost. To get fruit flavor in a beer, you need a lot of it. For a 5-gallon (19-L) batch, we're talking a minimum of 2.5 pounds (1.1 kg) of cranberries on the low side to nearly 20 pounds (9 kg) of apples on the high side. The general rule of thumb with fruit is to use 1 pound (0.45 kg) for each gallon (3.8 L) of beer, but for very subtly flavored fruits like blueberries or blackberries, you might want to increase that amount to 2 or 3 pounds (~1 to 1.3 L) per gallon (0.45 kg). If you're wondering about the impact on your beer's gravity, you have to

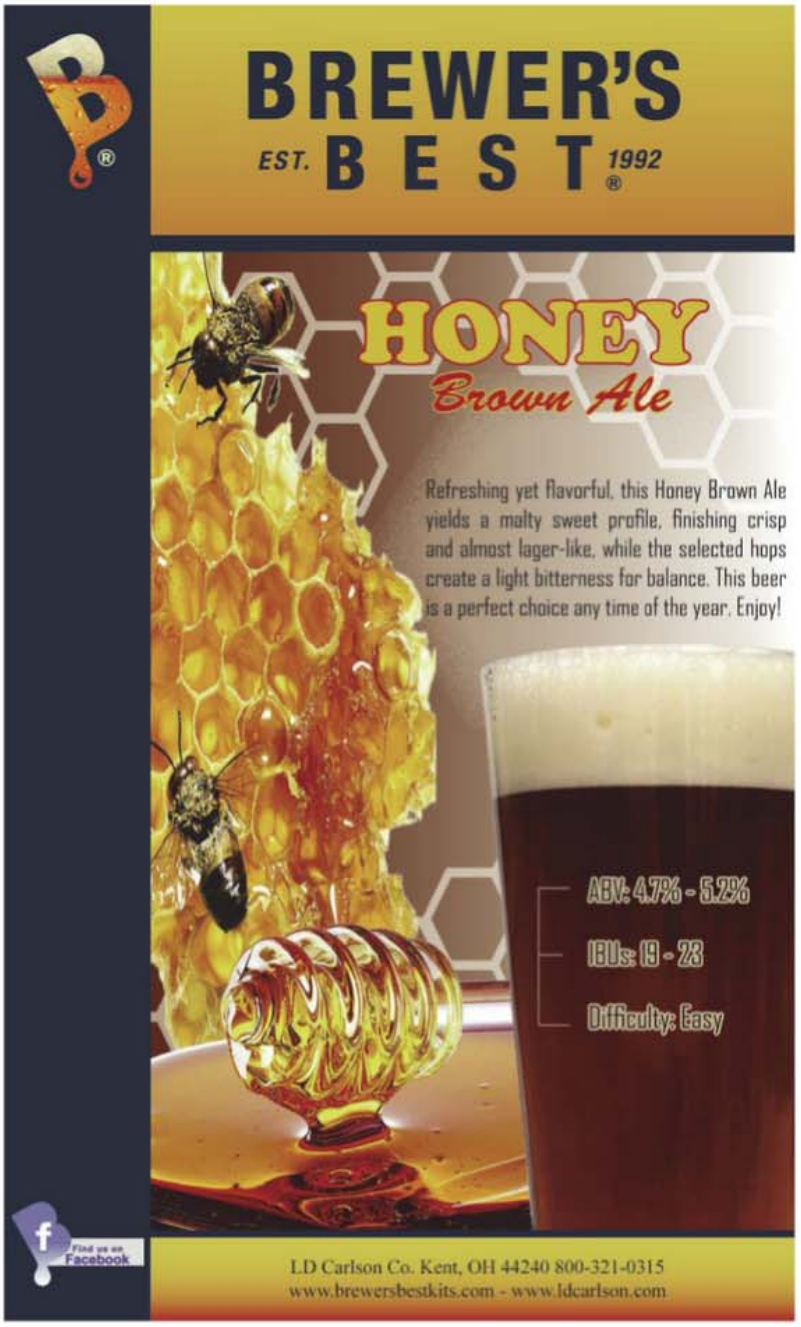


Photo by Eric Gaddy

remember that a good portion of fruit is water. The rough average of fruit juice gravity is in the 1.040–1.050 SG range. Vegetables are a little trickier to gauge. Many of them contain green flavors like chlorophyll (spinach) or sulfur compounds (garlic), which are less-than-desirable in a finished beer. Others, like chile peppers, will punish you horribly for overuse. Sometimes a single pepper (such as a ghost pepper) is enough to drive a full batch into hotter-than-hell territory.

Think about increasing the amount even more if you're adding it to a strongly flavored beer like a stout or porter. One pound (0.45 kg) of blueberries per gallon (3.8 L) in a porter produces a very restrained blueberry flavor and virtually no aroma. To really make them stand out, using 2 pounds (1 kg) per gallon (3.8 L) of finished beer isn't out of line.

Think of it as: "Would you like some beer with your raspberry?" Also, don't forget: these fruits have endless subvarieties. Take a chance on a new variety you've never tried before, like the freaky Buddha's hand citron or a candy cane beet. These are guidelines, after all, not Procrustean strictures.

Mean Green Beer

(5.5 gallons/21 L, all-grain)

OG = 1.057 FG = 1.015
IBU = 27 SRM = 3.8 ABV = 5.9%

Before we leave the world of vegetables, can we talk about the atrocity that's foisted on the American public every March 17? We know it; you know it: it's the scourge of green beer. If you're lucky, it's Harp with green dye injected into the keg. If you're not, it's some outstandingly bad American lager with the same green dye. Walk away from the green dye, people. Instead, take a chance and bulk up a golden ale with some body components like oats or wheat, and then hit it with fresh cucumber, spinach, and kale juice. Add some ginger to pull focus from the green, and voila, Irish eyes are smiling with a real Mean Green Beer.

Ingredients

11 lbs. (5 kg) 2-row pale malt
1.5 lbs. (0.68 kg) flaked oats
1.5 lbs. (0.68 kg) flaked wheat
7.5 AAU Warrior® pellet hops (60 min.)
(0.5 oz./14 g at 15% alpha acids)
1 oz. (28 g) Columbus pellet hops (0 min.)
1 bunch kale
2 bunches spinach
4 large English cucumbers
1 knuckle sized piece ginger, peeled
Wyeast 1272 (American Ale II) or White Labs WLP051 (California Ale V)
⅔ cup corn sugar (if priming)

Step by Step

This is a single infusion mash. Mash in and hold at 155 °F (68 °C) for 60 minutes. Boil the wort for 60 minutes adding the first hop addition as the wort comes to a boil and the second hop addition at the very end of the boil. Chill to fermentation temperature of about 68 °F (20 °C) and aerate the wort. Pitch an appropriate amount of yeast. Ferment until no sign of fermentation is visible and let condition for about one week. On the day of packaging, take the kale, spinach, cucumbers and ginger and juice them. Add the juice to the keg or bottling bucket and rack in on top of it. Carbonate to 2.5 volumes and enjoy!

Mean Green Beer

(5.5 gallons/21 L, partial mash)

OG = 1.057 FG = 1.015
IBU = 27 SRM = 3.8 ABV = 5.9%

Ingredients

3.9 lbs. (1.8 kg) extra light dried malt extract
3 lbs. (1.36 kg) 2-row pale malt
1.5 lbs. (0.68 kg) flaked oats
1.5 lbs. (0.68 kg) flaked wheat
7.5 AAU Warrior® pellet hops (60 min.) (0.5 oz./14 g at 15% alpha acids)
1 oz. (28 g) Columbus pellet hops (0 min.)
1 bunch kale
2 bunches spinach
4 large English cucumbers
1 knuckle sized piece ginger, peeled
Wyeast 1272 (American Ale II) or White Labs WLP051 (California Ale V)
⅔ cup corn sugar (if priming)

Step by Step

Crush the malt and add it with the flaked oats and flaked wheat to 11 qts.

(10 L) water at 155 °F (68 °C). Hold the mash at this temperature for 60 minutes. Heat about 2 gallons (8 L) of water to 170 °F (77 °C) and wash the grains with the hot water when the 60 minutes is up. Add the dried malt extract and top off to 6.5 gallons (25 L). Boil the wort for 60 minutes adding the first hop addition as the wort comes to a boil and the second hop addition at the very end of the boil. Chill to fermentation temperature of about 68 °F (20 °C) and aerate the wort. Pitch an appropriate amount of yeast. Ferment until no sign of fermentation is visible and let condition for about one week. On the day of packaging, take the kale, spinach, cucumbers and ginger and juice them. Add the juice to the keg or bottling bucket and rack in on top of it. Carbonate to 2.5 volumes and enjoy!

Brewing With Meat

We racked our brains to come up with a joke to start this section. We thought about meat puns, meat double entendres, and meat stories. Then we realized that the joke is brewing with meat!

For years Denny has run an Iron Chef-type brewing competition for his homebrew club. Teams of brewers show up with equipment and basic ingredients for brewing and are given a secret ingredient to incorporate into their beers (the secret ingredient is often not something they'd normally use in a beer). He had joked for several years about giving the brewers pork chops as a secret ingredient. It was strange enough to amuse people, and it was obvious that no one would ever brew with pork chops. Right?

One club member, Jeremiah Marsden, took the joke seriously and made a batch of beer he called "Pork Soda." Jeremiah is apparently an otherwise sane person, but you can see his recipe and comments here:

Pork Soda

(5.5 gallons/21 L, all-grain)

OG = 1.055 FG = 1.008

IBU = 27 SRM = 20 ABV = 6.3%

I wanted the essence of pork chop to come through — savory, herbal, and smoky. So I chose what is basically a brown ale with fairly low IBU as a base. The pork chops were seasoned with black pepper, sage, and rosemary and then grilled. They were added only to the mash. The grain bill included smoked malt to enhance the smoky grilled flavor, some darker crystal, and pale chocolate. Black pepper, seeds of paradise, and sage were added at the end of the boil, and then a sage-vodka tincture was added in the secondary. It was a nice savory beer; the sage came through very well, as did the light smoke. Make sure to mash high to enhance the malt, since the smoke and herbs dry it out a bit.

Ingredients

8.25 lbs. (3.74 kg) 2-row pale malt
1.65 lbs. (0.75 kg) Briess cherrywood smoked malt

1.1 lbs. (0.5 kg) crystal malt (40 °L)
4 oz. (113 g) crystal malt (120 °L)
4 oz. (113 g) chocolate malt (350 °L)
4 oz. (113 g) pale chocolate malt (170 °L)
4 oz. (113 g) Briess special roast malt (50 °L)
6.4 AAU Tettnang pellet hops (60 mins.) (2.2 oz./62 g at 2.9% alpha acids)
1.7 AAU Saaz pellet hops (30 mins.) (0.75 oz./21 g at 2.2% alpha acids)
1.7 AAU Saaz pellet hops (2 mins.) (0.75 oz./21 g at 2.2% alpha acids)
1 lb. (0.45 kg) pork chops
2 oz. (57 g) grains of paradise (5 mins.)
1 oz. (28 g) ground sage (5 mins.)
0.5 tsp. black peppercorn (5 mins.)
2 oz. (57 g) ground sage (secondary)
Wyeast 1450 (Denny's Favorite 50) yeast (2 qt./2 L starter)
⅔ cup corn sugar (if priming)

Step by Step

This is a single infusion mash. Heat strike water to achieve a saccharification rest at 154 °F (68 °F). Add the grilled pork chops to the mash and hold for 60 minutes. Total boil time is 60 minutes adding your first hop addition as the wort comes to a boil and the second hop addition with 30 minutes left in the boil. With 5 minutes lift in the boil, add the grains of paradise, black peppercorn and first addition of sage.

Chill the wort to 62–65 °F (17–18 °C). Pitch decanted yeast starter. Aerate well with the method of your choice. Ferment at 62–65 °F (17–18 °C) for approximately 1–2 weeks. Soak the 2 oz. (57 g) ground sage in enough vodka so that the sage is submerged to make a tincture. Let tincture sit for 1–2 weeks.

Transfer the beer to a sanitized secondary fermenter and add sage tincture. Let the beer sit for 5 days, then bottle or keg. Use priming sugar or force-carbonate the beer to about 2.5 volumes of CO_2.

Pork Soda

(5.5 gallons/21 L, partial mash)

OG = 1.055 FG = 1.008
IBU = 27 SRM = 20 ABV = 6.3%

Ingredients

4.25 lbs. (1.93 kg) extra light dried malt extract
1 lb. (0.45 kg) 2-row pale malt
1.65 lbs. (0.75 kg) Briess cherrywood smoked malt
1.1 lbs. (0.5 kg) crystal malt (40 °L)
4 oz. (113 g) crystal malt (120 °L)
4 oz. (113 g) chocolate malt (350 °L)
4 oz. (113 g) pale chocolate malt (170 °L)
4 oz. (113 g) Briess special roast malt (50 °L)
6.4 AAU Tettnang pellet hops (60 mins.) (2.2 oz./62 g at 2.9% alpha acids)
1.7 AAU Saaz pellet hops (30 mins.) (0.75 oz./21 g at 2.2% alpha acids)
1.7 AAU Saaz pellet hops (2 mins.) (0.75 oz./21 g at 2.2% alpha acids)
1 lb. (0.45 kg) pork chops
2 oz. (57 g) grains of paradise (5 mins.)
1 oz. (28 g) ground sage (5 mins.)
0.5 tsp. black peppercorn (5 mins.)
2 oz. (57 g) ground sage (secondary)
Wyeast 1450 (Denny's Favorite 50) yeast (2 qt./2 L starter)
⅔ cup corn sugar (if priming)

Step by Step

Crush the malt and add it to 8 qts. (7 L) of water at 154 °F (68 °C) and grilled pork chops. Hold the mash at this temperature for 60 minutes. Heat about 6 qts. (6 L) of water to 170 °F (77 °C) and wash the grains with the hot water when the 60 minutes is up. Add the dried malt extract and top off to 6.5 gallons (25 L). Total boil time is 60 minutes adding your first hop addition as the wort comes to a boil and the second hop addition with 30 minutes left in the boil. With 5 minutes left in the boil, add the grains of paradise, black peppercorn and first addition of sage.

Chill the wort to 62–65 °F (17–18 °C). Pitch decanted yeast starter. Aerate well with the method of your choice. Ferment at 62–65 °F (17–18 °C) for approximately 1–2 weeks. Soak the 2 oz. (57 g) ground sage in enough vodka so that the sage is submerged to make a tincture. Let tincture sit for 1–2 weeks. Transfer the beer to a sanitized secondary fermenter and add sage tincture. Let the beer sit for 5 days, then bottle or keg. Use priming sugar or force-carbonate to about 2.5 volumes of CO_2.

Bacon Helles

(5.5 gallons/21 L, all-grain)

OG = 1.050 FG = 1.012
IBU = 18 SRM = 4 ABV = 5.0%

Sage of the ages, Homer Simpson, when told that ham, pork chops, and bacon all come from the same animal expressed disbelief that such a magical animal could exist. Out of the three, bacon seems to be everyone's favorite ingredient, and that means you have to find a way to get it into a beer. Charlie Essers, aka Push Eject of the Brewing Network, found a clever way of safely adding bacon to his Helles recipe. The bacon itself was baked to ensure even cooking with no charring. (Since the Helles is a delicate beer, any char would translate into an unpleasant, in-your-face burned aroma.) The bacon wasn't added directly to the beer either; it was crumbled and soaked in vodka for a few days first to dissolve the bacony essence. The resulting tincture was then added to a half portion of the helles to allow Charlie to serve both the regular Helles and Schweinchen Helles at the same time.

Ingredients

10 lbs. (4.54 kg) Weyermann Pilsner malt
12 oz. (0.34 kg) Munich malt
4 oz. (113 g) melanoidin malt
4.2 AAU Magnum pellet hops (60 mins.) (0.3 oz./9 g at 14% alpha acids)
2 strips of bacon, thick cut (read on)
White Labs WLP820 (Oktoberfest/Märzen Lager) yeast (2 qt./2 L starter)
⅔ cup corn sugar (if priming)

Step by Step

This is a single infusion mash. Heat strike water to achieve a saccharification rest at 151 °F (66 °C) for 60 minutes. Total boil time is 60 minutes adding your first hop addition as the wort comes to a boil. After 60 minutes, turn off the heat and chill the beer to about 50 °F (10 °C). Pitch a large ½ gallon (2 L) or larger starter.

Allow the beer to ferment in primary for 2 weeks at 48-50 °F (9–10 °C). Raise the fermentation temperature to 65 °F (18 °C) for 2 days and then slowly lower to 35 °F (2 °C) for 4 weeks. Create the bacon tincture by cooking the bacon on a rack in the oven at 320 °F (160 °C) for 40–50 minutes or until perfectly crispy (but not burnt!). Pat off the grease and allow it to cool. Crumble the bacon and cover with the vodka. Shake every day until packaging the beer. On packaging day, filter the bacon tincture through a sieve and coffee filter and add to the keg or bottling bucket. Proceed as normal.

Bacon Helles

(5.5 gallons/21 L, extract with grains)

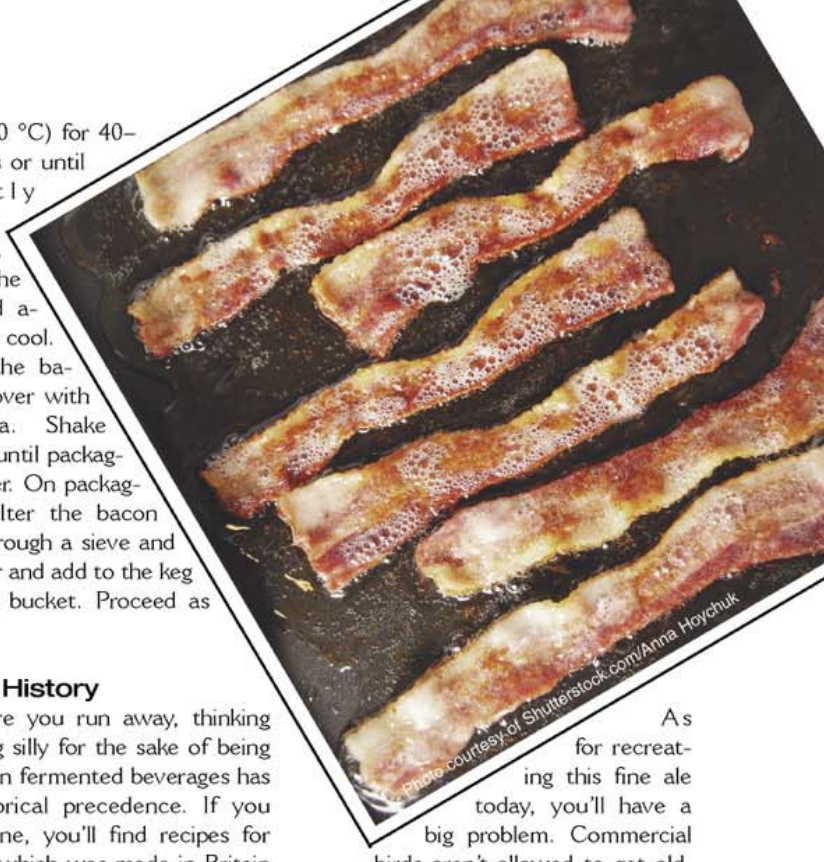
OG = 1.050 FG = 1.012
IBU = 18 SRM = 4 ABV = 5.0%

Ingredients

5.6 lbs. (2.54 kg) Pilsen dried malt extract
12 oz. (0.34 kg) Munich malt
4.0 oz. (113 g) melanoidin malt
4.2 AAU Magnum pellet hops (0.3 oz./9 g at 14% alpha acids) (60 mins.)
2 strips of bacon, thick cut (read on)
White Labs WLP820 (Oktoberfest/Märzen Lager) yeast (2 qt./2 L starter)
⅔ cup corn sugar (if priming)

Step by Step

Crush the malt and add it to 4 qts. (4 L) at 151 °F (66 °C). Hold the grains at this temperature for 30 minutes. Heat about 4 qts. (4 L) of water to 170 °F (77 °C) and wash the grains with the hot water when the 30 minutes are up. Add the dried malt extract and top off to 6.5 gallons (25 L). Boil the beer for 60 minutes adding the hops at the beginning of the boil. Chill the beer to about 50 °F (10 °C). Pitch a large ½ gallon (2 L) or larger starter. Allow the beer to ferment in primary for 2 weeks at 48–50 °F (9–10 °C). Raise the fermentation temperature to 65 °F (18 °C) for 2 days and then slowly lower to 35 °F (2 °C) for 4 weeks. Create the bacon tincture by cooking the bacon on a rack in the oven at 320 °F (160 °C) for 40–50 minutes or until perfectly crispy (but not burnt!). Pat off the grease and allow it to cool. Crumble the bacon and cover with the vodka. Shake every day until packaging the beer. On packaging day, filter the bacon tincture through a sieve and coffee filter and add to the keg or bottling bucket. Proceed as normal.



Meat In History

Now before you run away, thinking we're being silly for the sake of being silly, meat in fermented beverages has great historical precedence. If you search online, you'll find recipes for Cock Ale, which was made in Britain around the 1600s and 1700s. The recipe calls for ale to be boiled with an old rooster, fruits like dates and raisins, sack (Sherry), and spices like nutmeg and clove. It was considered a fine drink with medicinal qualities. Also, some cider makers used to throw raw pork sides into their ciders when the ferment had gone wrong. Turns out that what these brewers had stumbled on before they understood it was the power of protein and the clarifying impact of collagen and gelatin.

The introduction of the meat also added valuable amino acids that allowed the yeast to rise up and do their thing more effectively. (Remember, this is one hundred to two hundred years before yeast was even recognized as a key cause of beer.) These guys weren't carefully growing up pure cultured yeast starters with ideal cell counts, high viability, proper nutrition, and so on. They were either using the stuff from the air or stuff that lived in the vats or from previously fermenting beer. All of it was less than healthy and needed all the help it could get. Yeast exposed to meat fermented more strongly, producing a drier, clearer ale that would be rated as fine.

As for recreating this fine ale today, you'll have a big problem. Commercial birds aren't allowed to get old. The average age of a factory raised bird is about 6 to 7 weeks. Compared to a hen or rooster of the Cock Ale period, that's insanely young. A rooster destined for the pot would be a few years old. And that age is important! As the bird ages, the meat becomes tougher and laden with connective tissue — the home of collagen. It's this collagen and the gelatin from the bones that aids in the clarification of the beer. If you can find a stewing hen, you'll be much closer but still a little off. Stewing hen breeds are usually birds raised for egg laying, but when their productivity dips (after about 20 months), they consume more feed than their egg output warrants, and off they go, ready for the pot.

Digby's Cock-Ale, Modernized

(5.5 gallons/21 L, all-grain)

OG = 1.080 FG = 1.018
IBU = 42 SRM = 12 ABV = 8.3%

Sir Kenhelm Digby may have invented the modern wine bottle and been a strange enchanting figure of the English religious civil wars, but he didn't have the knowledge to fear raw chicken like we do

— so in his honor we present this beer.

Ingredients

14 lbs. (6.35 kg) Maris Otter pale ale malt
1 lb. (0.45 kg) Crisp brown malt
1 lb. (0.45 kg) Weyermann rauch malt
11 AAU Target pellet hops (60 mins.) (1 oz./28 g at 11% alpha acids)
5 lbs. (2.3 kg) bone-in chicken parts
2.5 lbs. (1.13 kg) raisins
6 oz. (170 g) dates
¼ nutmeg seed, grated
1 mace blade
1.5 L sweet Sherry
Wyeast 1275 (Thames Valley Ale) or White Labs WLP023 (Burton Ale) yeast
⅝ cup corn sugar (if priming)

Step by Step

This is a single infusion mash. Heat strike water to achieve a saccharification rest at 156 °F (69 °F) for 60 minutes. Total boil time is 60 minutes adding your hops as the wort comes to a boil. Chill the wort to fermentation temperature of about 68 °F (20 °C) and aerate. Pitch an appropriate amount of yeast. After primary fermentation, take the chicken and bring to a gentle boil for 2 hours to make a broth and make everything, including the bones, soft. Smash the chicken bones with a cleaver and throw the chicken into a food processor along with the raisins, dates, spice, and about 6 oz. (180 mL) Sherry. Do this in batches according to food processor size. Create a rough mince by pulsing the mix several times. Make it resemble a sticky ground beef. Add the mix and the rest of the wine to a bucket and rack the beer onto the mix. Age for a week before racking off and packaging.

Digby's Cock-Ale, Modernized

(5.5 gallons/21 L, partial mash)

OG = 1.080 FG = 1.018
IBU = 42 SRM = 12 ABV = 8.3%

Ingredients

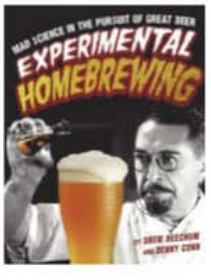
9.9 lbs. (4.5 kg) Maris Otter liquid malt extract
1 lb. (0.45 kg) Maris Otter pale ale malt

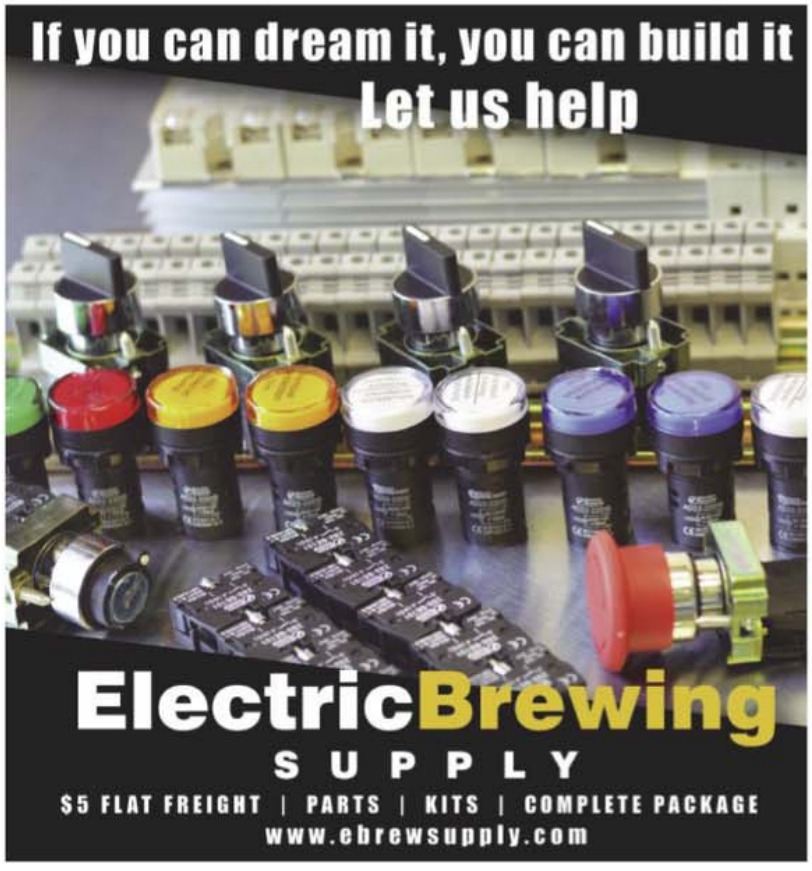
1 lb. (0.45 kg) Crisp brown malt
1 lb. (0.45 kg) Weyermann rauch malt
11 AAU Target pellet hops (60 mins.)
(1 oz./28 g at 11% alpha acids)
5 lbs. (2.3 kg) bone-in chicken parts
2.5 lbs. (1.13 kg) raisins
6 oz. (170 g) dates
¼ nutmeg seed, grated
1 mace blade
1.5 L sweet Sherry
Wyeast 1275 (Thames Valley Ale)
or White Labs WLP023
(Burton Ale) yeast
⅔ cup corn sugar (if priming)

Step by Step

Crush the malt and add it to 6 qts. (6 L) at 156 °F (69 °C). Hold the mash at this temperature for 60 minutes. Heat about 6 qts. (6 L) of water to 170 °F (77 °C) and wash the grains with the hot water when the 60 minutes is up. Add the liquid malt extract and top off to 6.5 gallons (25 L). Total boil time is 60 minutes adding your hops as the wort comes to a boil. Chill the wort to fermentation temperature of about 68 °F (20 °C) and aerate. Pitch an appropriate amount of yeast. After primary fermentation, take the chicken and bring to a gentle boil for 2 hours to make a broth and make everything, including the bones, soft. Smash the chicken bones with a cleaver and throw the chicken into a food processor along with the raisins, dates, spice, and about 6 oz. (180 mL) of Sherry. Do this in batches according to food processor size. Create a rough mince by pulsing the mix several times. Make it resemble a sticky ground beef. Add the mix and the rest of the wine to a bucket and rack the beer onto the mix. Let age for a week before racking off and packaging as usual. BYO

To learn even more more about experimental ingredients and brewing techniques, check out Drew Beechum and Denny Conn's new book, Experimental Brewing, *available now from major booksellers.*





Myrcene (β-myrcene) is the most abundant hop oil found in the lupulin gland of a hop cone. Due to its low flash point, dry hopping is an ideal way to retain its presence in your homebrew.

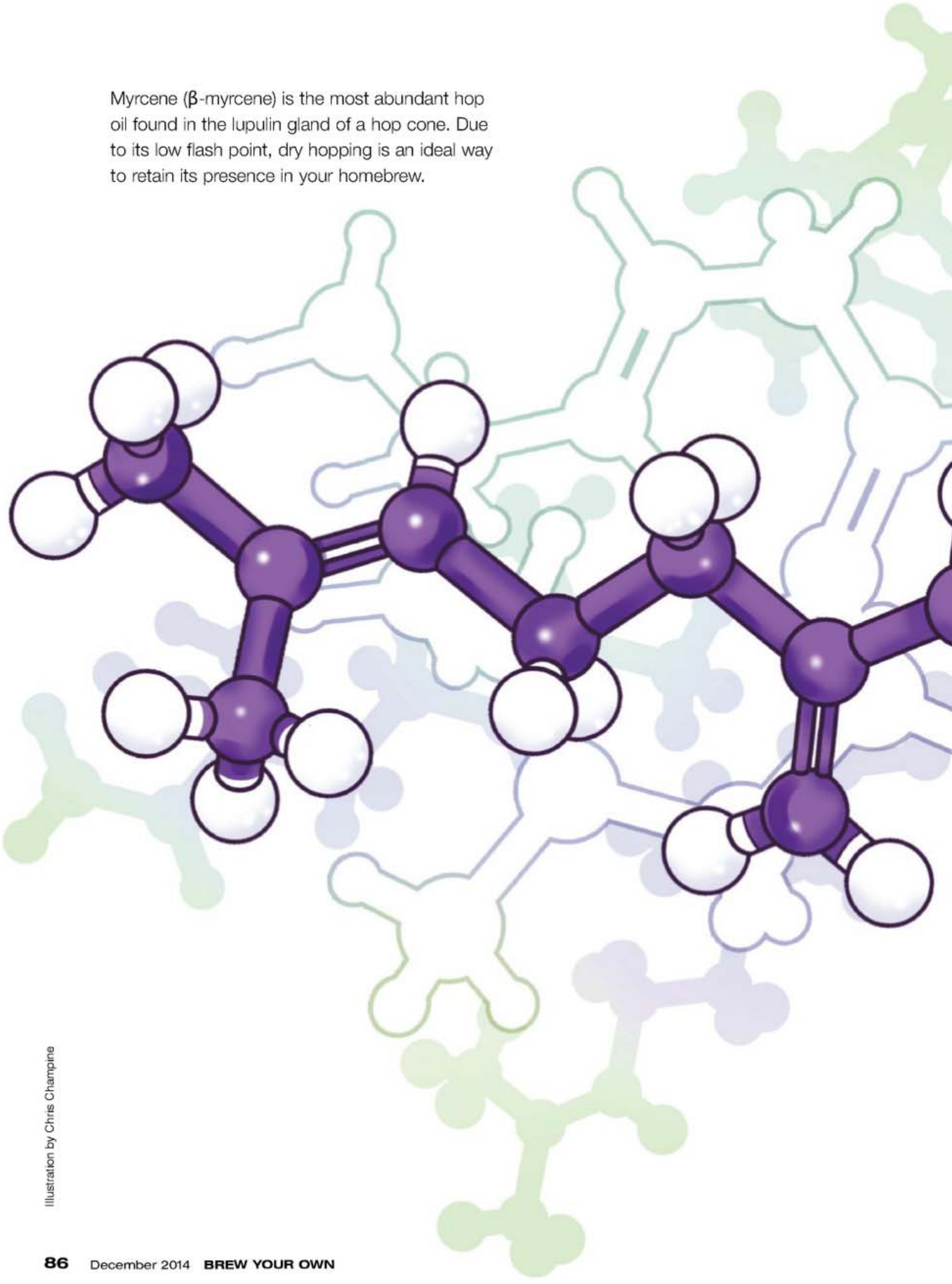
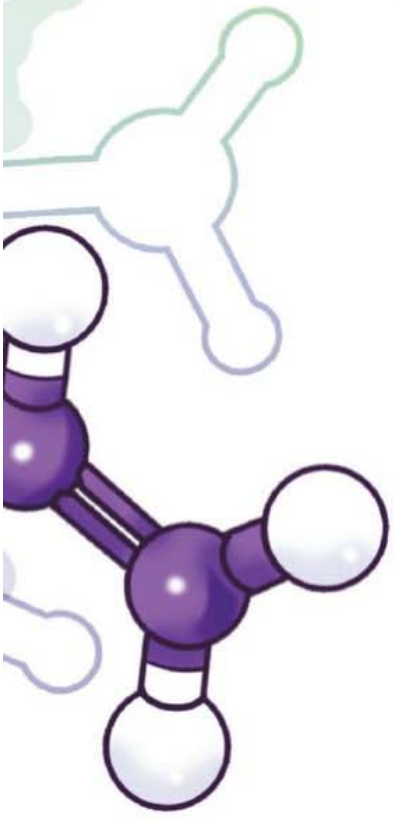


Illustration by Chris Champine

ADVANCED DRY HOPPING TECHNIQUES

going beyond alpha acids



by **Dave Green**

My favorite beer I've ever brewed was my first attempt at a Pliny the Elder clone. I used the recipe from the September 2004 issue of *Brew Your Own*. I remember thinking the author must have made a mistake in the recipe; it called for a whopping 6.75 oz. (191 g) of dry hops. Before that beer, I had never added more than 1.5 oz. (43 g) of dry hops. But against my wallet's better judgment, I brewed the recipe as it stood. The resulting beer was true hop heaven.

So what is it about that beer that is so striking? To anyone that has tasted or brewed a beer like Pliny the Elder, it's the hop oils that knock your olfactory senses sideways. Nowadays I constantly strive to make my hop-forward beers better, more interesting, more complex. Thanks in a large part to groundbreaking work by Thomas Shellhammer, Nor'Wester Endowed Professor of Fermentation Science at Oregon State University and his former student Peter Wolfe, who now resides as brewing scientist at Anheuser-Busch InBev, our understanding of the extraction process has advanced that much more. Using some advanced dry hopping techniques, we can use this science at home to achieve hop bliss. But first, let's go over essential oils and other hop components that can affect your beer.

Identifying the Players

Extracting hop oils and other aroma components from hop cones is the driving force behind dry hopping beers. The exact number of different hop oils found in the lupulin glands of hops has been found to be nearly 500 unique forms. Those hundreds of hop oils can be split into three major classification groups: Hydrocarbons, oxygenated hydrocarbons and sulfur containing compounds. The hydrocarbon group makes up well over half of the hop oils by weight in a hop cone, and most hopheads might know them as terpenes. Hop oils like myrecene, pinene, and humulene are just three examples of terpenes (hydrocarbons) that many folks versed in this subject would recognize. But don't let names fool you. For example, humulene has been shown to come in 17 distinguishable forms in a hop cone, each slightly different than the other (welcome to the wonderful world of organic chemistry).

Oxygenated hydrocarbons include the terpenoids. Terpenes and terpenoids have a very similar skeleton structure, but the terpenoids will include an oxygen group. Esters and alcohol groups fall into this category with familiar hop oils like linalool, geraniol and citronellol. This group will come into play later when discussing glycosides, so pay mind to this group.

Photo courtesy of Pfriem Family Brewers

The hop cannon at Pfriem Family Brewers in Hood River, Oregon, which shoots hop pellets into the fermenter using CO_2.

Finally there are the sulfur compounds such as thiols like 4mmP, a polarizing compound some beer drinkers liken to cat pee while others perceive as tropical fruit aromas. Many recent studies have shown that sulfur compounds may play a bigger role in the hop characteristics than thought previously, given the very low sensory threshold of many of these compounds. Even though they make up less than 1% of the hops oils, the ultimate weight they carry into the beer may be rather hefty.

Just outside of the hop oil world, but very relevant to this discussion, you'll find the glycosides. Glycosides are in fact a combination of a terpenoid (see earlier) with a sugar molecule (glucose). Peter Wolfe took the time to slowly explain how glycosides can play a prominent role in the aroma of beer. Glycosides are tied together with a "relatively" unstable bond (an ester bond) between the glucose group and the terpenoid. In beer, this ester bond can hydrolyze (break apart) and release the terpenoid and the glucose to the solution. So if you can hydrolyze the glycoside, you increase the terpenoids in solution.

I emphasized the word relatively in quotes in the last paragraph for a reason: To highlight the term. This bond break won't happen by itself; it needs a push. That can happen via two pathways. The first is a spontaneous reaction based on the pH of the solution. The lower the pH, the faster the spontaneous hydrolysis reaction can occur. This is convenient since beer pH is much lower than wort pH and this spontaneous reaction won't occur until pH is down near 4.4. The pH of beer is generally 4–4.2. The lower the pH, the faster this hydrolysis reaction occurs. The second pathway has been shown to occur thanks to yeast.

Hydrocarbons are generally the most volatile of the hop oils while their oxygenated cousins are less so. Glycosides are not volatile at all. Many brewers will look to the hop oil's flash point to gauge the volatility of the hop oil. The higher the flash point, generally the less volatile the hop oil. Hop oils can generally be diminished in your beer by three means. First is heat; the volatile oils can be vaporized more easily the warmer the solution. This most often occurs while the wort is still boiling or just after boil. Second is by scrubbing and most often occurs in the fermenter. Most brewers refer to the scrubbing process either when volatile oils are pushed out of the fermenter with any CO_2 escape or when oils stick to yeast membrane and are effectively dragged out of solution as the yeast flocculate (settle). Finally, hop oils can degrade by age or by oxygen. This occurs most often in the racking or bottling process and subsequent aging of the beer.

Now to put these concepts into play. To help with the details I interviewed seven brewers: Vinnie Cilurzo, Owner/Brewmaster at Russian River Brewing Co. in Santa Rosa, California; Matt Brynildson, Brewmaster at Firestone Walker Brewing Co. in Paso Robles, California; Jamil Zainasheff, Owner/Brewer at Heretic Brewing Co. in Fairfield, California: Ashton Lewis, Master Brewer at Springfield Brewing Co. in Springfield, Missouri; Josh Pfriem, Owner/Brewmaster at Pfriem Family Brewers in Hood River, Oregon; John Kimmich, Owner/Head Brewer at The Alchemist in Waterbury, Vermont; and Jack Hendler, Co-Owner/Head Brewer at Jack's Abby Brewing in Framingham, Massachusetts.

Know Thine Enemy – O_2

Every brewer and scientist I talked to had the same piece of advice to homebrewers: Focus on minimizing oxygen uptake post-fermentation. So let's talk about this one first since it is the first variable every brewer should worry about. John Kimmich has focused a lot of time and energy towards making sure that the dissolved oxygen (DO) of his beers is minimized. While it may not be the only reason his beer Heady Topper is ranked the #1 beer in the world by users on BeerAdvocate.com, it certainly helps. He recounted a story when a quality assurance person from his canning company came to test his beers one day. The tester needed to run back to his car since he thought his dissolved oxygen (DO) meter was broken. He had measured 1 part per billion (ppb) DO in The Alchemist's brite tank (a vessel that is somewhat akin to a homebrewer's bottling bucket). He had never seen numbers that low. While John's process may seem like a bit of sorcery, one thing that I do know is that John is adamantly opposed to filtering his beers. The yeast left in solution can act as a buffer against any oxygen uptake. This is one reason you may not want to filter your beers when brewing a hop-forward beer.

So how and when is oxygen going to be introduced into your beer after fermentation finishes? There are two principle ways so long as you are using proper brewing equipment and not aging for long periods of time. The first potential culprit for O_2 ingression is from racking. To help you solve the racking dilemma, homebrewers have four options: A bronze, silver, gold, and platinum option. The bronze option is for homebrewers who don't have CO_2 on hand. Rack as gently as possible and if possible, rack before the yeast has finished primary fermentation. This will allow a new blanket of CO_2 to develop after racking. The silver option is for brewers with access to CO_2 who can purge their receiving vessel with a shot of CO_2. One physical trait of CO_2 to keep is mind is that it is slightly

Dry Hop Recipe

The Hammer Rye IPL
(5 gallons/19 L, all-grain)

OG = 1.071 FG = 1.014
IBU = 66 SRM = 6 ABV = 8.3%

Inspired by Jack's Abby Brewing RIPL Effect, this was my attempt to brew something akin with a rye edge coming out from behind the bold hop profile. Jack's Abby used triticale, but I used a rye malt in my brew, and also used the hops I had on hand.

Ingredients

10 lbs. (4.54 kg) continental Pilsner malt
5 lbs. (2.27 kg) rye malt
8 oz. (0.23 kg) crystal malt (10 °L)
6 oz. (170 g) rice hulls
4.4 AAU Apollo hops (first wort hops)
(0.25 oz./7 g at 18% alpha acids)
9 AAU Apollo hops (15 min.)
(0.5 oz./14 g at 18% alpha acids)
9.6 AAU Columbus hops (0 min.)
(0.75 oz./21 g at 13% alpha acids)
9.2 AAU Chinook hops (0 min.)
(0.75 oz./21 g at 12.2% alpha acids)
4.8 AAU Cascade hops (0 min.)
(0.75 oz./21 g at 6.4% alpha acids)
7.1 AAU Amarillo® hops (0 min.)
(0.75 oz./21 g at 9.5% alpha acids)
1.5 oz. (43 g) Amarillo® hops (dry hop)
0.75 oz. (21 g) Chinook hops (dry hop)
0.75 oz. (21 g) Cascade hops (dry hop)
Wyeast 2007 (Pilsen Lager) or White Labs WLP840 (American Lager) yeast as a (~4 qt./4 L) starter
1 tsp. gypsum (optional if using low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

This is a single infusion mash. Heat 5.6 gallons (21.2 L) of strike water to 168 °F (76 °C) to stabilize the mash temperature at 152 °F (67 °C). Rest at this temperature for 45 minutes then begin lautering. Once you begin your run-off into your kettle add the first wort hops to the kettle. Collect 6.5 gallons (25 L) of wort, add the optional gypsum (see ingredients list) and boil for 75 minutes adding the second addition of hops with 15 minutes left in the boil.

After the boil is complete, begin a 20-minute whirlpool phase, keeping the wort hot. Rapidly chill wort to 52 °F (11 °C), pitch an appropriate yeast starter (~4 qt./4 L) and aerate the wort thoroughly. Ferment at 52 °F (11 °C). After primary fermentation is complete (1–2 weeks), drop the temperature of the beer down to 45 °F (7 °C) and condition for one to three weeks. After conditioning, gently rack the beer into a CO_2 flushed secondary vessel with flushed hops already in the vessel. Raise the temperature to 55–60 °F (13–16 °C) and wait three to seven days on the dry hops. Bottle the beer with priming sugar or rack the beer to a keg and force carbonate. Carbonate the beer to 2.4 volumes CO_2.

The Hammer Rye IPL
(5 gallons/19 L, extract only)

OG = 1.071 FG = 1.014
IBU = 66 SRM = 8 ABV = 8.3%

Ingredients

10 lbs. (4.54 kg) rye liquid malt extract
4.4 AAU Apollo hops (first wort hops)
(0.25 oz./7 g at 18% alpha acids)
9 AAU Apollo hops (15 min.)
(0.5 oz./14 g at 18% alpha acids)
9.6 AAU Columbus hops (0 min.)
(0.75 oz./21 g at 13% alpha acids)
9.2 AAU Chinook hops (0 min.)
(0.75 oz./21 g at 12.2% alpha acids)
4.8 AAU Cascade hops (0 min.)
(0.75 oz./21 g at 6.4% alpha acids)
7.1 AAU Amarillo® hops (0 min.)
(0.75 oz./21 g at 9.5% alpha acids)
1.5 oz. (43 g) Amarillo® hops (dry hop)
0.75 oz. (21 g) Chinook hops (dry hop)
0.75 oz. (21 g) Cascade hops (dry hop)
Wyeast 2007 (Pilsen Lager) or White Labs WLP840 (American Lager) yeast
1 tsp. gypsum (optional if using low mineral water)
⅔ cup corn sugar (if priming)

Step by Step

I've used the Briess rye liquid malt extract which is made up of about 20% rye malt and 10% caramel malt (40 °L). This will give the beer a slightly less rye edge and a slightly more caramel flavor than the all-grain version. That said, it will still produce an amazing beer.

Add 5.5 gallons (21 L) of water plus malt extract to your kettle. When the temperature of the kettle reaches about 180 °F (82 °C), add the first wort hops to the kettle. Collect 6.5 gallons (25 L) of wort, add the optional gypsum (see ingredients list) and boil for 75 minutes adding the second addition of hops with 15 minutes left in the boil.

After the boil is complete, begin a 20-minute whirlpool phase, keeping the wort hot. Rapidly chill wort to 52 °F (11 °C), pitch an appropriate yeast starter (~4 qt./4 L) and aerate the wort thoroughly. Ferment at 52 °F (11 °C). After primary fermentation is complete (1–2 weeks), drop the temperature of the beer down to 45 °F (7 °C) and condition for one to three weeks. After conditioning, gently rack the beer into a CO_2 flushed secondary vessel with flushed hops already in the vessel. Raise the temperature to 55–60 °F (13–16 °C) and wait three to seven days on the dry hops. Bottle the beer with priming sugar or rack the beer to a keg and force carbonate. Carbonate the beer to 2.4 volumes CO_2.

Web extra:

Check out a second hop-heavy recipe — for Dave's Astronomical American Pale Ale on the Web. A BYO.com-only exclusive: http://byo.com/story3166

Photo courtesy of Taft Canyon Brewers http://taftcanyonbrewers.com

Adding dry hops to an active fermentation can sometimes result in a dreaded "beer volcano" where the beer blows out of the fermenter. This situation can cause a significant loss of beer.

heavier than air (N_2 and O_2) so it will settle on the bottom and help create a blanket as long as there isn't too much agitation. So you may not need to purge all oxygen, just enough to create a healthy blanket. Ashton Lewis isn't as convinced, saying that, "Small differences in temperature create convective currents that mix gases. It may be true that there may be a greater concentration of carbon dioxide at the bottom of the vessel, but there is still more than enough oxygen in most cases of simple blanketing to oxidize beer." So finally we get to the gold and platinum options, which keeps the system closed and basically impossible for oxygen to get introduced to the beer (see the sidebar on page 93 for details on closed system racking).

The second potential culprit is from any post-fermentation additions such as dry hops or coffee or cocoa nibs or anything else that brewers may add to their beer. Pro brewers have created some highly inventive devices to deliver their dry hops to their fermenters in an oxygen free system. You may have heard of a hop cannon or Sierra Nevada's hop torpedo, which are two such devices. Hop cannons will shoot the pellets into the fermenter via CO_2 (see photo, page 88). The hop torpedo is an inline recirculation system that passes the finished beer through the dry hops before returning the beer back to the fermenter. Peter Wolfe and Thomas Shellhammer both agreed that these devices were overkill on the homebrew scale. Homebrewers can get away with eliminating most oxygen from the dry hop process for less. Thomas Shellhammer's advice, especially with whole cone hops is, ". . .to ensure the hops are free of residual oxygen before adding to the beer. Do this by vacuum packing them first; better yet, vacuum pack then gas flush them with nitrogen or carbon dioxide. Another approach is to submerge the hops in cold sterile water, then transfer the whole lot to the beer." Ashton Lewis adds that working with de-aerated water is a huge benefit if you can get it. Boiling the water will help de-aerate but won't remove all residual O_2. Peter Wolfe's suggested approach is slightly different. "I like to rack my beer onto the dry hops when there are still a few gravity points left to go until terminal gravity is reached," he said. The active yeast will help absorb some of the oxygen uptake that has occurred during transfer. And finally for those homebrewers who try to emulate the recirculation methods utilized by pro-brewers, Vinnie Cilurzo adds that you have to make sure you are not introducing any oxygen into the system. If you can have your beer read 1 ppb DO after racking and adding dry hops, you've mastered this enemy.

Choosing Your Weapon

The age old discussion is, "Which is better for dry hopping in your hop forward beers, pellets or whole hops?" No matter which you choose, the most important aspect is that you are choosing aromatic hops that are pleasing to your olfactory senses. To put it simply, "The hops need to smell awesome in order to make awesome beer," says Matt Brynildson. Vinnie Cilurzo's advice is to, "Watch out for hops that have onion/garlic character. You will never be able to get rid of this from the hop." Some brewers prefer whole hops and some prefer pellets. That said, tests run by Peter Wolfe and Thomas Shellhammer point to pellets holding a slight edge over the unprocessed form. What they found is that pellets actually contain less essential oils than whole cone hops most likely due to the pelletizing process. But oils from pellets are more easily extracted into beer during dry hopping leading to slightly more aroma than whole cone hops. Also the oils in pellets were extracted faster than whole cones. Pellets have better storage life and are easy to work with for dry hopping since they submerse themselves, break apart, and fall to the bottom so you can easily rack your beer off of them. A downside can be that some pellet producers have been known to expose the hops to high temperatures during the pelletizing process, destroying the hop's precious oils. Most pelletizers for the craft beer world have learned of this potential pitfall and have made adjustments to the process in order to keep pelletizing temperatures as low as possible.

If you are going to be using whole cone hops, you need to deal with two

potential factors that could hurt the beer. First is to make sure that if O_2 is found in the cones, that you flush them with CO_2, nitrogen (N_2), or sterile water before adding the beer (see Thomas Shellhammer's earlier advice). Racking the beer on top of the flushed hops is then the preferred method once you have them flushed. The second factor is that whole cones float and you need a way to submerse them without adding oxygen. A sanitized bag that is weighted down with sanitized stainless washers or marbles can be used to make sure that the hops remain submerged. Whole cone hops could also be added before primary fermentation is finished and then gently pushed down with a sanitized paddle to completely submerse them.

Despite what research shows, it is all about what works best for your system. Some homebrewers prefer to work with whole hops while others prefer to work with pellets. Both can produce award-winning beers.

Timing is Everything

For a few years I have always tried to eliminate as much yeast as possible from suspension before adding my dry hops. That concept was introduced to me from a sound bite given by Vinnie Cilurzo. The reason was simple as stated earlier in this article: Yeast can strip hop oils from solution. So I would either rack my beer to secondary before adding dry hops or added dry hops only after adding a fining agent like Polyclar or Biofine. I have always been happy with the results, but when I started polling homebrewers a little while ago, there was a lot of attention paid to adding dry hops while yeast was still active. The term biotransformation of hop oils kept coming up.

In my discussions with pro brewers, two of the seven brewers add their dry hops while yeast was still active. On the one side of the coin, Josh Pfriem states that, ". . .the constant nucleation from fermentation scrubs away some of the hop aromas that you are trying to achieve." Matt Brynildson, on the other hand, adds his hops during fermentation, and the hardware garnered for his hop-forward beers should make any brewer re-think their approach. Matt has three reasons for his method: "This is to take advantage of the active yeast for (1) dissolved oxygen protection (2) natural mixing which we believe helps in better extraction of wanted oils and (3) biotransformation of hop oil compounds." But he also warns of the potential pitfall of adding dry hops to an active fermentation. "The dreaded 'beer volcano' can happen easily resulting in beer loss . . ." (see a hop volcano photo on page 90).

So what are biotransformations anyway? Once again I turned to Peter Wolfe to help dissect this term. He explained that when we talk about biotransformations on hop compounds we are talking about oil components that yeast have modified. An important aspect is that we are talking main-

ly about terpenoids and glycosides. Terpenes are rarely affected by biotransformations. Biotransformations of hop compounds in beer can occur in two forms. The first is fairly straightforward when one compound is transformed into another. An example of this would be the transformation of geraniol to ß-citronellol. The second biotransformation is the hydrolysis of the glycosides which was introduced earlier. Certain yeast strains have shown the ability to transform non-aromatic glycosides into aromatic terpenoids. Shellhammer and Wolfe found that certain aromatic terpenoids increased their concentration over time in the presence of yeast. This may be just one reason many people find bottle conditioned or unfiltered beer to be superior to filtered beer.

Create the Perfect Environment

So for how long, at what temperature and how much to dry hop your beer? Before I started research into this article, my idea to get ideal hop oil extraction was to dry hop for 10 days at 65 °F (18 °C). It had always treated me well. I received a lot of hop aroma when appropriate levels of hops were added. But in a polling of homebrewers, I realized that my 10-day duration was on the high end of the scale. Many homebrewers were going as short as three days. Of all the brewers I talked to, only Vinnie Cilurzo went more than five days with his dry hops. Research by Wolfe and Shellhammer confirm that hop extraction occurs rapidly. In fact in a recirculating system they found that most aroma compounds are extracted from pellet hops in a matter of hours. For pelletized dry hops added without recirculation, they found that full extraction occurred in one to two days while whole hops took closer to a week for full extraction.

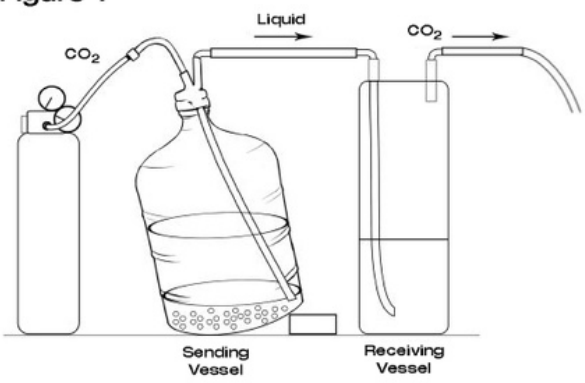
The next variable to look at is temperature. Considering the rise of the IPL (India Pale Lager), the temperature of the beer and its effect on the oil extraction is something to keep in mind. So my first turn in this department was to Jack's Abby Brewing Brewmaster Jack Hendler whose

Closed System Racking

Closed system racking is the Holy Grail for meticulous brewers. Peter Wolfe highly recommends homebrewers try to create a closed racking system, especially for hop-forward beers. The two closed system racking options are most easily done with either a conical fermenter or carboys with a racking cane fixed into a hood cap, but it could also be rigged up with modifications to a bucket lid. There are two objectives to overcome to close your system off. The first goal is to purge the receiving vessel with carbon dioxide (or other inert gas). The second is to make sure you are adding CO_2 into the top of the sending vessel.

The method I have traditionally employed is what I would call the gold method. First I slowly purge the receiving vessel (such as a Corny keg) with CO_2 for about 1 minute on very low pressure (1–2 PSI). Once the receiving vessel is purged, now it is time to rack. Using the carboy hood cap with a racking cane, I push CO_2 into the sending carboy, forcing the beer out of the carboy and into the purged receiving vessel (see Figure 1, below).

Figure 1



Ashton Lewis, of Springfield Brewing Company (and *BYO*'s Technical Editor) introduced a platinum method to me. The first step in this method is to completely fill the receiving vessel with liquid such as a dilute iodophor or Star San solution. The second step is to push all the liquid out of the vessel with CO_2 (see Figure 2, right top). Ashton adds that, "This can be done in a carboy without adding any real pressure if the water is siphoned out of the carboy and displaced by very low pressure gas. We use this method at Springfield Brewing Company because purging was not working for us and we switched to water flooding about 10 years ago. It also uses less gas, but adds time to the schedule." Using Ashton's advice, I quickly learned that this method worked incredibly comfortably and efficiently when performed on my own system. I push the dilute sanitizing solution from one keg or carboy to another using my CO_2. Now I have a receiving vessel

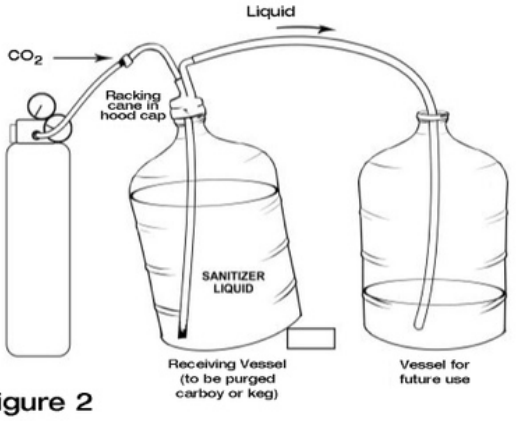
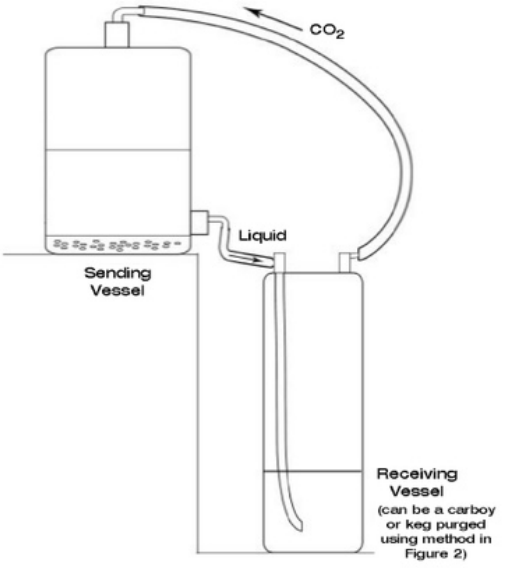


Figure 2

with 100% CO_2. Using my fermenter with a spigot at the bottom I can gravity feed the beer from the fermenter to the keg or carboy, displacing the CO_2 back from the receiving vessel back into the fermenter, making sure that no oxygen can enter the system (see Figure 3, below). If for some reason you don't have the luxury of gravity, pushing via your CO_2 regulator works just as well. Just be sure to start very slow and low with CO_2 if doing this, as you can over pressurize the system very easily. Carboy caps and bucket lids were not meant to withstand pressure. Start with your regulator turned all the way to 0 and very slowly dial up the pressure. 2 psi is more than enough pressure to apply.

Figure 3



lagers have made waves in the US craft beer scene. Surprising to me, the average time Jack dry hops is only three to four days. He does increase his temperature to 55 °F (13 °C) for adding hops, but adds that, "The cooler the temp, the less aroma you'll pull from the hops." If you do plan to try an IPL of your own, Jack has some further dry hopping suggestions. "You'll need to reevaluate dry hop addition quantities, because the dry hop aroma will be highlighted more than an ale. You may find a different or smaller quantity gets the aroma you're looking for," he said.

So how much dry hops should you add? Obviously that is completely dependent on what you are trying to achieve with your beer. But keep in mind that sometimes, more isn't always better. In my freshman year microeconomics course I learned about a basic principle, the law of diminishing returns. In the terms of dry hopping, the more you add, the less net gain you add with each additional increment. In fact you may find that you are detracting from a certain nuanced characteristic of the beer if you overwhelm it with another characteristic. Finding the right balance of hop oils of a varietal or a blend is key. If you've had Heady Topper before, you may be surprised to learn that John Kimmich dry hops with under 4 oz. (113 g) per 5 gallons (19 L).

Is Layering the Key?

Only two of the seven pro brewers I spoke to didn't add their dry hops in stages. One that was surprising was John Kimmich who adds all his dry hops in one big charge for his Imperial IPA. Jamil Zainasheff pointed out an important nuance to me: "The main reason is that we're dry hopping into cylindroconical fermenters. The bottom is a narrow cone, which means that when the hops drop to the bottom, it results in a smaller surface area." He said not to worry about layering in dry hops on a small scale. Peter Wolfe also weighed in on the topic saying especially if a homebrewer is using a flat bottomed fermenter, there is little reason to layer in your hops, the surface area to volume ratio is much greater on a homebrew scale.

There is one reason that homebrewers may want to layer in their dry hops. As stated earlier, Matt Brynildson adds dry hops while active fermentation is still ongoing. For some of his beers, he will add a first dry hop charge near the termination of active fermentation and a second addition after flocculation has occurred. He backs up his approach with the concept to, "Take advantage of both conditions (1) with yeast and (2) without yeast influence." So if you plan to add your first dry hop charge near the end of active fermentation, you may also want to take advantage of this two layered dry hop approach. Otherwise, if you are planning on waiting until most yeast has settled from the beer, then one stage dry hops are all you need.

Specialty Malts

Add color, flavor to your brews

by Terry Foster

In previous issues I have dealt with base malts (May-June 2013), crystal/caramel malts (November 2013), and black malt (December 2013), so now it's the turn for specialty malts. But what do I mean by that term? In fact it is a bit of a vague term, and the best I can do is to say that specialty malts are those malts added in small amounts with the intention of achieving a special effect, such as coloring the beer or giving it a special flavor. As such, their contribution to extract yield is not overly important as compared to base malts. In that sense you can argue that crystal and black malts fit this definition, but we've been there, got the commemorative glass, so I will only talk about other specialty malts here.

Most of those I shall cover are either toasted or roasted, and several are quite distinct products and come in only one form, such as amber, brown, Victory®, Special B, and Belgian Biscuit. Chocolate malts on the other hand come in a variety of forms, varying in levels of roasting and color. Many specialty malts simply require steeping to pull out whatever goodies they have, so they are well suited to extract brewing, although some such as amber and brown may require you to do a partial mash. Their importance lies in the fact that their variety, when combined with the range of base malts available, permits you to produce beers with a huge range of flavors, colors and aromas. The possibilities are endless, a point not understood by most wine critics who think that it is their beverage that has the greatest variety of flavors, usually because they are ignorant enough to think there is only one style of beer!

Biscuit malts

Let's start with biscuit malts. There are three that I am conversant, Briess Victory® Malt, at 28 °L, Belgian Biscuit Malt (20 °L) and Briess Special Roast (50 °L). All of them yield a starting gravity (SG) of 1.022–1.024/lb./gallon (5.6–6.1 °P) at 65% brewhouse efficiency and add biscuit or bready notes to the beer, as well as some brown color. Special Roast is of course more highly flavored and colored than the other two, and is said to give almost a sourdough flavor so it needs to be used with care in paler and more delicate beers. However these malts can be used to your advantage in almost all beer styles, except pale ales and pale lagers. I particularly like to use Victory® malt in an IPA while Special Roast goes well in a robust porter or oatmeal stout. You can add them at the rate of up to 15% of the grist, though I generally prefer 5-10%, depending what other specialty malts are in the recipe in question. In fact, I have used as much as 20% of Victory® malt in an IPA where it is the only specialty malt, and I have been pleased with the results. For extract brewing, these malts are relatively starchy and perform best when mashed with a pale (enzymatic) malt.

> "Many specialty malts simply require steeping to pull out whatever goodies they have, so they are well suited to extract brewing . . . "

Melanoidin malt

Melanoidin malt is a German product and has some similarity to higher dried Munich malts, but is definitely more aromatic and provides a malty fullness in the beer. It has a moderate color at 23–31 °L, but with somewhat of a reddish hue. It will yield 1.024–1.025 SG/lb./gallon (5.8–6.3 °P) at 65% efficiency. It is a malt that is really designed for use in lagers, so that they mimic those produced by decoction mashing. That means that it can be used in most other beer styles where you are looking for a little more body

and fullness without adding caramel or roasted flavors such as English bitter, brown ales, amber ales and so on. I also think it helps to soften the roasted aspects of the various forms of stouts. It can be added at rates up to 20% of the grist, but I prefer to limit it to about 10%, especially where significant amounts of other specialty malts are used. Using it in an extract brew would require a partial mash with pale malt to be carried out.

Special B malt

Next is Special B malt, a Belgian product that is really a type of crystal malt, but the production process is such that it has a very different flavor from other crystal malts. Special B has been roasted 130–150 °L and has a strong caramel and raisin flavor, but without the roasty notes that may be conferred by crystal malts of a similar color.

Special B gives a relatively low extract yield of 1.020 SG/lb./gallon (5.1 °P) at 65% efficiency. It is quite versatile and can be used to your advantage in many beer styles, particularly mild, brown and amber ales, English bitter, porters and stouts. It confers a nice warm red hue in all styles except the darker stouts. I like to use it in East Coast IPAs, which tend to be more malty and balanced than their dry, highly-hopped West Coast cousins. It can easily be overdone, for it has a strong enough presence to unbalance the lighter beers and I would limit its use to no more than 5% of the total grist. It requires only steeping for use in extract beers.

Amber malt

Amber malt is drum-dried malt, but is subjected to a temperature only somewhat slightly higher than would be the case for pale malt. It is modest in color at 20–30 °L, and will give an extract yield of 1.022–1.023 SG/lb./gallon (5.6–5.8 °P). Amber malt imparts little in the way of sweetness, but does add some body and a biscuity, nutty flavor to beer.

In its original form it was a classic porter ingredient in the late 18th and early 19th centuries, when many porter grist formulations consisted of equal parts pale, amber, and brown malts. Modern amber may well be different in flavor to the earlier type, but can still add complexity, especially in mild, brown and amber ales, and porters, although its flavor tends to be drowned in hoppy beers. Adding it at the rate of 10-15% of the grist in a mash is usually the best way to go and works especially well for a brown porter. Amber malt does contain some starch and must be used in a partial mash along with pale malt if you want to use it in an extract brew. You may want to use it in only small amounts along with the more flavorful brown or biscuit malts.

Brown malt

In historical terms, brown malt is the porter malt, for it was

quoted as being the sole malt used on brewing porters. It was prepared by drying the green malt very quickly in such a manner that the grain would "pop" as the internal moisture boiled. Modern brown malt is different in that it is drum-dried rather than kilned, and is taken to a higher temperature than amber malt, making it darker in color (50–70 °L), with an extract potential of around 1.022 SG/lb./gallon (5.6 °P) for 65% efficiency. Until recently it was only an English product but Briess now offers their Carabrown® Malt WK, which they quote as being on the light side of the brown malt style at 55 °L.

Brown malt will add sweetness, some biscuity character, some toasted notes, caramel, toffee, and particularly licorice flavors. It contains some starch and can only be used when mashed along with pale malt. I think 20% of the grist would be a good top limit for most beers, but 10-15% would be sufficient in the case of lower gravity beers. Quite obviously it works very well in porters and in all forms of stout, but at lower addition rates it also adds something to mild, brown and old ales. In such cases it will give even better results when used with an equivalent amount of amber malt. I haven't tried it, but a touch of brown malt might also work well in dark lagers, and even in black IPAs. It will be obvious from the above that you will need to do a partial mash with this malt and some pale malt, along with any other specialty malts you wish to use, in your extract beers.

Chocolate malt

Chocolate malt is an old favorite, which we all know as a high-roast product coming in at the far end of the spectrum just before the ultimate roasted product black malt. Yet it is not just one product, for the "degree of roast" and the color of chocolate malt covers quite a range and varies from one manufacturer to another. See Table 1 on page 98 for a list of products from some well-known manufacturers.

In general, chocolate malt confers chocolate, nutty and light roasted flavors to beer. But the point I want to make from Table 1 is that the higher the color, the more highly the malt has been roasted and the stronger the flavor effect will be, for a given rate of addition. Indeed, at the very top of the color spectrum this malt comes close to the color of black malt, so the flavor can be expected to be somewhat harsh, with less cocoa-type, or nutty flavors. Note that Weyermann also has their Carafa® Special I, II, and III that are made from de-husked barley, so that for a given color level they will give a somewhat smoother flavor than other chocolate malts. Chocolate malts give an extract yield at 65% efficiency of 1.022 SG/lb./gallon (5.6 °P) and can be leached out by steeping in hot water, so chocolate malt is ideal for use in extract brewing. Just for the record, Weyermann goes even further and makes chocolate wheat malt (300–450 °L), and chocolate rye malt (188–300 °L), although I haven't yet seen these in any of my homebrew-

Table 1: Available Chocolate Malts		
Manufacturer	Designation	Color °L
Fawcett	Pale Chocolate	180-250
Franco-Belges	Chocolate	300-375
Weyermann	CARAFA® I	300-375
Dingemans	Chocolate	300-380
Thomas Fawcett	Chocolate	325-400
Muntons	Chocolate	340-320
Crisp	Chocolate	340-420
Briess	Chocolate	350
Simpson	Chocolate	375-450
Weyermann	CARAFA® II	413-450
Pauls	Chocolate	415-490
Briess	Dark Chocolate	420
Baird	Chocolate	450-500
Weyermann	CARAFA® III	480-563

ing supplier's catalogues.

Preeminent in porters and stouts, chocolate malts are usually used at the rate of 5-10% of the grist, depending on the style. But at somewhat lower rates they add something to a whole range of other beers from brown, mild, amber, and old ales to even English bitter in small amounts. The very pale types can also be used in dark lagers, especially doppelbock, but the de-husked varieties are even more fitted for this purpose, and indeed are good in any brew where you want chocolate flavor without roastiness.

Summing up

There are other specialty malts out there, such as oat malt, rye malt, peated and smoked malts that I have excluded, partly due to lack of space, but also because their use is limited to only a few beer styles. The malts I have dealt with have applications in a wide range of styles, and should be considered whenever you start to work out a new recipe, or want to get something extra out of an old recipe. I have dealt with them separately, but they are more commonly used in combination with one another, which means that the permutations of flavors you can achieve with these malts makes it easy to brew distinctive beers. When formulating a recipe, think carefully as to what you want to achieve, then run down the list of these malts and see if any fit what you are looking for. BYO

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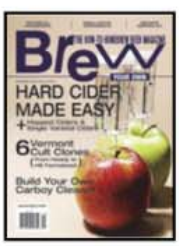

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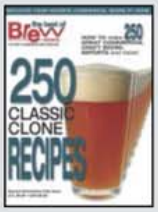

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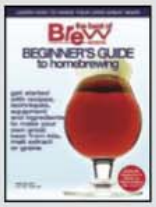

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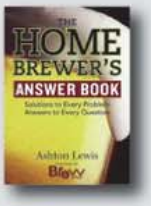

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projects

by Matt Bryenton

Gauge Mash Temps

Build a recessed mash tun thermometer

Most homebrewers who are all-grain brewing start out like I did by making their own equipment. Sometimes this is out of necessity, but if you are anything like me you do it for the satisfaction of making things yourself. Like most people who transition into all-grain brewing, I immediately needed a new piece of equipment to get started: A mash tun. The most common option for homebrewers is to convert an insulated picnic or sports drink cooler, which is what I did.

For the first few batches I used a handheld thermometer to monitor my mash temperatures. This worked fine but I soon realized there were several things I didn't like about it. The first is that handheld thermometers are notorious for not being the most accurate or consistent, unless you shell out big bucks for a National Institute of Standards and Technology (NIST) traceable calibrated thermometer. The second is that I didn't like opening and closing my mash tun, letting out that precious heat every time I wanted to check the mash temperature. So I decided I needed to come up with something different.

> "This would allow me to monitor the temperature of the mash without having to remove the lid."

After doing some research, I decided the solution would be to install a permanent thermometer on my tun. This would allow me to monitor the temperature of the mash without having to remove the lid. The thermometer I chose is the same as the one you would install on a boil kettle as these are accurate, reasonably priced and very durable. I purchased the 6-inch (15-cm) probe version to get deep into the mash for a good representation of the temperature, although a 3-inch (7 cm) would work fine. I recommend checking for clearance inside the tun if you use a false bottom to help you decide. I tested my thermometer by checking it in boiling water (212 °F/100 °C) and comparing it at various temperatures against the one I have on my boil kettle. I was actually surprised at how consistent these were relative to each other; each temperature check gave the same reading on both thermometers, which is exactly what I was looking for.

Since these thermometers do not have long enough attachment threads to go through cooler style mash tun walls, it would have to be recessed into the insulated wall of my tun. This was actually preferable for me. I have never been a big fan of how these thermometers stick out from my kettles and I am always paranoid that I am going to catch the thermometer on something and break it. This would also provide a nice clean looking installation. This column is based on my 10-gallon (38-L) cylindrical water cooler mash tun but it could also be applied to other cooler styles.

Materials and Tools:

Mash Tun
3-inch (7-cm) round face thermometer with a 3- or 6-inch (7- or 15-cm) probe
(2) ⅞-inch ID stainless steel washers
(2) silicone O-rings
½-inch NPT stainless steel nut
2-foot (0.6 m) level
Pencil/marker
Drill
⅞-inch spade drill bit
120 grit sandpaper
Utility knife
Blowtorch
Wrench/pliers

1. MARK YOUR THERMOMETER LOCATION

First, decide where to put your thermometer and mark the center spot. I wanted about 6 inches (15 cm) between my drain valve and the thermometer, which would position the probe around the top of the grain bed of a typical 5-gallon (19-L) mash (~10 lbs./4.5 kg of grain). I recommend standing your mash tun up and using a level to center your mark above the valve. Having it lined up with the drain valve doesn't matter for functionality but will be a little more aesthetically pleasing if it is. Once you have the level in the right spot, draw a small vertical line with the pencil roughly where you want the thermometer. Make sure you use a pencil so you can erase any marks that may remain after the installation. Next I measured up 7.5 inches from the top of my drain valve and marked it on the pencil line I just drew. This will be the center of my thermometer and give me the 6 inches (15 cm) I wanted between the top of the valve and the bottom of the thermometer.

2. DRILL THE PROBE HOLE

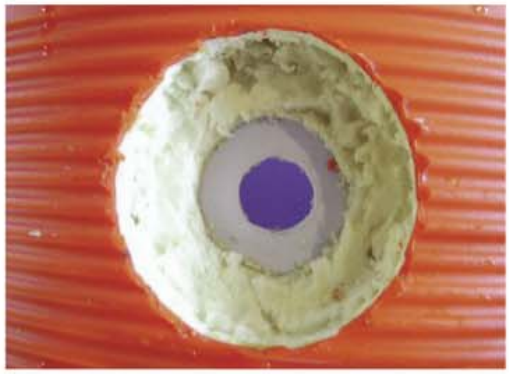
My grandfather was a wood craftsman and he was very fond of saying "measure twice and cut once" so I would recommend double checking your placement to make sure you are happy with it before drilling. With the ⅛-inch spade bit, drill a hole through the cooler walls for the probe to go through. It is very important to go slowly using very little force, you don't want to push too hard or you will punch through the inside and crack the plastic around the hole. It is helpful and recommended to use a nice sharp (or brand new) drill bit. Once you have the hole cut, clean up the inside edges so they are nice and smooth with the utility knife and/or sand paper (if necessary). Next, drop the probe of the thermometer through the hole and trace around the face with the pencil on the outside of the tun. You want the thermometer face to have a nice tight fit with the plastic of the cooler so make sure to stay in close to it as you trace it.

3. CUTTING THE OUTER PLASTIC

Next I needed a way to get through the outer plastic shell of the cooler. I wanted a nice clean cut but didn't have a Dremel tool or a big enough hole saw (either of which you could use if you have them), so I improvised by using a blowtorch and a utility knife blade. I heated the blade of the utility knife and used it to make a nice clean cut by melting through the outer layer of plastic. The blade cools off fairly quickly so take your time and heat the blade back up each time it cools down. This step is more melting than cutting so keeping your blade hot is key. Use caution not to burn yourself and do this in a well-ventilated area being especially careful that you do not breathe in any melting plastic fumes! You don't need to go deep either; you just want to get through the outer (orange) plastic layer. Once you have cut all the way around the outer plastic, remove the cutout and carefully cut away any melted bits that are sticking up at the edges using the utility knife.

4. REMOVING THE EXCESS INSULATION

Since I needed to recess this thermometer and there is a lot of foam insulation in the body of these coolers, I needed to remove some of that insulation to make room for the thermometer face. I used the utility knife to remove about half of the insulation behind the orange plastic cutout. You don't want to go too deep — leave enough insulation behind to cushion and stabilize the thermometer face so that it doesn't flex around, which could cause cracking of the plastic wall inside the mash tun. I found going back and forth between dry fitting the thermometer and removing material ensured the thermometer ended up just a little past the plastic outer layer. You can always go back and remove more later if you need to. The remaining insulation will compress behind the thermometer as you do the final tightening, making a nice secure fit. Clear a little more space for the washer that will keep the thermometer from pulling through the plastic side of the tun while tightening it up. I wanted the washer to be flush against the inner plastic wall of the mash tun so that it would offer maximum stability.



5. INSTALLING THE THERMOMETER

To install the thermometer you need to add the first ½-inch washer onto the thermometer threads followed by the first silicone O-ring. Install the thermometer into the hole in your mash tun with the O-ring pressing up against the inner plastic wall of the mash tun. Inside the tun, add the second silicone O-ring to the threads of the thermometer then the second ½-inch washer. Adding the nut and tightening it up can potentially be tricky for a couple of reasons. The first is that I have found the thickness of O-rings to be significantly different depending on the supplier. For my installation, the O-rings I had purchased were really thick when compared to some that I had used in the past. I had to use the palm of my hand to hold the face of the thermometer tight to the tun while I pushed and started the nut on the threads inside of the tun. If you have the thinner style O-rings this won't be an issue.

6. FINISHING UP AND LEAK TESTING

Tightening up the nut can also be tricky since you can't use a wrench to hold the thermometer from moving while tightening it. Once again I used my palm to push against the face of the thermometer, trying to mainly put pressure on the metal edges instead of the glass. Wearing a latex or nitrile glove will help increase your grip. You want to be really, really careful that you don't push too hard on the glass on the thermometer; you don't want it to break! Next you want to do a leak test by filling the tun up with water. Mine had a slight leak on the first try but it only took a little additional adjusting of the nut to get it tight enough so that it didn't leak. I would recommend leaving the water in the tun for an hour to simulate the time of a mash to make sure there are no leaks. This thermometer has now been installed on my mash tun leak free for over a year now and I love having it on there. Cheers!

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last call
by Marco Anelli

Beer . . . At School?

Homebrewing as a "learning experience"

It started as a joke. In June 2013, at the end of school party at Istituto Maria Immacolata (an Italian Catholic school in Gorgonzola, near Milan, Italy) I said to a teacher, "I see that here beer is sold to kids over 18 (the legal drinking age), why don't you make some as a science project for next year's party?"

I had been bitten years ago by the homebrewing bug, but I was certainly surprised when, a few days later, I was attending a meeting to evaluate the feasibility of that very idea. A brief discussion confirmed that there are several topics, taught in the fourth year of high school, that could tie in with beer: Science, biology, physics, economy, marketing, medicine and history, just to name a few.

The principal too was in favor of the initiative and at the beginning of the following year the project, christened "Beer: From biochemistry to responsible consumption," was officially included in the teaching program and I was drafted to help teach it.

The kids were divided into four groups and, in the month of January, sat through two lectures on how beer is made, its main ingredients, the different styles, the equipment needed, etc. After that, each group was left to decide which style of beer they wanted to brew.

Getting the beer ready by a given date (the end of school party) was first of all an exercise in project management. All activities had to be planned, taking into account constraints such as the time for fermentation and maturation, the need to obtain supplies and equipment and the availability of the lab. Budget had to be considered too.

Two groups decided to play it safe and went for an extract-based Australian pale ale and a wheat with cane sugar. The others were more willing to take chances and opted for an orange flavored weiss and a tropical fruit Pilsner.

The planning phase went without major issues and in March the groups assembled for the first time in the lab to actually make the beer. The fermentation was completed with only a few, "It stopped bubbling, what do I do?" calls and the second lab session was dedicated to kegging and bottling. The teachers decided to get involved too and made their own beers: A New Zealand bitter and a lychee Pilsner.

While the kegs and 300 bottles were safely resting in the school cellars, heated discussions took place on the names, the labels (prepared during art hours), and the price. The names were chosen from mythology: (Jupiter, Ambrosia, Pluto, Cupid, Ceres and Diana) and the bottles (after a brief "market survey") were priced between 2–3 Euros ($2.60–$4).

The program ended with a lecture given by a physician (also me) on the acute and chronic effects of alcohol consumption by teenagers.

All the bottles were sold and the kegs emptied at the party. The brews were more than drinkable. It must be said, however, that everybody was a bit too liberal with fermentables because all of the beers were between 6 and 8% ABV, a thing that probably made the party itself a bit livelier.

From the "financial" point of view, all expenses were covered, including the purchase of the four fermenters, which will be available for future projects. The small profit the class made will finance other school initiatives.

We know some people may question the appropriateness of such a project when they see "beer" and "school" in the same sentence. Everything else aside, however, if this initiative helped teenagers to become more responsible and informed consumers; we will consider it a big success.

For more pictures and images of the labels the class made, see the online article at http://byo.com/story3163

"". . . everybody was a bit too liberal with fermentables because all of the beers were between 6 and 8% ABV, a thing that probably made the party itself a bit livelier.""

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