GOT MILK STOUT?

OAK-AGED HOMEBREWS

STEAMPUNK BREWING SYSTEM

Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

DECEMBER 2012, VOL.18, NO.8

CELEBRATING SIERRA NEVADA

A craft beer pioneer stays true to its homebrew roots
Plus: 5 Sierra clones

Clear Tips on Filtering Homebrew

Going Big With Strong Ales

Brew an Ancient Mexican Beer

Sierra Nevada Brewing Co. Founder Ken Grossman

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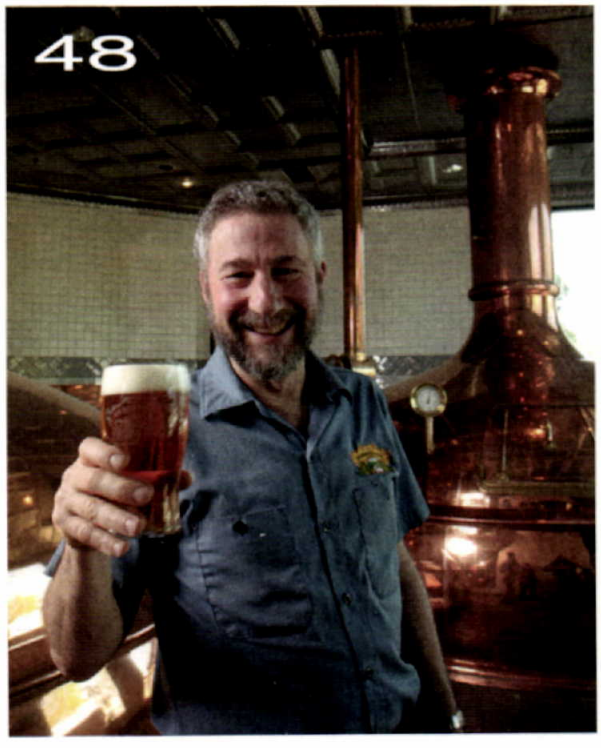

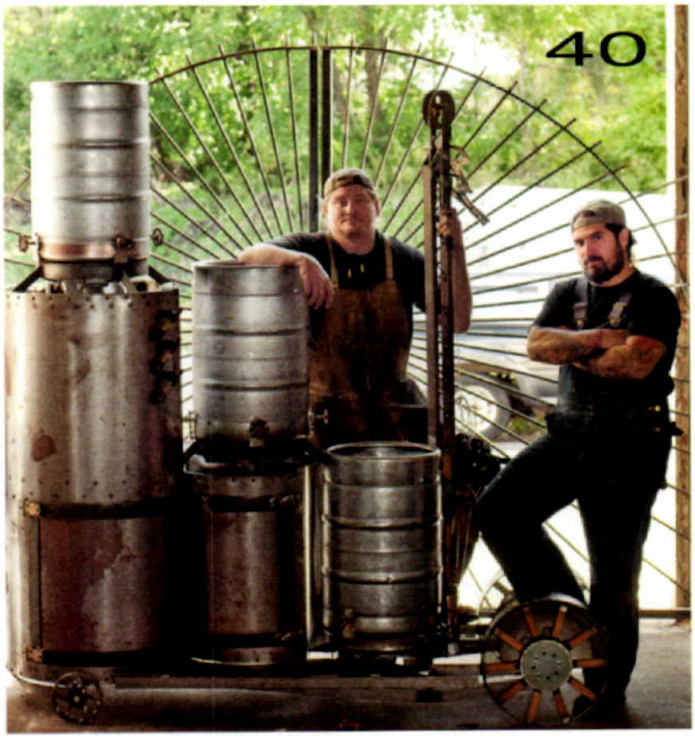

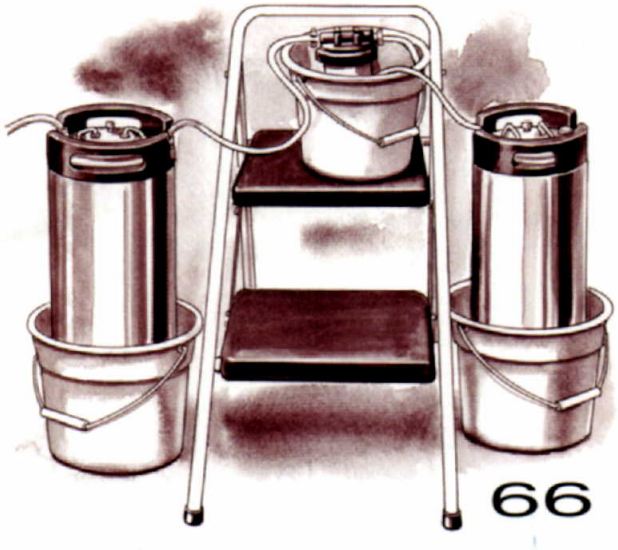

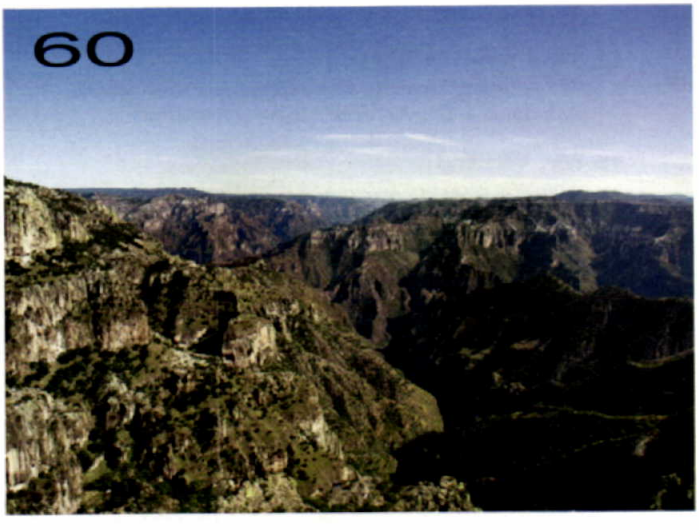

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BYO RECIPE STANDARDIZATION

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

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

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

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

pilsner • bitter • lager • stout • ipa • kits • improvers • malts • and more...

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what's happening at BYO.COM

Go Rogue in your Homebrewery

Much like the Sierra Nevada Brewing Company (featured on page 48 of this issue), Rogue Ales in Newport, Oregon are craft beer pioneers that have maintained a consistent and interesting lineup of beers over the years. Grab a vial of Pacman yeast and get five tips for brewing the Rogue way.

www.byo.com/component/resource/article/657

Spice Up Your Homebrews

This is the time of year to break out the winter warmers, and we have some expert advice on how to properly spice your beers from three US pro brewers. Hint: take it easy!

www.byo.com/component/resource/article/1434

Winter Seasonal Beers

Brewed stronger, richer and more full-bodied, these beers taste great alongside a roaring fire or when hoisting the holiday cheer with friends. Check out some award-winning recipes for winter-approved homebrews.

www.byo.com/component/resource/article/2338

Cover Photo: **Sierra Nevada Brewing Co.**

Brew Your Own — THE HOW-TO HOMEBREW BEER MAGAZINE

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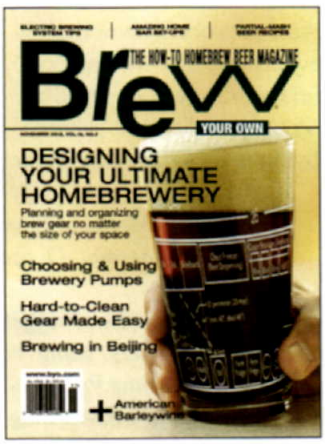

No shirt, no shoes, no power tools

The November 2012 issue's wine barrel table article has a problem: the builder appears barefoot even though the project tool list includes a power saw. Regardless of whether the photography was staged for the magazine, *BYO* should not even hint that readers should saw the top off a barrel while barefoot. Author Warrick Smith's warning, " . . . with any woodworking project, always be safe," should apply to all areas of safety, not just eye protection and proper ventilation.

Aaron Brown
North Pomfret, Vermont

Operating power tools while barefoot, or wearing open-toed shoes, is indeed a safety hazard. At a minimum, operators should wear closed-toed shoes and in some instances, steel-toed work boots would be the best option. Thank you for your letter.

Stop, calibrate and listen

In the "Troubleshooting" article in the "Fix Your Beer" issue (September 2012), you seemed to miss one of the major points that most homebrewers never think about — their thermometer. Of all the different issues you raise that can impact over and under attenuation, it is all for naught if your thermometer is not calibrated. A huge problem with overattenuated and/or thin beer could be that your 152 °F mash may actually be resting at 147 °F. Maybe the reason you always have a high amount of unfermentables left in your beer with a high FG is because that 152 °F is actually 156 °F. Maybe your efficiency problems are because your temperature is so far off that it isn't converting due to being out of the optimal range. Maybe your issues with esters and fusel alcohols is because you chill to 68 °F on the thermometer which is actually 78 °F. I was fortunate enough to come into your January-February 2006 Yeast issue, which actually deals with this issue, after reading your "Troubleshooting" article. This would have been a great addition to the current article. Checking the temperature your thermometer

contributors

Dave Miller has been both a homebrewer and a professional brewer. As a homebrewer, he was a founding member of the St. Louis Brews homebrew club and won the Homebrewer of the Year award in 1981 for his Best of Show Dutch Pilsner at the National Homebrew Conference. And of course, he is known for his homebrewing book, "Dave Miller's Homebrewing Guide" (1995, Storey). He brewed professionally at Nashville's Blackstone Restaurant and Brewery, and won numerous GABF medals, until he retired in 2008.

On page 66 of this issue, you can read an excerpt from his new book, "Brew Like a Pro" (2012, Storey) in which he discusses filtering beer.

Sean Z. Paxton, otherwise known as the Homebrew Chef, has worked as a professional chef and has been a homebrewer since 1993. He has prepared several brewer's dinners for the Northern California Homebrew Festival. His blog, found at www.homebrewchef.com, contains many of his recipes and menus. Sean has written several articles for *BYO* on the topic of cooking with beer, starting with "Cooking with Homebrew," in the September 2010 issue. In this issue, on page 48, he profiles Sierra Nevada Brewing Company, giving a history of the brewery and also five clone recipes. In addition, on page 96, he describes how he — with the help of Sierra Nevada — made hopped pork BBQ.

David J. Schmidt is a freelance writer and translator, and also a fifth generation homebrewer. He lives in San Diego, California, has traveled to 28 countries and speaks eight languages. He has spent the last eleven years exploring rural Mexico and experiencing folk brews, making him a veritable Indiana Jones of homebrewing. (Think Harrison Ford with a beer gut.)

In the January-February 2011 issue of *Brew Your Own*, he introduced readers to pulque — an indigenous Mexican homebrew made from the agave plant.

On page 60 of this issue, he brings us the story of tesgüino — a corn beer that is sacred to the inhabitats of the Sierra Madre Occidental mountain range in Mexico. He also provides both easy and more traditional recipes for this interesting beverage.

reads in boiling water as well as partially melted crushed ice in a Styrofoam cup and adjusting for the difference (either through math or by using the calibration nut) may just be the answer some of your readers are looking for.

Justin Bruce
Eugene, Oregon

Calibrating your brewing instruments — including your thermometer, hydrometer and pH meter — is important. Without proper calibration, you are not assured that the readings you take are accurate and they can't be compared to other sources of information (including published information on brewing science or your own notes on past brew days.) Although calibration is important, it wasn't mentioned in the "Troubleshooting" story because that piece focused on five very common brewing issues (and touched on several more in the accompanying chart). And, as you mention, we've covered that topic in some detail before.

Add a brewpub beat?

First, *BYO* stuff is simply amazing. I really enjoy when I see the magazine in my letter box, because that means I'll have a good time. I wonder if it would be interesting if you eventually added a brewpub/microbrew section where we would be able to read tips, facts, story, equipment, etc, on the brewpub and microbrew world. Any microbrew, brewpub or brewery can tell what equipment they choose to begin in the business, or tips on how to open a brewpub. It could be a little bit like "Brewing Up A Business" by Sam Calagione and other stories of that kind.

Mathieu Tougas
Montreal, Quebec

Glad you like the magazine and thanks for the story suggestion. We have covered the topic of homebrewers "going pro" from time to time. If you go to our "Turning Pro" portion of the website (byo.com/stories/list/indices/55-turning-pro) you will find links to past articles covering professional education brewing programs and tips from hobbyists who made the jump. Also check out Jamil Zainasheff's blog on turning pro at byo.com/blogs/categories/listings/homebrew-to-pro-brewer where he chronicles his experiences opening his own commercial brewery — Heretic Brewing Company in Pittsburg, California.

If any reader has a homebrewing topic they'd like to see covered, you can contact us as edit@byo.com, tweet your idea to us via Twitter (@BrewYourOwn) or post the suggestion on our Facebook page (www.facebook.com/BrewYourOwn).

Brew 2.0

THE HOW-TO HOMEBREW BEER MAGAZINE

YOUR OWN

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byo.com/digitaledition

homebrew nation

READER PROFILE

Brewer: Ryan DeLutis

Hometown, State: Lancaster, Pennsylvania

Years brewing: 6

Type of brewer: All-grain

Homebrew setup (volume, style, efficiency): 5-gallon (19-L) batches, using a 52-quart (49-L) marine cooler mash tun, 9-gallon (34-L) kettle and a turkey fryer. I brew outside all year, from 35 to 98 °F (4 to 37 °C) days. I have a 3-tap keezer in my basement, soon to be converted to wall taps.

Currently fermenting: Aletimate Warrior IPA (2012 Lancaster Homebrewer's Ball *Best of Show*) and a dunkelweizen.

What's on tap/in the fridge: Dropkick Stout, Fightin' Irish Red and my annual birthday brew

How I started brewing: My wife bought me my first kit and equipment and it came out horrible. But I persevered, and after all these years I am finally making good beer!

My blog/website, etc.: My website is www.dubbeldachs.com. I have everything there: my recipes, projects, and even a thorough all-grain tutorial for brewers who would like to make the jump from extract to all-grain.

reader recipe

Watermelon Wheat
(5 gallons/19 L, all-grain)

OG = 1.052 FG = 1.012
IBU = 13 SRM = 5 ABV = 5.0%

Ingredients

6.0 lbs. (2.7 kg) German wheat malt (light)
4.0 lbs. (1.8 kg) 2-row pale malt
0.5 lbs. (0.23 kg) Briess Cara-Pils® malt
3.75 AAU Mt. Hood pellet hops (0.75 oz./21 g at 5% alpha acids) (60 min.)
White Labs WLP320 (American Hefeweizen Ale) yeast
6 C. watermelon juice (fresh squeezed, not pasteurized)
Less than 1 oz./watermelon extract to taste (at kegging)

Step by Step

Mash grains in 3.5 gallons (13 L) of water at 150 °F (66 °C) for 60 minutes. Sparge with 4.75 gallons (18 L) of 170 °F (77 °C) water. Boil the wort for 60 minutes. At the beginning of the boil, add 0.5 oz./14 g of Mt. Hood hops. I also add yeast nutrient at 15 minutes, but no Irish Moss in a wheat beer. When boil is done, chill to 65 °F (18 °C) and pitch yeast.

When your primary fermentation is complete, prepare your fresh watermelon. I use a sanitized steel bowl and potato masher to mash fresh watermelon and run the juice through a funnel with strainer. Collect 6 cups of juice and place in your secondary vessel. Rack your beer on top. The juice and (pink) beer will begin a vigorous secondary fermentation. When complete, it will leave cool pink and white melon/yeast rings in the bottom. The final beer will pour yellow with a slightly pink head. Rack to your keg or bottling bucket and taste. Add watermelon extract (less than an ounce) to taste. Bottle or keg your beer as usual.

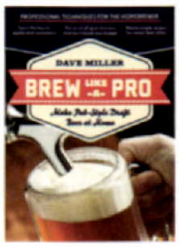
byo.com brew polls

Have you ever brewed a sour beer?

No, but I would like to: 47%
No, I'm not interested: 37%
Yes, a few times: 12%
Yes, I brew them often: 4%

what's new?

Brew Like A Pro Released



In *Brew Like a Pro*, Dave Miller reveals the secrets of truly great draft- and pub-style brewing. He offers recipes for small batches of classic, all-grain brews that stay fresh in kegs for months, eliminating the need for bottling. And he includes complete plans for a professional-quality home system that requires just 18 square feet of space. See the excerpt from *Brew Like A Pro* on filtering on page 66 of this issue.

$18.95 at major booksellers and homebrew shops

Belle Saison Yeast from Lallemand

Lallemand has released a new dried saison yeast strain, Belle Saison. Belle Saison is the classic Belgian saison strain, which gives brewers the ability to create saison and "farmhouse" styles of ales. Belle Saison is meant to be fermented at warm temperatures (around 90 °F/ 32 °C) to develop unique esters and aromatic characteristics that typify these styles.

http://danstaryeast.com/products/belle-saison-yeast

Maris Otter Light Malt Extract from Muntons

Muntons has released a new Maris Otter liquid malt extract as part of their "red label" range of extracts. This light liquid malt extract contains a minimum of 60% Maris Otter. Now available in homebrew stores – ask your retailer for details.

www.muntons.com

December 2
Dickens Christmas Fair Best of Brew Competition
Daly City, California
The Silicon Valley homebrew club "Worts of Wisdom" welcomes homebrewers to enter their beers in their annual BJCP-registered competition. Part of the Great Dickens Christmas Fair & Victorian Holiday Party, the competition is for the best English-style beers. All entrants receive a free ticket to the fair on December 2nd, 2012 to witness the final judging and awards ceremony.
Deadline: Nov. 11
Entry Fee: $7
Contact: Dave Messink, dmessink@umich.edu
Web: http://wortsofwisdom.org/

December 15
Washington Mead & Cider Cup
Everett, Washington
The Greater Everett Brewers League of Washington State will again pit cider against mead in their annual competition. Registration is online only.
Deadline: Dec. 7
Entry Fee: $7
Contact: Roger Kee, brewchops@yahoo.com
Web: www.wahomebrewers.org/wamacc/index.php

December 15
The Max Lager Challenge
Atlanta, Georgia
Max Lager's Wood-Fired Grill & Brewery invites homebrewers to enter their first-annual homebrew competition. Entries can include all lager style categories including hybrid styles such as Kölsch and California Common. Max Lager will also accept entries in their exclusive "Experimental Lager" and "Holiday Beer" categories. At the end of judging on the 15th there will be an awards ceremony accompanied by a beer dinner and the tapping of some special casks.
Deadline: Dec. 8
Entry Fee: $7
Contact: Robert Carlton, carltonr123@bellsouth.net
Web: http://maxlagers.com/

homebrew nation

homebrew drool systems

P&K's Basement Brew Pub

Pete Gleneski • Canton, Michigan

This self-designed and constructed brewpub is a homebrewer's dream. Its design includes a custom computer automated beer brewing system, a built-in, temperature-controlled beer keg cooler, eight custom taps, a concealed CO_2 tank storage area and a stepped liquor cabinet, all in a natural oak finish. Not only does this bar look and function like a typical bar, but it is also my brewery as well.

I use custom-designed and built electronics to interface the brewery to a personal computer allowing complete control of the brewing process via some custom-written software. I just input batch size, amount of grain used, mash step temperatures, mash step durations, hop additions and boil length. The software controls and regulates the water input, mash temperature, wort routing, sparging, boiling and chilling.

Of course, the dream is never over. Future improvements include embedding the software on a microprocessor with only graphics communicated to the PC via serial port or USB to avoid some windows port security battles. It would also be nice to rework the hardware and software to make a portable version of the brewery to take to friend's houses and homebrewing events. Feel free to email me at pk.autobrew@yahoo.com. Cheers!

social homebrews

Like *BYO* on Facebook:
www.facebook.com/BrewYourOwn

Follow *BYO* on Twitter at: @BrewYourOwn

BYO asked: What's currently fermenting? What are you pouring and enjoying? What's your next planned batch of homebrew you're going to make?

Darren McLellan • Cape Elizabeth, Maine
Fearless Felix Stratospheric Ale, I was chilling the wort when he jumped in the fermenter. Also, Nephew's Märzen/Octoberfest — long story. I'm lagering Pouring Passive Agressive Pale Ale. 8.25% but drinks like a session beer.

beginner's block

RACKING AND TRANSFERRING

by betsy parks

One of the essential skills you will come across when homebrewing, especially if you brew a style that is high in gravity, is racking. This is when beer is moved from one container to another to separate it from the particles that settle at the bottom of the carboy, fermenter or bucket.

Why rack?

To really understand racking, think of your beer as something of a shaken-up snow globe. There are all kinds of particles in suspension in the liquid, such as hop material and yeast cells. Over time, those particles settle at the bottom of the vessel. Yeast cells die and fall to the bottom, and other particles settle. After primary fermentation, you can remove the beer from these deposits as prolonged exposure to the sediments, especially dead yeast cells, can cause off flavors. This isn't such an important step if you are making a beer that doesn't need extended conditioning, however a style that needs to condition longer, like a lager, may need extra weeks of conditioning and should be transferred off of the sediment into a secondary fermenter. There is some controversy regarding how long you should wait to transfer your beer off of the sediment, but it is ultimately up to the brewer. For more analysis of delayed racking, read the *Brew Your Own/Basic Brewing* experiment on the subject at www.byo.com/component/resource/article/1960.

How to rack

To rack beer from one vessel to another you will need a racking cane and siphon tube with a clamp that controls the flow in the tube. Basic racking from carboy to carboy requires siphoning the beer. It's a good idea to practice siphoning water from one container to another a few times before you try it with your beer if you've never done it before. For the complete process of siphoning, read "Beginner's Block" in the May-June 2009 issue of *Brew Your Own*, but essentially it is the process of using gravity to pull a volume of liquid from a higher vessel into a lower vessel — for example, from a carboy on a table to a carboy on the floor.

The most important part of the siphoning step, however, is to be sure that you rack the liquid from the top of the container and work your way down rather than putting the racking cane at the bottom of the container. Racking from the bottom of the container will transfer the particles you are trying to separate out from the beer.

Preventing oxidation

Any time you transfer beer from one container to another, you risk oxidation. Oxidation can cause off flavors (read more about oxidation in "Advanced Brewing" on page 75 of this issue.) If you are transferring your beer with a basic setup (just a racking cane/siphon setup), prevent as much oxygen exposure as you can by being careful to transfer the beer slowly into the secondary fermenter and preventing splashing. Also, transfer into a vessel that does not leave air at the top of the liquid when you are finished transferring — this is called headspace, and leaving that air in the secondary means that you are basically trapping oxygen in an enclosed space with your homebrew. Be sure to choose appropriately sized vessels. When you add equipment to your homebrewing setup, you can also use CO_2 to prevent oxidation when transferring your beer. If you use CO_2, you can purge the secondary fermenter with the gas before transferring the beer to push the oxygen out of the vessel. BYO

by marc martin

DEAR REPLICATOR, MY WIFE, JEAN, AND I BREW TOGETHER. MY TASTES RUN TOWARD THE HOP HEAD SIDE AND I BREW PLENTY OF PALE ALES AND IPAS, BUT HER TASTES RUN TOWARD THE MALTY SIDE AND SHE JUST LOVES PORTERS AND STOUTS. HER ALL-TIME FAVORITE STOUT IS THE STORM KING IMPERIAL STOUT FROM THE VICTORY BREWING COMPANY, BUT I'M NOT MUCH HELP WHEN IT COMES TO PUTTING TOGETHER THOSE RECIPES. WE ARE HOPING YOU CAN GET SOME INFORMATION SO THAT WE CAN DUPLICATE THIS FINE BEER.

KEVIN BAKER
BLOOMINGTON, MINNESOTA

During my recent interview Victory Co-Owner Bill Covaleski fondly related the story of his first homebrew batches. His close friend since fifth grade, Co-Owner Ron Barchet, gave him his own homebrewing kit for Christmas in 1985. Both Bill and Ron became accomplished homebrewers and after some requisite stints in the corporate world decided that making beer was their true passion. Realizing that more technical skills would be required they chose to pursue formal brewing education. First Bill traveled to Germany and completed his studies at the Technical University of Munich at Weihenstephan. Ron followed by attending the International Course of Brewing Studies at the prestigious Doemens Academy.

By February of 1996, with a 25-barrel brew house, they opened the brewery. Following traditional German decoction brewing methods, two of their first beers were Octoberfest and a Dortmunder Export. That first year they sold 2,500 barrels. Bill says that the projection for 2012 is 94,000 barrels.

There can be no doubt that this is a true imperial stout. This heavy-bodied beer is topped by a dense, creamy, dark tan head that laces the glass all the way to the bottom. Aromas of licorice, espresso and roast barley fill your nose with a lingering hint of hops. Initially bitter sweet chocolate assaults the tongue followed by a strong, dark grain profile. The high hop bitterness decidedly wins the war against residual sweetness leaving you not to question the 82 IBU level. This is a stout that you won't soon forget.

Kevin, you won't have to search for Jean's favorite stout now because you can "Brew Your Own." For more about Victory Brewing Company visit the website http://victorybeer.com/ or call 610-873-0881. BYO

VICTORY BREWING COMPANY STORM KING IMPERIAL STOUT CLONE

(5 gallons/19 L, extract with grains)

OG = 1.089 FG = 1.018 IBU = 82 SRM = 53 ABV = 9.1 %

Ingredients

6.6 lbs. (3 kg) Briess Pilsen, unhopped, liquid malt extract
2.5 lb. (1.13 kg) dried malt extract
2.5 lb. (1.13 kg) Vienna malt
1 lb. (0.45 kg) Carafa® malt (400 °L)
1 lb. (0.45 kg) roast barley (450 °L)
20 AAU Centennial hop pellets (60 min.) (1.9 oz./54 g at 10.5 % alpha acids)
7 AAU Cluster hop pellets (30 min.) (1.0 oz. /28 g of 7 % alpha acids)
2.9 AAU Cascade hop pellets (5 min.) (0.5 oz./14 g of 5.75% alpha acids)
½ tsp. yeast nutrient (last 15 minutes of the boil)
½ tsp. Irish moss (last 30 min.)
White Labs WLP 001 (American Ale) or Wyeast 1056 (American Ale) yeast
0.75 cup (150 g) of corn sugar for priming (if bottling)

Step by Step

Steep the crushed grain in 2 gallons (7.6 L) of water at 155 °F (68 °C) for 30 minutes. Remove grains from the wort and rinse with 2 quarts (1.8 L) of hot water. Add the liquid and dried malt extracts and 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 a fermenter. Now add the wort to 2 gallons (7.6 L) of cold water in the sanitized fermenter and top off with cold water up to 5 gallons (19 L). Cool the wort to 75 °F (24 °C). Pitch your yeast and aerate the wort heavily. Allow the beer to cool to 68 °F (20 °C). Hold at that temperature until fermentation is complete. Transfer to a carboy, avoiding any splashing to prevent aerating the beer. Condition for 1 week. Bottle or keg. Allow the beer to carbonate and age for two weeks.

All-grain option:

This is a single step infusion mash using 14.5 lbs. (6.6 kg) Pilsner malt to replace the liquid and dried malt extracts. Mix all of the crushed grains with 6 gallons (23 L) of 175 °F (79 °C) water to stabilize at 155 °F (68 °C) for 60 minutes. Sparge slowly with 175 °F (79 °C) water. Collect approximately 6 gallons (23 L) of wort runoff to boil for 60 minutes. Reduce the 60-minute Centennial hop addition to 2 oz. (57 g) (21 AAU) and the 30-minute Cluster hop addition to 0.75 oz. (21 g) (5.25 AAU) to allow for the higher utilization factor of a full wort boil. The remainder of this recipe and procedures are the same as the extract with grains recipe.

Sweet Stout

Make a beer with body

by Betsy Parks

DARK, SWEET AND FULL-BODIED, SWEET STOUT — ALSO KNOWN AS MILK STOUT — IS A FUN BEER TO ADD TO YOUR REPERTOIRE. IN THIS ISSUE THREE BREWERS DISCUSS BREWING THIS WINTER-FRIENDLY STYLE WITH BALANCE.

We brew two diferent sweet/milk stouts at AleWerks: Coffeehouse Stout and also Café Royale, which is an imperial coffee milk stout aged in bourbon barrels.

This style has a mild sweetness in the finished beer with a touch of body; the lactose in the beer balances out the roasted malt, and for us also the coffee flavors. We use Antigua Guatemala coffee and we like to emphasize those flavors. We age the Café Royale in whiskey barrels for three months.

For the grain bill on our sweet stouts, we use pale malts for the base and then add some (but not too much) black patent, pale chocolate, caramel 80 and Victory® or biscuit malt.

For hops we use Fuggles because the style calls for hops that are mild and earthy.

We use Whitbread yeast to ferment both of of these stouts. We originally started brewing them with this strain and stuck with it because we like the way it performed and attenuated. We ferment both of these stouts at 68 °F (20 °C).

I think the main mistakes that a new brewer or a brewer who isn't familiar with the style might make when attempting to brew a sweet stout is getting it out of balance. Too much lactose or too much roast on the malt side is a mistake. You will either make a beer that is too bitter with too much acidity from too much roasted malt, or if you add too much lactose it will be too sweet and you won't get the attenuation you want from the yeast.

If you want to brew this style in your homebrewery, I think the most important thing — as I mentioned — is balance. Also, always make sure your recipe is solid before you brew anything.

Geoff Logan, Head Brewer at Williamsburg AleWerks in Williamsburg, Virginia. Geoff started out his career as a professional musician and a homebrewer. After his band, Rain Market, stopped playing he started working for Williamsburg AleWerks where he wore many hats before becoming the Head Brewer.

At Half Acre we brew one chocolate milk stout called Chocolate Camero. This is a style we don't get to do often, so when we do we really go for it. By its nature it's a departure from our normal brews.

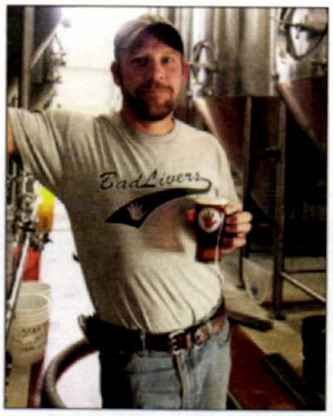
We design our milk stout to be rich, full-bodied, and heavy on the bakers chocolate flavor. We build a dry malt bill heavy on caramel and roasted malts, add lactose sugar to raise the body and sweetness, and brew and age on roasted cacao nibs. The malt bill includes our base 2-row, Munich malt to add richness, a mixture of chocolate and dark chocolate malts to add color and chocolate flavor, roasted barley to add color and roast character.

You can use a variety of different hops for this style, but remember that hopping in this style is light. Chocolate Camero is bittered with Warrior hops to add a clean balanced bitterness, and we use a late addition of Fuggles to add an earthy component to balance out the sweetness.

If you are thinking about making a sweet stout, my advice would be to not go too big in terms of gravity and alcohol volume. Mash in low and let the lactose build the body and sweetness. Also, keep the hop content and bittering levels low. Since you are homebrewing and working with small batches, you're not risking too much, so try messing around with the lactose to get it right. Otherwise this style is fairly mistake free.

HALF ACRE
BEER COMPANY CHICAGO, IL

Matt Gallagher, Head Brewer and Co-Owner at Half Acre Beer Company in Chicago, Illinois. Matt became interested in brewing as a metallurgist living in Colorado. He started brewing after striking up a friendship with Half Acre's founder, Gabriel Magliaro, in 2007.



Joe Schiraldi, Vice President of Brewing Operations at Left Hand Brewing Company in Longmont, Colorado.

One of the most enjoyable things about this beer style is accessibility. Because of this beer style I have introduced many, many people over the years to the first dark beer that they liked. Most of the people we talk to enjoy things like iced coffee or iced cappuccino, so when they taste the beer at, say, a festival I tell them to imagine that it's a hot summer day and you've just poured yourself some iced coffee. The response I get is one of the most exciting things about this beer.

We don't do anything out of the ordinary when brewing. The grains are made up of crystal malts, Munich malts, flaked oats, flaked barley, chocolate malt and roasted barley. We do add lactose, which is becoming less and less out of the ordinary in today's craft beer market. We bitter with Columbus and use Golding for aroma hops.

If you are trying to brew a sweet stout, one of the most important aspects is paying attention to how much lactose you put in there — there's a sweet spot. You want to be able to taste it and smell it, but it's got to work well with whatever else you bring to the table.

Also, brewing this style is a question of experimentation to get it where you like it. You have to decide if you like it more chocolate-like or more coffee-like, and then again you need to experiment to get the lactose right to buffer it.

Luckily for brewers there are a lot more sweet stouts than there once were in the marketplace. In the last decade a lot of craft breweries have discovered what a great style of beer it is. If you want to brew your own sweet stout, start by tasting what's out there. There's a plethora of them these days — see how different breweries approach it. BYO

Re-Pitching Yeast

Boil timing, brewing lagers

by Ashton Lewis 

Q I AM TIRED OF BUYING YEAST ALL THE TIME. IS IT OK TO JUST REPITCH THE TRUB FROM A PREVIOUS BATCH?

@DANGEROLSEN
VIA TWITTER

A Re-pitching of yeast is a normal method used by brewers around the globe. Although the practice is simple, there are a few rules that may make the method less than ideal for the typical homebrewer. The first rule is that the yeast should be harvested shortly after fermentation is complete and used within a short time period.

The most common method of yeast harvesting is by bottom cropping, because lagers are the dominant beer type in the world. Most commercial lager brewers these days bottom crop yeast from the bottom cone of cylindroconical fermenters and store it for short durations in a yeast brink (chilled and often agitated storage tank). Ale strains are sometimes bottom cropped and other times skimmed from the top of open fermenters, then stored in a similar fashion to lager yeasts prior to re-use.

There are a variety of ways to harvest yeast when homebrewing and the yeast can successfully be stored and re-used if you are careful. I suggest storing yeast in a flask and using cotton batting to close the top. Yeast stored in this type of container can be placed in a refrigerator without any problems for up to about 10 days before re-use. It is really preferable to keep this duration as short as possible since yeast viability and vitality decrease with time, especially as storage temperature increases. Ideally the storage temperature should be around 34 °F (1 °C).

Harvesting yeast for re-use at home has one major drawback and that is the fact that most homebrewers do not brew frequently enough to re-use for very long. Some brewers share yeast and are able to keep a culture going from one batch to another with short storage durations in between. This can work very well if you have a group of friends who are good, clean brewers.

"Harvesting yeast for re-use at home has one major drawback and that is the fact that most homebrewers do not brew frequently enough to re-use for very long."

Q DOES THE AMOUNT OF TIME IT TAKES TO GET THE WORT TO A ROLLING BOIL HAVE A NEGATIVE IMPACT ON THE BREW ITSELF, OR NOT?

KEVIN DILL
VIA FACEBOOK

A In a very general sense the time required to bring wort to a boil can cause problems when the time is too long. Holding hot wort for extended time periods leads to heat-related chemical changes, generally termed "thermal stress". But in a more practical sense this is not normally associated with waiting for the kettle to boil for one very simple reason; evapora-

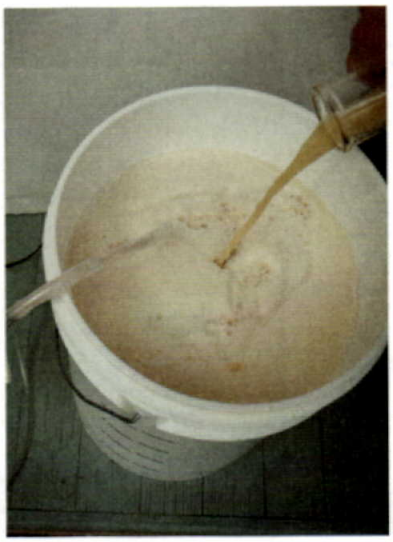


Photo by Les Jörgensen

tion rate.

Brew kettles are designed to boil and evaporate water from wort during boiling. Traditional, some would argue outdated, kettles are usually designed to evaporate about 8–10% per hour. More modern designs focus on reduced energy consumption and thermal stress during boiling, and the evaporative rates in these designs is usually around 4%. So how does this relate to kettle heating time?

In order to achieve these evaporative rates a certain amount of energy must be supplied to the kettle and this amount of energy is plenty to heat the contents of the kettle to the boiling point during wort collection.

In practice, brewers do want to get the wort boiling as soon as possible to save time and also not feel like too much time is spent looking at a pot of wort waiting for it to boil. It does help to have a burner that can be cranked up for the heating stage and then dialed back once the wort begins to boil. If the burner is too small to get the wort boiling within 30-45 minutes of kettle full I would look for a larger unit that can provide more heat.

One practical method used by most brewers during the brew day is to begin applying heat to the kettle during wort collection. If this is timed right the boil begins just about the time the kettle is full.

Q

I'M RELATIVELY NEW TO HOMEBREWING AND WANT TO TRY TO BREW A LAGER BUT I HAVE BEEN SCARED AWAY BY THE TEMPERATURE REQUIREMENTS. WITHOUT SPENDING A LOT, WHAT ARE MY BEST AND SIMPLEST OPTIONS?

COLIN OAKES
TORONTO, ONTARIO

A

One of the keys to brewing great lager beers, really, is keeping the fermentation temperature cool. There is no way to sugar-coat the importance of this fact. Lager beers that are fermented warmer than about 58 °F (14.5 °C) often have fruity aromas and sometimes have strong solvent and sulfur notes depending on the yeast strain. Here at Springfield Brewing Company in Springfield, Missouri, we brew several different lagers and the strain we use for fermentation works really quite well at 54 °F (12 °C). Some brewers prefer cooler temperatures for lagers, and the lower end of fermentation temperature used by commercial breweries hovers around 46 °F (8 °C). In order for commercial brewers to consistently achieve these cool temperatures, jacketed fermenters that are chilled with glycol or ammonia are required. Homebrewers often do something similar by placing their fermenter in a refrigerator to maintain a cool environment.

I think we brewers are often times spoiled by technology and too frequently equate old or traditional methods with being outdated, primitive or simply wrong. While there is no question that technology allows us to do things differently than our forerunners, there is also no question in my mind that brewers from the past brewed some very fine beers. You are in an ideal location to brew lagers like they were brewed prior to the advent of commercial refrigeration. And this is brewing during the months of the year that are cool enough for the type of beer you want to brew. By looking at the average highs and lows in Toronto, there are about four months of the year that have an average daily temperature in the middle of the sweet spot for most lager strains.

My advice on brewing lagers is pretty simple. Begin with healthy yeast and pitch plenty of it. Targeting

15 million cells per mL of wort is a good rule of thumb pitching rate for normal gravity beer. If you pitch with a slurry that has a normal cell density of about 100 million cells per mL, you will need 3 liters for a 20-liter batch size. For all those gallon users, sorry for switching units, but I cannot think in gallons of wort when cell densities are also reported using metric terms. Three liters of yeast seems like a lot of yeast, but the numbers don't lie. Proper pitching rate is a great start for great lager.

The second half of this piece of advice is to give your yeast the building blocks required for proper growth, and this means properly aerating your wort. If there is one gizmo every brewer should build or buy sooner than later it is a wort aeration device. During growth yeast cells need oxygen to synthesize sterols and unsaturated fatty acids, both of which are important constituents of cell walls.

And finally, let the fermentation take off in a cool environment with a maximum temperature not warmer than 54 °F (12 °C), and no cooler than about 45 °F (7 °C). This very well may be the average temperature of your garage. If you follow these three simple pieces of advice your lager fermentation should be complete in 10 to 14 days for brews with an original gravity in the 12 to 15 °Plato (1.048 to 1.061 SG) range, and longer for higher gravity beers. After fermentation is complete there are multiple options for packaging and cold conditioning, but these are not as critical to defining the beer flavor as is fermentation. Focus on the fermentation of lagers first, and the rest of the process will be become more apparent the more you brew and the more comfortable you become with these types of yeasts.

Q A COMMERCIAL BREWER RECENTLY TOLD ME THAT HE IS CONCERNED THAT VOLATILE ORGANIC COMPOUNDS FROM WILDFIRES IN THE PACIFIC NORTHWEST WILL CONDENSE ON HOPS AND ALTER THEIR ORGANOLEPTIC PROPERTIES. IS THIS A REAL POSSIBILITY? ASSUMING IT IS, HOW MIGHT THE TAINTED HOPS AFFECT BEER?

GREG LEWIS
IDAHO FALLS, IDAHO

I know that wine grapes grown near eucalyptus trees can pick up enough eucalyptus oil to impart the aroma to wine. So it is does seem possible in theory that hops grown near wildfires could pick up enough smoke from the air to taint the aroma of the hops. I know that some western areas of the United States had a bad wildfire season this year and that the smell of fire and resultant ash was a nuisance to residents living nearby. As it happens, some wildfires in Washington were relatively close to hop farms.

To answer this question I looked in brewing texts and online for references about wildfires affecting hops and came up empty handed. So I then asked a friend and colleague in the brewing industry who works for Roy Farms in Moxee, Washington, if he knew anything about this topic. Roy Farms is one of the largest hop farms in the world and is located in the Yakima Valley. The answer I got in response to this question was very positive to brewers; the smoke concentration required to impart smoky aromas to hops would have to be so high as to be lethal to humans and other mammals living near the hop fields. The good news is that there have been no deaths around Washington hop fields attributed to smoke from wildfires, and thus no smoke effect on the hops either.

I thought this question seemed to meet the litmus test of something falling into the realm of the possible, but based on my limited search it seems that this may be one of those things not to lose sleep worrying about. BYO

"The smoke concentration required to impart smoky aromas to hops would have to be so high as to be lethal to humans and other mammals living near the hop fields. The good news is that there have been no deaths around Washington hop fields attributed to smoke from wildfires."

Ashton Lewis is the Brewmaster and Co-Owner at Springfield Brewing Co. in Springfield, Missouri. Do you have a question for Mr. Wizard? Email your questions with your name, city and state to wiz@byo.com.

Sweet Stout

Make your own milk stout

by Jamil Zainasheff

I have always defended style guidelines as providing a sort of "shorthand" when discussing beers. You tell someone you are brewing pale ale, and they know it is light in color and fermented with ale yeast. If you say, "I'm brewing an American pale ale" then they know it has some American brewing characteristics. Saves a lot of time and words when us beer geeks get together, right?

But the problem is, not all of the style names are as descriptive as they should be. For example, "cream ale" has always bothered me. If you do not know beer styles, the term cream ale can be misleading. It may be an ale, but it certainly is not creamy. I find it even more annoying when brewers ask what they should be putting in their recipe to make a cream ale taste creamier! Vanilla? Argh, the humanity! But I digress.

Contrast that with "sweet stout." Now that is a good style name. Most people with a passion for beer and little understanding of style guidelines would have at least some idea of what a sweet stout might be: A stout, but sweeter than a regular stout. Okay, it is a simplified description of the style, but pretty darn accurate. Even if you were to call it by the more traditional name milk stout or cream stout, I think people would still have a pretty good shot at guessing what kind of beer they would get if they ordered one. Hooray for decent style names!

Sweet stout is traditionally an English style and historically known as milk or cream stout. The name comes from the practice of adding lactose (milk sugar) to sweeten the beer. Sweet stout is dark, sweet, rich and full of roasted flavors and aromas. It is full-bodied and has substantial coffee and chocolate notes. The appearance is very dark brown to black in color. Think of sweet stout as similar to dry stout in roastiness, but much fuller and sweeter. While some commercial examples are drier than others, you will have more success in competitions focusing on the sweet side of the style. Sweetness in this style comes from reducing the bitterness of the beer and adding crystal malt and lactose powder. Lactose is only mildly sweet, but it is unfermentable by brewing yeasts, which also helps add to the mouthfeel.

To brew a great example of this style, start with high quality British pale ale malt as the base. It provides that background rich malt character that is a key component in fine British beers. British pale ale malt is kilned a bit darker (2.5 to 3.5 °L) than the average North American two-row or pale malt (1.5 to 2.5 °L) and this higher level of kilning brings out the malt's biscuit-toasty flavors. Some brewers use North American pale ale malt or North American two-row with the addition of some specialty malts, but this will not produce the same beer as using British pale ale malt. Spend the money, make the effort, and use the proper base malt if you want to make an excellent example of the style.

Similarly, extract brewers should make the effort to source an extract made from British pale ale malt. If you end up using North American two-row malt extract, you can try to compensate by partial mashing some additional specialty malts such as Munich, biscuit or Victory®.

All-grain brewers should use a single infusion mash. A temperature in the range of 150 to 155 °F (66 to 68 °C) works well. Use a lower temperature when using lower attenuating yeasts or higher starting gravities. Use a higher mash temperature when using the higher attenuating yeasts or lower starting gravity beers. If you are unsure, a great starting point is 152 °F (67 °C).

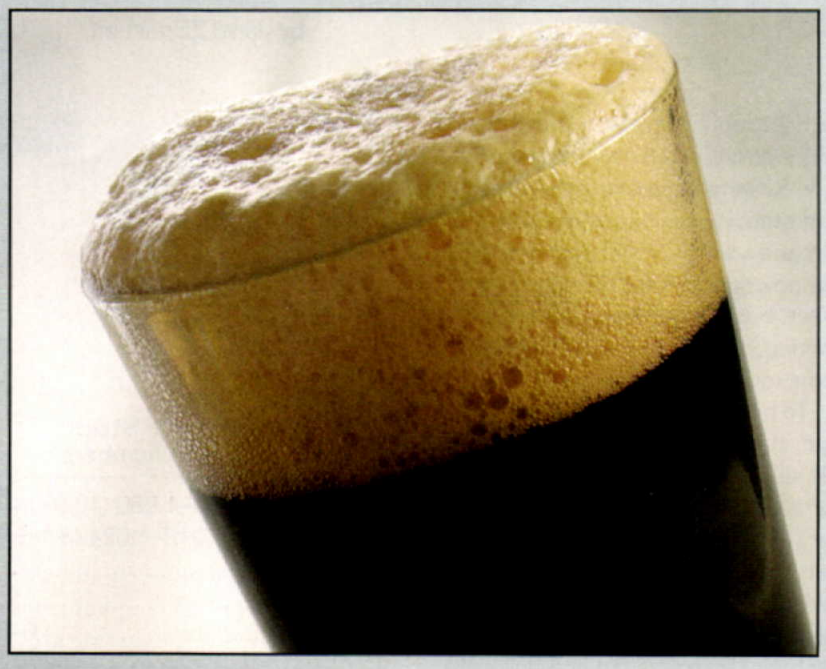
While using the proper base malt is important, sweet stout also requires a fair amount of specialty malt. To develop some sweetness and a caramel flavor component, consider

Continued on page 21

Sweet Stout
by the numbers

OG:	1.044–1.060 (10.9–14.7 °P)
FG:	1.012–1.024 (3.1–6.1 °P)
SRM:	30–40
IBU:	20–40
ABV:	4.0–6.0%

Photo by Charles A. Parker/Images Plus



Sweet Stout
(5 gallons/19 L, all-grain)

OG = 1.060 (14.8 °P)
FG = 1.023 (5.7 °P)
IBU = 22 SRM = 41 ABV = 4.9%

Ingredients

8.8 lb. (4 kg) Crisp British pale ale malt (or similar)
14.8 oz. (420 g) lactose (0 °L)
14.1 oz. (400 g) Baird's black patent malt (525 °L)
10.6 oz. (300 g) Baird's crystal malt (80 °L)
7.1 oz. (200 g) Thomas Fawcett & Sons pale chocolate malt (200 °L)
6 AAU Kent Goldings hop pellets (1.2 oz./35 g at 5% alpha acids) (60 min.)
White Labs WLP006 (Bedford British) or Wyeast 1099 (Whitbread Ale) yeast

Step by Step

Mill the grains and dough-in targeting a mash of around 1.5 quarts of water to 1 pound of grain (a liquor-to-grist ratio of about 3:1 by weight) and a temperature of 151 °F (66 °C). Hold the mash at 151 °F (66 °C) until enzymatic conversion is complete. Infuse the mash with near-boiling water while stirring or with a recirculating mash system raise the temperature to mash out at 168 °F (76 °C). Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 5.9 gallons (22.3 L) and a gravity of 1.051 (12.6 °P).

The total wort boil time is 60 minutes. I prefer to mix in the lactose with the first runnings, which gives me lots of time to make sure it gets dissolved before firing up the kettle. Add the first hop addition as soon as the wort reaches a full boil and then start your timer. Add Irish moss or other kettle finings with 15 minutes left in the boil.

Chill the wort to 68 °F (20 °C) and aerate thoroughly. The proper pitch rate is 2 packages of liquid yeast or 1 package of liquid yeast in a 2-liter starter. Ferment at 68 °F (20 °C). When finished, carbonate the beer to approximately 1.5 to 2 volumes.

Sweet Stout
(5 gallons/19 L, extract with grains)

OG = 1.060 (14.8 °P)
FG = 1.023 (5.7 °P)
IBU = 22 SRM = 41 ABV = 4.9%

Ingredients

6.6 lb. (3.0 kg) English pale ale liquid malt extract
14.8 oz. (420 g) lactose (0 °L)
14.1 oz. (400 g) Baird's black patent malt (525 °L)
10.6 oz. (300 g) Baird's crystal malt (80 °L)
7.1 oz. (200 g) Thomas Fawcett & Sons pale chocolate malt (200 °L)
6 AAU Kent Goldings hop pellets (1.2 oz./35 g at 5% alpha acids) (60 min.)
White Labs WLP006 (Bedford British) or Wyeast 1099 (Whitbread Ale) yeast

Step by Step

If you cannot get fresh liquid malt extract, it is better to use an appropriate amount of dried malt extract (DME) instead.

Mill or coarsely crack the specialty malt and place loosely 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 roughly 170 °F (77 °C) for about 30 minutes. Lift the grain bag out of the steeping liquid and rinse with warm water. Allow the bags to drip into the kettle for a few minutes while you add the malt extract and lactose powder. Do not squeeze the bags. Add the malt extract, lactose, and enough water to make a pre-boil volume of 5.9 gallons (22.3 L) and a gravity of 1.051 (12.6 °P). Stir thoroughly to help dissolve the extract and bring to a boil.

The total wort boil time is 60 minutes. Add the first hop addition as soon as the wort reaches a full boil and then start your timer. Add Irish moss or other kettle finings with 15 minutes left in the boil. Chill the wort to 68 °F (20 °C) and aerate thoroughly. Follow the fermentation and packaging instructions for the all-grain version.

using 5% to 10% of 40 to 120 °L crystal malt. I prefer to use crystal malts in the 80 °L range, since it provides a dark caramel flavor. To create the dark color and an espresso-like richness, British black malt, chocolate malt, and even roasted barley are good choices. The proper amounts are going to vary based on color and flavor. Generally, 10% of the grist is highly kilned malt in a stout. Be aware that malts of the same name from different suppliers can vary substantially in color and flavor. You might find both chocolate malt and black malt ranging from 300 °L to 500 °L, so the name that the maltsters give a product is not always a reliable indicator. Let flavor be your guide.

If you are looking for more complexity or increased head retention, you can add other malts as well. Wheat malt, Victory®, biscuit and others are common additions in many recipes, but keep in mind that using too many specialty malts often ends up as a muddled malt character, not a more complex one. Emphasize one or two particular malt characters in your recipe by using two or three grains. Select high quality British specialty malts such as Muntons, Simpsons or Thomas Fawcett. These malts have a rich malt character, which is complex on its own. One specialty grain that I like a lot in this style is pale chocolate malt (~200 °L). It has a dark toast character that is not quite chocolate and it fills a void in the range of malt flavors in this beer. You might experiment with other adjuncts as well, such as treacle, but keep in mind that simple sugars will ferment out completely and will contribute toward a thinner body, which is the opposite of what you want in a sweet stout.

All English-style beer is best brewed with English hops, such as East Kent Goldings, Fuggles, Target, Northdown or Challenger. Hop flavor and aroma should be absent or at the most minimal, also similar to dry stout. The bittering level for sweet

> "Think of sweet stout as similar to dry stout in roastiness, but much fuller and sweeter. While some commercial examples are drier than others, you will have more success in competitions focusing on the sweet side of the style."

stout has a wide range of 20 to 40 IBU, but you should be shooting for a balance that is slightly to moderately sweet. A bitterness to starting gravity ratio (IBU divided by OG) in the range of 0.4 and 0.6 is good. Skip the late hop additions in this style. There should be no hop flavor or aroma. At most, any hop character detected in the finished beer would be from the bittering hop addition.

Fermentation creates most of the flavor and aroma in many British beers. "English" yeast strains provide a variety of interesting esters and leave some residual sweetness to balance the hop bittering. Many English yeasts attenuate on the lower side (< 70%), but there are some that attenuate quite well (up to 80%). For many British-style beers you have to think about the final balance of the beer.

Sweet Stout Commercial Examples

2X Stout
Southern Tier Brewing Co.
Lakewood, New York
www.southerntierbrewing.com

Chocolate Camaro
Half Acre Beer Co.
Chicago, Illinois
www.halfacrebeer.com

Farson's Lacto Stout
Simonds Farsons Cisk Plc.
Mriehel, Malta
www.farsons.com

Hitachino Nest Sweet Stout
Kiuchi Brewery
Ibaraki-ken Naka-gun, Japan
www.kodawari.cc

Mackeson's XXX Stout
Whitbread PLC
London, England
www.whitbread.co.uk

Milk Stout
The Duck-Rabbit Craft Brewery
Farmville, North Carolina
www.duckrabbitbrewery.com

Milk Stout
Left Hand Brewing Co.
Longmont, Colorado
www.lefthandbrewing.com

Moo Thunder Stout
Butternuts Beer & Ale
Garratsville, New York
www.butternutsbeerandale.com

Saranac Mocha Stout
Saranac - Matt's Brewing Co.
Utica, New York
www.saranac.com

Snowplow Stout
Widmer Brothers Brewing
Portland, Oregon
www.widmerbrothers.com

Split Shot Espresso Milk Stout
Elysian Brewing Co.
Seattle, Washington
www.elysianbrewing.com

Most British beer styles are near even or on the bitter side. If the beer has a high starting gravity, or you are using a lot of specialty grains that add residual sweetness (such as crystal malts), you need to select a more attenuative strain. If you are brewing a beer with a lower starting gravity and/or limited specialty grains, then you want to go with a less attenuative yeast. This is

> "My favorite yeast strains for brewing sweet stout are White Labs WLP006 (Bedford British) and Wyeast 1099 (Whitbread Ale). They both provide a wonderful ester profile without being excessively fruity, and they attenuate less than many English yeasts."

one of the most important things to know about crafting your own British-style recipes. My favorite yeast strains for brewing sweet stout are White Labs WLP006 (Bedford British) and Wyeast 1099 (Whitbread Ale). They both provide a wonderful ester profile without being excessively fruity, and they attenuate less than many English yeasts. Lower attenuation in this case helps preserve that rich malt sweetness and fuller mouthfeel.

At lower temperatures (<65 °F/18 °C), these yeasts produce a relatively low level of esters and at high temperatures (>70 °F/21 °C) they produce abundant fruity esters and fusel alcohol notes. I start my fermentation in the middle of this range (67 °F/19 °C), letting the temperature rise a few degrees over a couple days. This creates the expected level of esters, helps the yeast attenuate fully, and keeps the amount of diacetyl in the finished beer down to a minimum.

Serving British-style beers at cellar temperature, around 52 to 55 °F (11 to 13 °C), allows the character of the beer to come out and can improve drinkability. Colder temperatures prevent the drinker from picking up the interesting fermentation and malt flavors and aromas, so try serving your sweet stout above 50 °F (10 °C). Target a carbonation level around 1.5 to 2 volumes of CO_2. BYO

Jamil Zainasheff is the Founder and Brewmaster of Heretic Brewing Co.

holiday GIFT GUIDE

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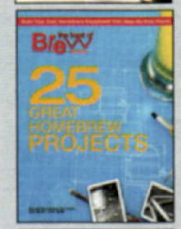

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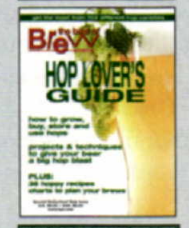

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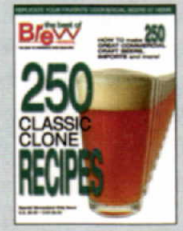

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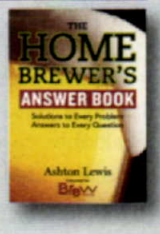

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5 STRONG ALE CLONES

BREWING BETTER BIG BEERS

Story by **Glenn BurnSilver**

If you ask 10 different brewers to define "strong ale," you will likely get 11 different answers. Brewers around the world have always made bigger, stronger ales for special occasions, for blending with weaker ales or to be aged before consumption.

As craft brewers have begun pushing the limits of what can be brewed and still be called beer, the idea of "strong" has shifted significantly. Is a 7.5% ABV India pale ale (IPA) — now a popular, "everyday" beer for many — still a strong ale? And on the other end of the spectrum, is a beer loaded with almost enough alcohol to be a liqueur still merely a strong ale?

So where does one draw the line on just what is a strong ale? For the sake of this article, we'll group ales with alcohol contents hovering around 8 or 9% ABV and call them strong ales. (We'll use the term as a descriptor, not as designating a beer style; we all know that the BJCP Guidelines describe a number of ales that fit this description, some with the word "strong" in them and some not.)

Beers of this strength have enough alcohol that most brewers would view them as strong, but not confuse them with the strongest of the traditional beer styles (esp. barleywines) or the newer very high-alcohol craft beers. As examples of strong ales, we've cloned five commercial beers in this range. While the alcohol contents of these five examples are similar, there are regional variations that set each brew apart so that all are "strong," but each definitely stands on its own.

> "This type of beer will benefit from a secondary, or conditioning phase, especially if it is going to be dry hopped."

Belgium is known for its strong ales, which may be pale or dark, dry or sweet and may be spiced or not. In addition, there may be some "spiciness" derived from the yeast strain.

English strong ales may have a bready or biscuit-like characteristic with a malty sweetness, light alcohol overtones and mild hop assertiveness as many are stronger versions of English pale ales.

American strong ales begin with a malty backbone, and many have a greater hop presence, but they come in many forms. American brewers freely use ingredients and brewing techniques from other countries with established brewing traditions to create a whole range of big brews, some of which are based on traditional beer styles and some of which are unique.

Of course, this is beer, and in the modern world of brewing, nothing is set in stone. Empire Brewing Company brewmaster Tim Butler clarifies, "Strong ales vary widely from region, to region, brewer to brewer, and country to country. I definitely

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STRONG ALE clone recipes

Oceanside Ale Works American Strong Ale clone

(5 gallons/19 L, all-grain)

OG = 1.082 FG = 1.014
IBU = 83 SRM = 22 ABV = 9.2%

Ingredients

8.0 lbs. (3.6 kg) 2-row pale malt
4.0 lbs. (1.8 kg) Munich malt
1.0 lb. (0.45 kg) Briess Caramel Munich (60 °L) (or Weyermann Caramunich® II)
1.0 lb. (0.45 kg) Briess Victory® malt
1.0 lb. (0.45 kg) Belgian candi sugar
1.0 lb. (0.45 kg) corn sugar
9.75 AAU Nugget hops (60 mins) (0.75 oz./21 g of 13% alpha acids)
10.5 AAU Millennium hops (60 mins) (0.75 oz./21 g of 14% alpha acids)
10.5 AAU Columbus hops (15 mins) (0.75 oz./21 g of 14% alpha acids)
0.75 oz. (21 g) Cascade hops (dry hop)
White Labs WLP007 (Dry English Ale) or Wyeast 1098 (British Ale) yeast (3.5 qt./3.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Two or three days before brewing, make a yeast starter. (OG 1.015 to 1.020, aerated thoroughly before pitching the yeast. Ferment yeast starter in the mid 70s °F/~24 °C.)

On brewday, mash in at 152 °F (67 °C) for 60 minutes in 18 qts. (17 L) of water. Recirculate until wort clears and then begin running off wort. Sparge with water hot enough to make the grain bed temperature rise to 170 °F (77 °C) by the end of wort collection. (Or, mash out to 170 °F/ 77 °C and sparge with water hot enough to keep the grain bed at that temperature.) Collect at least 7.0 gallons (26 L) of wort (or monitor runnings and stop collecting wort when the specific gravity drops below 1.010). Boil wort 90 minutes (or until wort volume is reduced to 5 gallons/19 L). Add hops at times indicated. Add sugars with 15 minutes left in the boil. Chill wort, transfer to fermenter, aerate and pitch yeast sediment from starter. Ferment at 68 °F (20 °C). Dry hop beer in secondary for 7 days.

Oceanside Ale Works American Strong Ale clone

(5 gallons/19 L, partial mash)

OG = 1.082 FG = 1.014
IBU = 83 SRM = 22 ABV = 9.2%

Ingredients

2.0 lbs. (0.91 kg) Briess Light dried malt extract
3.0 lbs. (1.4 kg) Briess Light liquid malt extract (late addition)
4.0 lbs. (1.8 kg) Munich malt
1.0 lb. (0.45 kg) Briess Caramel Munich (60 °L) (or Weyermann Caramunich® 2)
1.0 lb. (0.45 kg) Briess Victory® malt
1.0 lb. (0.45 kg) Belgian candy sugar
1.0 lb. (0.45 kg) corn sugar
9.75 AAU Nugget hops (60 mins) (0.75 oz./21 g of 13% alpha acids)
10.5 AAU Millennium hops (60 mins) (0.75 oz./21 g of 14% alpha acids)
10.5 AAU Columbus hops (15 mins) (0.75 oz./21 g of 14% alpha acids)
0.75 oz. (21 g) Cascade hops (dry hop)
White Labs WLP007 (Dry English Ale) or Wyeast 1098 (British Ale) yeast (3.5 qt./3.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

To make this beer, you will need a partial mash vessel capable of holding 6 lbs. (2.7 kg) of grain — 3 gallons (11 L) or larger. Mash grains at 152 °F (67 °C) for 45 minutes. Recirculate and collect 3 gallons (11 L) of wort. Combine collected wort with dried malt extract in brewpot. (Boil a larger volume, if you can, and don't let the volume of the boil drop below 3 gallons/11 L during the boil.) Boil wort 90 minutes, adding hops at times indicated. Add sugars and liquid malt extract with 15 minutes left in boil. Chill wort and transfer to fermenter. Top up to 5 gallons (19 L), aerate and pitch yeast sediment from starter. Ferment at 68 °F (20 °C). Dry hop beer in secondary for 7 days.

Snake River Brewing Ol' Stinky's Strong Ale clone

(5 gallons/19 L, all-grain)

OG = 1.076 FG = 1.014
IBU = 68 SRM = 23 ABV = 8.1%

Ingredients

14.25 lbs. (6.5 kg) pale malt
18 oz. (0.50 kg) Munich malt (7 °L)
8.0 oz. (0.23 kg) Caramunich® (35 °L)
6.4 oz. (0.18 kg) Caraaroma® (150 °L)
1.6 oz. (45 g) roasted barley
8.25 AAU Chinook hops (90 mins) (0.75 oz./21 g of 11% alpha acids)
1.0 oz. (28 g) Chinook hops (0 mins)
0.50 oz. (14 g) Centennial hops (0 mins)
0.75 oz. (21 g) East Kent Goldings hops (dry hop)
0.25 oz. (7 g) Columbus hops (dry hop)
Wyeast 1056 (American Ale) yeast (3 qt./3 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Two or three days before brewing, make a yeast starter. (OG 1.015 to 1.020, aerated thoroughly before pitching the yeast. Ferment yeast starter in the mid 70s °F/~24 °C.)

On brew day, mash in at 149 °F (65 °C) in 20 qts. (19 L) of water and hold for 25 minutes. Vorlauf for 20 minutes, then begin collecting your wort. Sparge with water hot enough to make the grain bed temperature rise to 170 °F (77 °C) by the end of wort collection. (Or, mash out to 170 °F/ 77 °C and sparge with water hot enough to keep the grain bed at that temperature.) Collect at least 8.0 gallons (30 L) of wort (or monitor runnings and stop collecting wort when the specific gravity drops below 1.010). Boil wort for 2 hours (or until volume is reduced to 5 gallons/19 L). Add hops at times indicated in the ingredient list. After the boil, stir wort and wait 15 minutes before beginning to chill wort. (Alternately, add the 0

STRONG ALE clone recipes

minute hop additions with 15 minutes left in the boil and skip the whirlpool.) Primary fermentation may take about 3 weeks at 70 °F (21 °C). Dry hop after fermentation is complete.

Snake River Brewing Ol' Stinky's Strong Ale clone

(5 gallons/19 L, extract with grains)

OG = 19 FG = 3.5
IBU = 68 SRM = 23 ABV = 8.1%

Ingredients

3.75 lbs. (1.7 kg) Coopers Light dried malt extract
5.0 lbs. (2.3 kg) Alexander's Pale liquid malt extract (late addition)
18 oz. (0.50 kg) Munich malt (7 °L)
8.0 oz. (0.23 kg) Caramunich® (35 °L)
6.4 oz. (0.18 kg) Caraaroma® (150 °L)
1.6 oz. (45 g) roasted barley
8.25 AAU Chinook hops (90 mins) (0.75 oz./21 g of 11% alpha acids)
1.0 oz. (28 g) Chinook hops (0 mins)
0.50 oz. (14 g) Centennial hops (0 mins)
0.75 oz. (21 g) East Kent Goldings hops (dry hop)
0.25 oz. (7 g) Columbus hops (dry hop)
Wyeast 1056 (American Ale) yeast (3 qt./3 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Place crushed grains in a steeping bag. Steep grains at 149 °F (65 °C) in 3.2 qts. (3.0 L) of water for 45 minutes. While grains are steeping, heat 2 gallons (7.6 L) of water to a boil in a separate pot. Lift bag and place in colander over brewpot. Pour "grain tea" through bag in colander (to strain out any solids in the wort), then rinse grain bag with 1.5 qts. (1.4 L) of water at 170 °F (77 °C). Add water heated separately to make at least 3.0 gallons (11 L) to wort. Add dried malt extract and boil wort for 90 minutes, adding hops at times indicated. Add liquid malt extract in final 15 minutes of the boil. At the end of boil, stir wort to get it spinning and let sit for 15 minutes before chilling. Chill wort and transfer to fermenter. Top up to 5.0 gallons (19 L), aerate and pitch yeast. Ferment at 70 °F (21 °C). Dry hop beer for 7 days after primary fermentation is complete.

Empire Brewing Company American Strong Ale clone

(5 gallons/19 L, all-grain)

OG = 1.078 FG = 1.016
IBU = 78 SRM = 26 ABV = 8.5%

Ingredients

15.5 lbs. (7.0 kg) Thomas Faucett Maris Otter malt
4.0 oz. (0.11 kg) Thomas Faucett chocolate malt
2.0 oz. (57 g) Thomas Faucett roasted barley
13 AAU Galena hops (60 min) (1.0 oz./28 g of 13% alpha acids)
6 AAU Nugget hops (30 min) (0.5 oz./14 g of 12% alpha acids)
4.5 AAU Amarillo® hops (15 min) (0.5 oz./14 g of 9% alpha acids)
4.5 AAU Amarillo® hops (10 min) (0.5 oz./14 g of 9% alpha acids)
4.5 AAU Amarillo® hops (5 min) (0.5 oz./14 g of 9% alpha acids)
0.5 oz. (14 g) Amarillo® hops (0 mins)
1.0 oz. (28 g) Galena hops (dry hop)
0.75 oz. (21 g) Amarillo® hops (dry hop)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis US-05 yeast
1 cup corn sugar (for priming)

Step by Step

Two or three days before brewing, make a yeast starter. (OG 1.015 to 1.020, aerated thoroughly before pitching the yeast. Ferment yeast starter in the mid 70s °F/~24 °C.)

On brew day, mash in at 152 °F (67 °C) in 20 qts. (19 L) of water and hold for 60 minutes. Recirculate until wort clears, then begin collecting your wort. Sparge with water hot enough to make the grain bed temperature rise to 170 °F (77 °C) by the end of wort collection. (Or, mash out to 170 °F/77 °C and sparge with water hot enough to keep the grain bed at that temperature.) Collect at least 8.0 gallons (30 L) of wort (or monitor runnings and stop collecting wort when the specific gravity drops below 1.010). Boil wort for 90 minutes (or until volume is reduced to 5 gallons/19 L). Add hops at times indicated in the ingredient list. Ferment at 68–70 °F (20–21 °C). Dry hop for 2 weeks at 35-40 °F (1.6–4.4 °C).

Empire Brewing Company American Strong Ale clone

(5 gallons/19 L, extract with grains)

OG = 1.078 FG = 1.016
IBU = 78 SRM = 26 ABV = 8.5%

Ingredients

1 lb. 10 oz. (0.74 kg) Thomas Faucett Maris Otter malt
4.0 lbs. (1.8 kg) Muntons Light dried malt extract
5.0 lbs. (2.3 kg) Muntons Light liquid malt extract (late addition)
4.0 oz. (0.11 kg) Thomas Faucett chocolate malt
2.0 oz. (57 g) Thomas Faucett roasted barley
13 AAU Galena hops (60 min) (1.0 oz./28 g of 13% alpha acids)
6 AAU Nugget hops (30 min) (0.5 oz./14 g of 12% alpha acids)
4.5 AAU Amarillo® hops (15 min) (0.5 oz./14 g of 9% alpha acids)
4.5 AAU Amarillo® hops (10 min) (0.5 oz./14 g of 9% alpha acids)
4.5 AAU Amarillo® hops (5 min) (0.5 oz./14 g of 9% alpha acids)
0.5 oz. (14 g) Amarillo® hops (0 mins)
1.0 oz. (28 g) Galena hops (dry hop)
0.75 oz. (21 g) Amarillo® hops (dry hop)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis US-05 yeast
1 cup corn sugar (for priming)

Step by Step

Steep grains at 152 °F (67 °C) in 3.0 qts. (28 L) of water for 1 hour. Boil wort for 90 minutes, adding hops at times indicated. Add dried malt extract at beginning of boil, add liquid malt extract in the final 15 minutes of the boil. Ferment at 68–70 °F (20–21 °C). Dry hop for 2 weeks at 35-40 °F (1.6–4.4 °C).

STRONG ALE clone recipes

Stewart's Brewing Company McBride's Strong Ale clone

(5 gallon/19 L, all-grain)

OG = 1.075 FG = 1.015
IBU = 30 SRM = 17 ABV = 7.8%

Ingredients

12 lbs. (5.4 kg) Crisp Pale Malt (or other English pale malt)
12 oz. (0.34 kg) Crisp Dark Crystal Malt (77 °L)
0.75 oz. (21 g) Crisp Chocolate Malt
0.75 oz. (21 g) Crisp Roasted Barley
10 oz. (0.28 kg) Crisp Wheat Malt
1.0 lb. (0.45 kg) sucrose (table sugar)
4.25 AAU Northern Brewer hops (60 mins)
(0.5 oz./14 g of 8.5% alpha acids)
3.15 AAU Mt. Hood hops (30 mins)
(0.75 oz./21 g of 4.2% alpha acids)
11 AAU East Kent Goldings hops (10 mins)
(2.0 oz./57 g of 5.5% alpha acids)
English ale yeast (your choice)
0.75 cups corn sugar (for priming)

Step by Step

Mash grains at 156 °F (69 °C) for 60 minutes. Lauter and sparge to collect 5.75 gallons (22 L) at 1.071. Boil 60 minutes, add sucrose with 20 minutes remaining. Ferment with Ringwood Ale, Whitbread, Fuller's, or your favorite earthy, malt-accentuating English yeast. Primary fermentation should last 1–2 weeks at 68 °F (20 °C). Condition in secondary fermentation for 2 weeks at 60 °F (16 °C). Option: Age the beer an additional month or two on 1 oz. (28 g) of oak chips.

Stewart's Brewing Company McBride's Strong Ale clone

(5 gallon/19 L, extract with grains)

OG = 1.075 FG = 1.015
IBU = 30 SRM = 17 ABV = 7.8%

Ingredients

8.0 oz. (0.23 kg) Crisp Pale Malt (or other English pale malt)
3.0 lbs. (1.4 kg) Muntons Light dried malt extract
4.5 lbs. (2.0 kg) Muntons Light liquid malt extract (late addition)
12 oz. (0.34 kg) Crisp Dark Crystal Malt (77 °L)
0.75 oz. (21 g) Crisp Chocolate Malt
0.75 oz. (21 g) Crisp Roasted Barley
10 oz. (0.28 kg) Crisp Wheat Malt
1.0 lb. (0.45 kg) sucrose (table sugar)
4.25 AAU Northern Brewer hops (60 mins)
(0.5 oz./14 g of 8.5% alpha acids)
3.15 AAU Mt. Hood hops (30 mins)
(0.75 oz./21 g of 4.2% alpha acids)
11 AAU East Kent Goldings hops (10 mins)
(2.0 oz./57 g of 5.5% alpha acids)
English ale yeast (your choice)
0.75 cups corn sugar (for priming)

Step by Step

Steep grains at 156 °F (69 °C) in 3.0 qt. (2.8 L) of water for 60 minutes. Boil wort 60 minutes, adding hops at times indicated. Add dried malt extract at start of boil. Add sucrose and liquid malt extract with 20 minutes left in the boil. Ferment with your favorite earthy, malt-accentuating English yeast. Ferment at 68 °F (20 °C). Condition in secondary for 2 weeks at 60 °F (16 °C). Option: Age an additional month or two on 1 ounce oak chips.

Baird Brewing Belgian Strong Pale Ale clone

(5 gallons/19 L, all-grain)

OG = 1.071 FG = 1.009
IBU = 30 SRM = 5 ABV = 8%

Ingredients

9.0 lb. (4.0 kg) Bohemian Pilsner malt (floor-malted)
2.25 lb. (1.0 kg) German Munich II malt
0.75 lb. (340 g) German light wheat malt
0.50 lb. (230 g) German rye malt
0.25 lb. (110 g) unmalted wheat
1.25 lb. (570 g) candi sugar (or white table sugar) (5-10 mins)
5.5 AAU Nugget hops (75 mins)
(0.5 oz./14 g of 11.0% alpha acids)
3.2 AAU Motueka hops (45 mins)
(0.5 oz./14 g of 6.4% alpha acids)
2.85 AAU Tradition hops (25 min)
(0.5 oz./14 g of 5.7% alpha acids)
1.25 AAU East Kent Golding hops (15 mins)
(0.25 oz./7 g of 5.0% alpha acids)
0.95 AAU Spalter hops (15 mins)
(0.25 oz./7 g of 3.8% alpha acids)
0.25 oz. (7 g) Tettnanger hops (5 mins)
0.25 oz. (7 g) Saaz hops (5 mins)
0.25 oz. (7 g) Hersbrucker hops (0 mins)
0.25 oz. (7 g) Styrian Golding hops (0 mins)
0.25 oz. (7 g) East Kent Goldings hops (dry hops)
0.25 oz. (7 g) Spalter hops (dry hops)
0.25 oz. (7 g) Tettnanger hops (dry hops)
0.25 oz. (7 g) Saaz hops (dry hops)
0.25 oz. (7 g) Hersbrucker hops (dry hops)
0.25 oz. (7 g) Styrian Golding hops (dry hops)
White Labs WLP410 (Belgian Wit II) yeast
5.0 oz. (140 g) white sugar or corn sugar (for priming)

Step by Step

Mash at 149 °F (65 °C) for 90 minutes. Sparge with enough water to allow for 20 liters (5.2 gal.) in the fermenter after a 90 minute boil (5 gal./19 L of finished beer). Chill wort to 72 °F (22 °C) and let temperature rise during the first 12–24 hours to 75 °F (24 °C). Maintain temperature for 7–10 days until fermentation finishes. Chill to 59 °F (15 °C), transfer and dry hop for 5–7 days, keeping temperature between 59–68 °F (15–20 °C). Chill to 45 °F (8 °C) before bottling or kegging. Condition cold for several months.

believe that this is a style that is open to interpretation," Butler says. "My idea of a strong ale is a beer that is dark, with a malty backbone and a significant hop character, noticeable hop aroma, a balancing bitterness and a pure hop flavor. The ABV should be between 7.5 and 9 percent."

Empire's American Strong Ale begins with English malts by Thomas Faucett (American strong ales have roots in its English counterparts), but with a heavy infusion of American hops and clean-fermenting American ale yeast strain.

McBride's Ale, brewed at Stewart's Brewing Co. in Delaware, is close to a traditional English style, with earthy English East Kent Golding hops and roasted barley, pale and dark malts and some wheat malt for added body. "I would call ours a 'Classic' English Strong, because it isn't as aggressive as the more modern examples out there," says Stewart's Head Brewer, Ric Hoffman.

Chris Poel, Lead Brewer at Baird Brewing in Numazu, Japan produces a Belgian Strong Pale Ale that's markedly different from the Empire and Stewart examples. His beer relies on a light body and mild hop character, but features a spiciness and subtle esters from a Belgian yeast strain that adds "just enough complexity without becoming too over-the-top with phenolics," he says.

Then there's Oceanside Ale Works' American Strong Ale. Head Brewer Mark Purciel considers his beer a hybrid of all three styles.

"It has the malt richness of the English without the high alpha acids from the hops in an American variety," Purciel says. "It has the neutral yeast as an American, but candi sugar as an adjunct with a Belgian."

Try This At Home!

Whatever the semantics, all the brewers interviewed here agree strong ale can easily be accomplished at home — either as an all-grain beer or brewed using malt extracts. Once a type — English, Belgian or American — is selected, the brewing process mostly follows "ordinary" brewing steps. For strong ales that are supposed to be reminiscent of a regional style, it's important to use specialty malts and hops typical of the region. But it's possible, of course, to substitute alternatives and brew an ale that is not inspired by a specific brewing tradition.

Boosting the Alcohol Content

A key aspect to these beers is the alcohol content. Several of the recipes presented here add sucrose or candi sugar to help boost the fermentables and drive the alcohol level up.

"Homebrewers seem to have an aversion to using sugar, but it's a normal part of the grain bill for many Belgian beers," Poel says, noting that his brew has a "healthy dose of light candi sugar."

White table sugar is an acceptable

substitute, and Hoffman notes that demerara — natural brown sugar — is also acceptable.

Additionally, selecting the right malt extract (if applicable) can be crucial in attaining the proper style color while assuring plenty of fermentables remain. Adding these at the right time can make a big difference as well — shorter boil times means lighter colors in the finished beer.

"For brewers doing a concentrated boil, using late extract additions and sugar additions will help a lot," Poel says. "Try adding only ⅓ of the extract at the beginning of the boil, saving the final ⅔ and all the sugar until right near the end, say 5–10 minutes before knockout. This will keep the color light while still providing enough sugar to get the alcohol levels up where they need to be."

Butler agrees, adding: "I think the best way to get the right color is to use extra light malt extract for fermentable sugars and ground specialty malts steeped in the kettle before boiling for color. That way, the brewer has much more control of the color and flavor of the beer, and the extract is used basically for fermentables."

The best bet for extract brewers is to boil their full volume of wort, provided they can maintain a full rolling boil and cool that volume quickly afterwards. If boiling your wort on your stovetop, boil as much as you can handle — thicker worts will pick up more color during the boil.

For all-grain brewers, Poel's mashing advice reflects the attitude of the Ramon character in the Pixar movie Cars — take it low and slow.

"Mash long and low," he says. "This will provide not only more flavor, but will also draw out every bit of carbohydrates and sugars needed for a strong fermentation. We mash at 149 °F (65 °C) for 90 minutes, but don't be afraid to go longer. Or even consider a step mash, 30–45 minutes at 140 °F (60 °C) and 45–60 minutes at 149 °F (65 °C)."

With more grain (compared to the grain bill of an average-strength ale), all-grain brewers will be able to collect more wort and, as such, have a deci-

sion to make. They can collect wort until the specific gravity of the runnings falls below 1.008–1.010, then take the time to boil the wort down to their target volume. If you are used to collecting around 6.5 gallons (25 L) of wort for a 5% ABV ale, you could collect up to 10–12 gallons (39–44 L) of wort for an 8–9% ABV ale.

Alternately, they can collect the same volume of wort as when brewing an average-strength ale and accept that their extract efficiency will take a bit of a hit, since they will be leaving some sugars behind in the grain bed.

Pitch Perfect

However one reaches this point, when it's time to pitch, an important aspect is making sure the yeast is happy. For a strong ale, an alcohol tolerant yeast strain is best (although you'd be hard pressed to find a strain that couldn't handle 9% alcohol). It's more important to pitch a substantial amount of yeast to assure proper attenuation. Some advocate pitching two or three packages of liquid yeast, others say a large yeast starter should do the trick.

"We pitch 50–60% more yeast for a beer of this strength compared to a regular-strength ale," Poel says.

If you're brewing an ale in the 8–9% ABV range, making a 3–4 qt. (~3–4 L) yeast starter, and aerating it well should raise a sufficient amount of yeast for the fermentation to start quickly and reach a proper final gravity.

Fermentation temperatures are also important. If temperatures can get too hot, the yeast can walk off the job.

"Believe it or not, when our temperature has reached above our threshold, we have had the yeast crap out early," Purciel says. "Ferment at the optimum temperature the yeast manufacturer recommends."

You should especially keep an eye on fermentation temperatures right around high kräusen; that's when they are most likely to climb too high.

Should the fermentation slow too much, rousing can help bring the process back to life, but the possibility for a second pitch also exists.

"Yep, we have done it," Purciel adds. "If (fermentation) is slowing down and it doesn't seem you will get anywhere near your target FG, then go and repitch."

Chill Out

Being a hearty brew, strong ales can benefit from some time in isolation — that is, in a secondary fermentation stage — to allow the flavors to merge and the residual yeast to "clean up" any unfermented sugars. This will also help reduce the esters that are frequently present in high-alcohol beers. Do a two-day diacetyl rest at approximately 68 °F (20 °C), then rack to the secondary and begin the cooling phase.

If dry hopping is involved, Poel recommends keeping the secondary at a warmer temperature for about a week to allow for better extraction of the hop oils.

"If you have the time, I would store cool (50 °F/10 °C) or cold (35 °F/2 °C) for at least a month to let the fusel alcohol flavors simmer out a bit," says Rob Denton, Assistant Brewer at Snake River Brewing Company & Brewpub in Jackson, Wyoming. "Even longer is better."

Butler agrees, "This type of beer will benefit from a secondary, or conditioning phase, especially if it is going to be dry hopped. This cold maturation temperature will meld the flavors and allow the yeast to flocculate."

Hurry Up And Wait

Strong ales will benefit from bottle aging. While every brewer is anxious to sample his or her latest creation, holding out 4–6 weeks will create a better product. As an experiment, mark some bottles to be sampled only after 3, 4, 6 or even 12 months to see how flavors change. Then it will be obvious the wait was worth it.

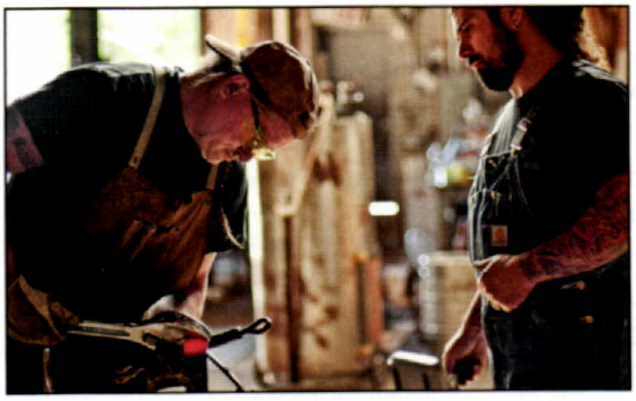
But no matter how long you hold out, a strong ale will be a robust brew, loaded with flavor and complexity. It's not necessarily a session beer — knocking back a few might make that stool a bit wobbly — but a fine session can be had lingering over any of these strong ale styles. BYO

Glenn BurnSilver is a frequent contributor to Brew Your Own *magazine.*

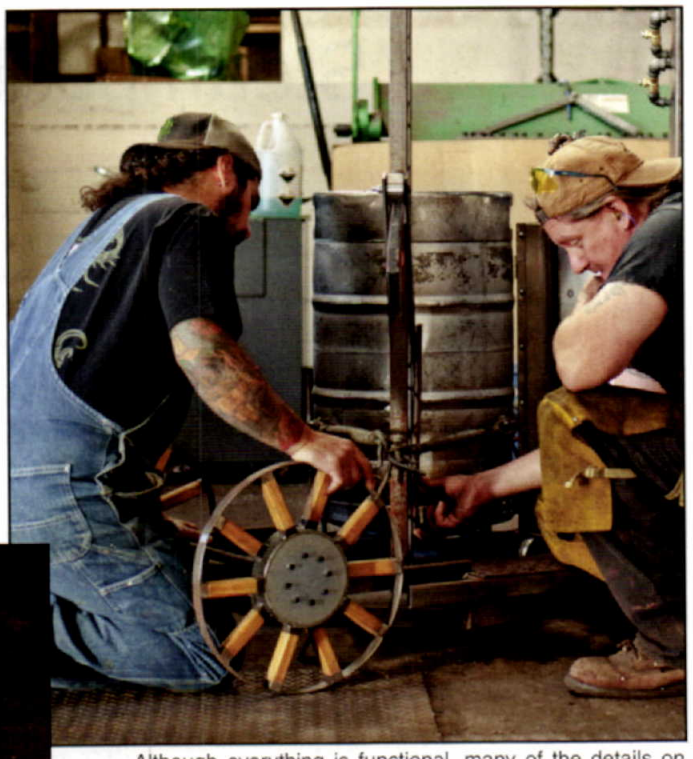
Photos courtesy of Mike Shane

Steampunk Brewery

Story by Glenn BurnSilver

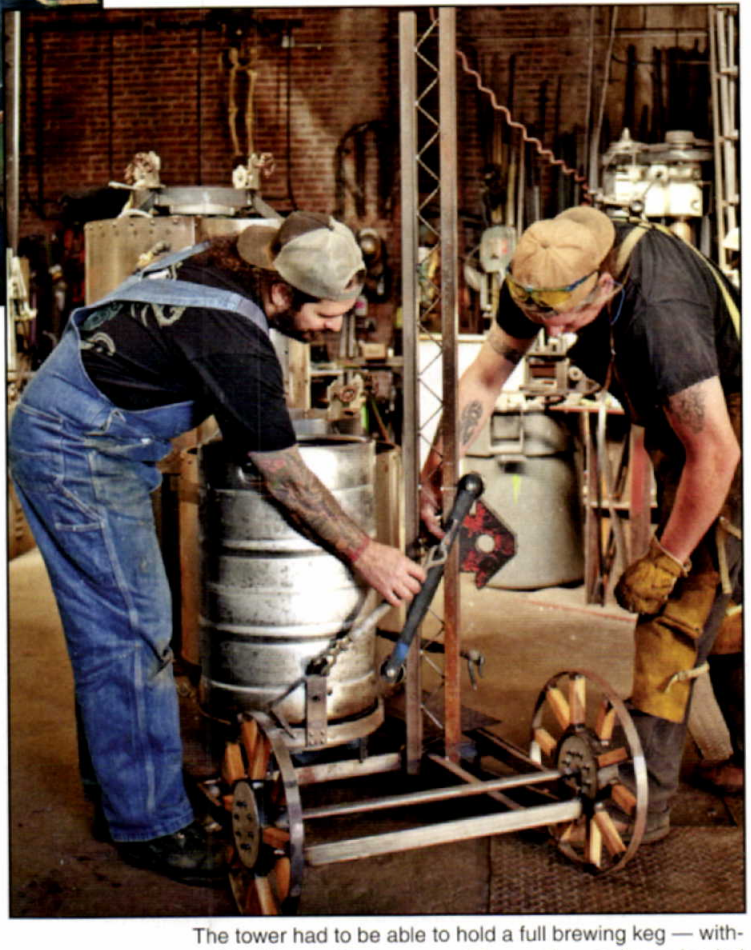


Scott Van Campen and Mark Zappasodi finished their steampunk-influenced brewery, which they called Brewing as Art, during weekends spanning nine months.



Although everything is functional, many of the details on the rig, including the wheels, give it a Victorian-era industrial feel — the "art" in Brewing as Art.

Van Campen did the metal work, but the brewer Zappasodi picked up a lot of know-how during the project.



The tower had to be able to hold a full brewing keg — without buckling or tipping, even if bumped — as it was hauled to the top of the brewing rig.

Building the rig took a lot of teamwork, and Zappasodi compares a team consisting of a brewer and welder to chocolate and peanut butter.

Steampunk Recipes

Smoked "Imp" Imperial Stout (5 gallons/19 L, all-grain)

OG = 1.092 FG = 1.018
IBU = 55 SRM = 57 ABV = 9.6%

I like to make my imperial stouts on the dry/thin side so I mash low, but feel free to raise your mash temperature, or add some rolled oats for more of a "wet" stout with added mouthfeel. I also purposely used lighter sugar, specialty malts and a clean yeast strain to let the smoked malt shine.- Mark Zappasodi

Ingredients

11.5 lbs. (5.2 kg) Crisp Maris Otter malt
1.5 lbs. (0.68 kg) Caramunich® Type I malt
1.0 lb. (0.45 kg) crystal malt (60 °L)
8.0 oz. (0.23 kg) light chocolate malt
8.0 oz. (0.23 kg) roasted barley
2.0 lbs. (0.91 kg) Briess Cherry Wood Smoked Malt
1.0 lb. (0.45 kg) light brown sugar (15 mins)
¼ cup molasses (0 mins)
½ tsp. Wyeast yeast nutrient (10 mins)
1 WhirlFloc® tablet (15 mins)
5.5 AAU Galena hops (FWH) (0.5 oz./14 g of 11% alpha acids)
11 AAU Galena hops (90 mins) (1 oz./28 g of 11% alpha acids)
1 oz. (28 g) Fuggle hops (0 mins)
White Labs WLP001 California Ale (1 qt./1 L yeast starter)

Step by Step

Mash in with 166–168 °F (74–76 °C) water to settle at 149–150 °F (65–66 °C) for 60 minutes. Raise temperature to 168–170 °F (76–77 °C) for ten minutes. Sparge with 175 °F (79 °C) water for 60–90 minutes. Add first wort hops and collect at least 7 gallons (26 L) of wort to be boiled for 90 minutes. Cool quickly to 65 °F (18 °C) and pitch yeast. Let temperature raise naturally to between 68 and 70 °F (20–21 °C) and hold. This beer should take 7 to 10 days to complete and then rack to secondary for a week to ten days. Keg at 10 PSI or bottle with 1 cup of corn sugar in 750 mL corked and hooded bottles. This beer will age well for years or can be consumed in a few weeks after bottling.

Smoked "Imp" Imperial Stout (5 gallons/19 L, partial mash)

OG = 1.092 FG = 1.018
IBU = 55 SRM = 57 ABV = 9.6%

Ingredients

0.5 lbs. (0.23 kg) Crisp Maris Otter malt
1.5 lbs. (0.68 kg) Caramunich® Type I malt
1.0 lb. (0.45 kg) crystal malt (60 °L)
8.0 oz. (0.23 kg) light chocolate malt
8.0 oz. (0.23 kg) roasted barley
2.0 lbs. (0.91 kg) Briess Cherry Wood Smoked Malt
1.0 lb. (0.45 kg) light brown sugar (15 mins)
¼ cup molasses (0 mins)
6.0 lbs. (2.7 kg) Muntons Light dried malt extract
½ tsp. Wyeast yeast nutrient (10 mins)
1 WhirlFloc® tablet (15 mins)
5.5 AAU Galena hops (FWH) (0.5 oz./14 g of 11% alpha acids)
11 AAU Galena hops (90 mins) (1 oz./28 g of 11% alpha acids)
1 oz. (28 g) Fuggle hops (0 mins)
White Labs WLP001 (California Ale), Wyeast 1056 (American Ale) or Fermentis US-05 yeast (3 qt./3 L yeast starter)

Step by Step

For the partial mash adaptation of this recipe, you will need a 3.0-gallon (11-L) beverage cooler (with a spigot) and a grain bag capable of holding 6.0 lbs. (2.7 kg) of grain. Place crushed grains in the large steeping bag and place in the cooler. Heat 8.2 qts. (7.8 L) of water to 161 °F (72 °C) and stir into grains so that the temperature hits 149–150 °F (65–66 °C). Place lid on cooler and hold at this temperature for 60 minutes. Collect wort and sparge with 190 °F (88 °C) water by drawing off 2–3 cups (470–710 mL) of wort and adding it to your brewpot, then gently pouring the same amount of hot water to the top of the grain bed in the cooler. Repeat until you have collected 3.0–3.5 gallons (11–13 L) of wort. Add first wort hops (FWH) while collecting wort. Add roughly half of the malt extract and boil wort for 90 minutes. (Keep some boiling water handy and don't let the boil volume dip below 3.0 gallons/11 L.) Add hops at times indicated and carefully stir in remaining malt extract in final 15 minutes of the boil. Cool wort quickly to 65 °F (18 °C) and pitch yeast. Let temperature raise naturally to between 68 and 70 °F (20–21 °C) and hold. This beer should take 7 to 10 days to complete and then rack to secondary for a week to ten days. Keg at 10 PSI or bottle with 1 cup of corn sugar in 750 mL corked and hooded bottles. This beer will age well for years or can be consumed in a few weeks after bottling.

Tips for Success

When making a dark beer, water chemistry can make the difference between a beer that seems too acidic and one in which the roasted flavors taste pleasant. If you were starting from distilled water, adding 0.25 oz. (7.1 g) of calcium carbonate (chalk) and 0.25 oz. (7.1 g) of sodium bicarbonate (baking soda) per 5 gallons (19 L) of brewing liquor (brewing water) would benefit this beer. (If you have a pH meter, check the mash pH. It should fall between 5.2 and 5.6.)

Also, as with any big beer, thorough wort aeration, adding some yeast nutrients in the boil and making a yeast starter will yield a better fermentation.

Like any good collaboration, Staten Island, New York neighbors Scott Van Campen and Mark Zappasodi's "Brewing as Art" — a fully functional, gravity-fed brewing apparatus on wheels that happens to look like something from a Victorian-era horror movie set — began over beer.

"We were hanging out having some beers and talking about the art of beer making and the creative processes behind it and actually how similar it was to what I do with my work. It's the same process, different ingredients," Van Campen, 43, owner of New York Custom Fabricators, recalls.

"We said, 'Hey, wouldn't it be cool to make something that was just over the top really cool looking and functional that makes beer?' That's really how it started," he continues.

"Then, it was like, 'what if it was mobile?'" says Mark Zappasodi, 42 — the self-described "obsessed" homebrewer.

The pair began making plans to build their adventurous device and concluded their idea was artistic enough on two levels — brewing and metallurgy — to seek a grant from the Staten Island Council on Arts and the Humanities, which helps fund projects from local artists.

The pair submitted pictures of Zappasodi brewing and Van Campen doing metal work. The application's required "work sample" became a six-pack of Zappasodi's homebrew delivered in a custom carrier Van Campen fabricated to look like an old milk jug-style holder with wire handles.

"So it was proven we could work together," Van Campen says with a laugh. "But I think there were some grumblings in the art community that the council is funding people to make beer now. They weren't upset with this, but sort of taken back that 'Oh, that's not really art.' That lit a fire under us that we really did need to make sure this came off right, and not just something making beer, but one with esthetic qualities to it."

Design 101

The council grant stipulated the project be completed in one year. Given that Van Campen's days were filled at his shop and Zappasodi worked nights as a union painter, the pair, who lived only five minutes apart (Zappasodi recently relocated to a family farm in rural Massachusetts), relied on their Sundays — nine months worth to be exact — to do everything from initial design to final fabrication and testing.

"We'd have a bagel and coffee and sketch out some ideas, how we'd do the plumbing, etc. It was piece by piece. We took our time," Van Campen says.

The pair decided the machine would be best served both artistically and practically with a steampunk esthetic, that can best be described as something integrating modern technology with a decidedly Victorian and industrial age look and feel.

"A lot of my work has an industrial slant to it," Van Campen says.

"I've always liked the look of bridges with big rivets. The industrial look of the Victorian age is really pleasing to me. And I always liked the steampunk look," he continues.

The sculpture eventually used steel, aluminum, stainless steel and wood, but before the pair could begin utilizing the piles of scrap materials in Van Campen's shop (in fact, almost the entire machine was fabricated out of recycled materials) a structural design was needed.

To do this, Zappasodi invited Van Campen over for a brewing session. Working off the brewing station layout, a design model was formulated.

"We decided to mold it around my brewery set up at home: Two coolers, mash lauter, boil pot," Zappasodi says. "Scott came over a couple times and took notes and measured out how I brew, and we envisioned it on the sculpture."

Thus, like Zappasodi's home system, Brewing as Art is a gravity fed system that doesn't require pumps or electricity — an important aspect of the project as the goal was to be able to brew anywhere.

"Everything has to be done by

hand. Nothing is automated, there are no pumps. It's very streamlined," Zappasodi says.

The tallest tower at the machine's frontend features a propane-fired hot liquor tank on top with the mash lauter in the middle feeding into the boil pot below. Once the boil's complete, the wort is lifted via a hand-cranked pulley, drained through a heat exchanger and into a demijohn for fermentation.

"I just fell in love with it. It was perfect," Van Campen adds of the demijohn that Zappasodi sourced by trading a couple of traditional six-gallon (23-L) carboys for it. "It has that mad scientist beaker look."

While this system, which can brew up to 12 gallons (45 L) at one time, sounds straight forward enough, Zappasodi and Van Campen realized that hoisting a barrel of boiling liquid in the air could be problematic — as many homebrewers can no doubt attest. The first thing they built was the tower used to lift the boil pot to drain into fermentation. Attaching it to a table, a keg was filled with water and lifted to see if their plan would work.

"You'd be amazed at how quickly a barrel full of liquid can twist a heavy piece of metal," Zappasodi exclaims.

A heavier piece of steel was utilized, but still, as a mobile unit, there were concerns with overall safety while brewing in a public setting.

"Safety is a big issue as we're going to have 10 gallons (38 L) of boiling water and high in the air. What's going to stop it from spilling? Or if we do a public brew, what if somebody bumps into it?" Van Campen asks.

"That's why there are some handles; they crank down and actually hold the kegs on the burners. They are not going to fall off."

Propane tanks are stored in the tower and almost all plumbing is hidden from view for a clean look. As the brew machine slowly came to life like a modern day Frankenstein — old rivets here, leftover wood handles there, cast-off wheels — the pair realized they would have to use modern day kegs for the liquid portions of the process. Kegs weren't around in the industrial age but, as Van Campen explains, the steampunk esthetic of modern technology with Victorian age looks made the use of kegs within the realm of possibility.

"It makes sense to use them in a lot of respects," he says. "One, the volume. The size of the machine we were looking for, we wanted to do 10-gallon (38-L) batches. And although stainless steel 100 years ago wasn't a commonly used or readily available material, we tried to cover that look (with some copper wrapping)."

"And cleanliness was a big factor," Zappasodi adds. "We wanted something that would work and be able to be cleaned and produce good beer."

Zappasodi admits not quite everything was recycled. Gauges, clocks, burners and thermostats were purchased to save time and energy.

"At some point we knew we had to rein it back a little bit," he says. "Scott actually wanted to make the clocks and thermostats on it. It's not that he couldn't do it, but how much time did he really want to spend on this? For simplicity sake and time we cut back some of our ideas, but I think it was best that we did. It could have been overdone."

Brewing on Art

Zappasodi has brewed about a dozen batches on Brewing as Art, from Belgian ales to IPAs, stouts to pumpkin beers, with a modicum of success. A few brews have been made in public settings at festivals and fairs — where passersby are both surprised and impressed by their creation — but most of the brewing has occurred with the machine parked at home or in Van Campen's metal shop.

While he is "really happy" with how the machine performs, Zappasodi notes that it's not all perfect. The burners are too airtight under the tanks, causing the occasional mash scorching. He's tried using a false bottom, but then has to deal with slower sparge times. He's also had to make other minor adjustments using kegs for mashing.

"I'd never mashed in a keg before, only coolers. Coolers are pretty efficient and you can get every drop out of them," he says. "With kegs you have that little pocket on the bottom so it does change the dynamic. You use a little more water, and there's a little more waste. But scaling up fixed that. It required a little bit of tweaking, but it wasn't dramatic. The gravity might have fallen off slightly, say 6.5% (ABV) instead of 7% or 7.2%."

"Really, there haven't been any sort of issues," he adds. "It's actually very efficient. I've been getting somewhere in the 80 to 85 percent efficiency range."

Both men admit there's more they'd like to do to Brewing as Art, such as add hard lines for water intake and outtake, maybe install a copper wort chiller (fitting the steampunk ideal) and adding bigger wheels for increased mobility.

"There are things we'd still like to execute on it, but we just haven't got there yet," Zappasodi says.

The pair also agree the whole process proved to be an enjoyable and educational experience, and serves as a testament to the friendship they have forged over the years.

"I had never brewed before, so it was a big learning process for me about beer making," Van Campen says. "And Mark, I think he learned a fair bit more about metal working than anyone anticipated."

"A welder and a brewer that are on the same page?" Zappasodi concludes. "It's just like chocolate and peanut butter, you know." BYO

Glenn BurnSilver is a frequent contributor to Brew Your Own *magazine.*

Photos courtesy of Sierra Nevada Brewing Co.

SIERRA NEVADA

Story by **Sean Z. Paxton**

About twelve years ago, I first met Sierra Nevada Brewing Company Founder Ken Grossman at the Northern California Homebrew Festival in Napa, California. Ken was the keynote speaker. His talk began with sharing the mistakes he had made over the years at Sierra Nevada. One of the many stories that surprised me related to when Sierra Nevada had grown to need a bigger bottling line. After purchasing a bottling line through an ad, sight unseen, Ken found that it was not in working order upon arrival. Without the funds to be able to buy a new bottle line, Ken had to figure out a way to make it work. To make matters worse, the company that created the bottling line, was no longer in business and the parts didn't exist to make it operable. So he took classes on refrigeration at a local trade college, and spent quite a bit of time in every welding class offered, to hone his skills.

"We all had to learn the hard way," said Ken, "as the other breweries back then that didn't embrace that notion as well as they should have, and either ran out of money or did such a poor job of crafting their breweries that they had lots of quality problems."

To understand the impact of Ken's participation in the craft brewing industry, I talked to other craft brewers in the industry. Matthew Brynildson, Brew Master at Firestone Walker Brewing Co. commented, "I believe the craft brewing world would have a much different landscape if it were not for Ken Grossman and the Sierra Nevada Brewing Company. They have set and continue to set the standards by which the rest of us work toward."

I took some time to talk to Ken about the history and growth of Sierra Nevada. We discussed the early days of Sierra Nevada and what was available to the small brewer.

"Back in the late seventies, when I started the plant, there were no places to buy homebrew equipment and homebrewing really was at a pretty primitive state as far as the technology and information that was available. Going from a serious homebrewer to an aspiring craft brewer or small brewer, you had to do it yourself."

Ken still has the original brewing notes for Sierra Nevada Pale Ale batches one through ten. As they honed that recipe for their first commercial experiments, they changed the water salts, hop varieties and crystal malts. The Pale Ale they currently produce is almost identical to the one they brought to market back in the beginning, except for the hop varieties, but Cascade has always been the dominant hop. The barley varieties have changed, starting with Klages back in those days, then changing to Harrington, then AC Metcalfe, then to some of the newer varieties.

In 1983, Sierra Nevada began to gain a great deal of notoriety. An article highlighting Sierra Nevada's beers was written in the San Francisco Examiner about the same time they made a connection with someone who was a buyer for a big grocery store chain. The grocery chain started to promote the beer and from then on, they couldn't make enough beer to keep up with the demand.

Ken went to Germany in late 1983 to buy a brewhouse, the one that currently sits next to the pub at their Chico, California brewery right now. Yet when they bought the brewhouse, no one would lend them the money to install it. So once again, Ken had to figure out how to make his brewery come alive. He stored it in a warehouse for almost four years until he could borrow enough money to install it. So Sierra Nevada expanded from brewing three thousand barrels to almost twelve thousand barrels when they finally had enough cash to build a twentieth century brewery in 1988. The original brewery that Ken built was sold to Mad River Brewery and continues to be their brewhouse to this day.

Being a privately held company has allowed Sierra Nevada to be the kind of business they want to be. With no shareholders to answer to, Ken has been able to make choices that many breweries might not be willing or able to make. Good friends with Ken for over 10 years, Sam Calagione of Dogfish Head Craft Brewed Ales said, "Ken has been a great mentor for me, on how he kept Sierra Nevada a privately held company."

This independence has allowed Ken and Sierra Nevada to be one of the greenest breweries on the planet. With more solar panels than Google, 85% of the energy used at the brewery is generated on-site. All the methane gas that is a by-product of the waste water treatment plant, is captured and re-purposed to fire the brew kettles. Ken's philosophy of business is captured in the following comment, "I acknowledge that Sierra Nevada uses a lot of natural resources; we use water, we use energy and transportation. All of those things that it takes to make a bottle of beer and ship it to a variety of locations throughout the country. So it is important to be as responsible as we can and to try to be as efficient and use as little resources as possible and hopefully others will do the same."

Sierra Nevada currently has 450 employees, 4 of which are in charge of making the brewery more efficient, to look at new technology and improve the green infra-structure.

In another effort to highlight freshness, while also continuing to have a full circle mentality, almost 9 acres of hops are grown on the Chico campus. Cascade, Citra® and Chinook varieties can be seen from the nearby road as one drives over the freeway. There is an additional 5 acres of land used to grow 2-row barley. Both the hop and barley fields are certified organic. All the compost that fertilizes the fields comes from a compost machine that turns all the food scraps from the on-site restaurant and the spent grain into organic nutrients. The barley crop yield dictates the amount of Estate Ale that is brewed each year. The remaining house grown hops are added into the Northern Hemisphere Harvest Ale.

Sierra Nevada now has six year-round beers (Pale Ale, Torpedo, Kellerweis, Porter, Stout and Ovila Dubbel) and four seasonal brews

(Ruthless Rye IPA, Summerfest, Tumbler Autumn Brown Ale and Celebration), plus the Limited Release Series (including Bigfoot Barleywine, and Brux) and a variety of other beers.

Ken collaborated with many of his peers to celebrate Sierra Nevada turning 30. To commemorate the anniversary of the brewery, creative brews were developed with Fritz Maytag (Anchor Brewing Co.), Jack McAuliffe (New Albion Brewery), Charlie Papazian and Fred Eckhardt. Each beer is another example of Ken's willingness to promote the craft of beer and highlight his relationships, giving back to those who have shared so much with him. Vinnie Cilurzo, who worked with Ken and his son Brian Grossman on the Brux Collaboration project, said, "In my mind, Ken is the most influential person in the entire craft beer industry because of his attention to quality. Ken doesn't do anything the easy way, but he always does it the right way. No matter what it takes, quality always comes first!"

The Chico campus also has an impressive and fully equipped ten barrel brewhouse, complete with several conicals and water filters flowing all the way to a kegging line. This microbrewery is used for brewing test batches that can be easily scaled up to the 200 barrel brewhouse. This is where several test batches of Ruthless Rye IPA were brewed; one dry hopped, another batch put through a torpedo and another to tweak the recipe. Yet, this isn't the only purpose of this brewery in a brewery. Sierra Nevada's Beer Camp was created for customers, bar owners, and industry people who want to learn more about what it takes to make beer. "Beer Camp has been a real fun project for us," said Ken. "We have done over 80 different beers now. We have learned a bit and stretched our brewing horizons with the input of a bunch of people."

"That part of the business, in reality, probably doesn't make any money, but it's fun to do, it keeps some interest and builds excitement, shows what we are up to and lets us spread our wings a little bit and learn from some of our respected peers," said Ken.

Continued on page 57

SIERRA NEVADA CLONE RECIPES

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

OG = 1.052 FG = 1.011
IBU = 38 SRM = 10 ABV = 5.4%

Ingredients

10 lb. 2 oz. (4.6 kg) 2-row pale malt
11 oz. (0.30 kg) caramel malt (60 °L)
4.4 AAU Perle hops (90 mins)
(0.5 oz./14 g of 8.8% alpha acids)
6.0 AAU Cascade hops (45 mins)
(1.0 oz./28 g of 6% alpha acids)
1.5 oz. (43 g) Cascade hops (0 mins)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis US-05 yeast
(1 qt./1 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Two or three days before brew day, make the yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast.

On brew day, mash in at 155 °F (68 °C) in 14 qts. (13 L) of water. Hold at this temperature for 60 minutes. Raise mash temperature to 170 °F (77 °C), hold for 5 minutes then recirculate. Run off wort and sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Collect 6.5 gallons (25 L) of wort. (Check that final runnings do not drop below SG 1.010.) Boil wort for 90 minutes, adding hops at times indicated. Ferment at 68 °F (20 °C).

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

OG = 1.052 FG = 1.011
IBU = 38 SRM = 10 ABV = 5.4%

Ingredients

3 lb. 5 oz. (1.5 kg) 2-row pale malt
1.25 lbs (0.57 kg) light dried malt extract
3.3 lbs. (1.5 kg) light liquid malt extract
11 oz. (0.30 kg) caramel malt (60 °L)
4.4 AAU Perle hops (90 mins)
(0.5 oz./14 g of 8.8% alpha acids)
6.0 AAU Cascade hops (45 mins)
(1.0 oz./28 g of 6% alpha acids)
1.5 oz. (43 g) Cascade hops (0 mins)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis US-05 yeast
(1 qt./1 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Mash grains at 155 °F (68 °C) in 5.5 qts. (5.2 L) of water. Hold at this temperature for 45 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 90 minutes, adding hops at times indicated. Add liquid malt extract in the final 15 minutes of the boil. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C).

Sierra Nevada Pale Ale clone (5 gallons/19 L, extract with grains)

OG = 1.052 FG = 1.011
IBU = 38 SRM = 10 ABV = 5.4%

Ingredients

1 lb. 5 oz. (0.60 kg) 2-row pale malt
1.75 lbs (0.80 kg) light dried malt extract
4.0 lbs. (0.79 kg) light liquid malt extract
11 oz. (1.8 kg) caramel malt (60 °L)
4.4 AAU Perle hops (90 mins)
(0.5 oz./14 g of 8.8% alpha acids)
6.0 AAU Cascade hops (45 mins)
(1.0 oz./28 g of 6% alpha acids)
1.5 oz. (43 g) Cascade hops (0 mins)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale) or Fermentis US-05 yeast
(1 qt./1 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Place crushed grains in a steeping bag. Steep grains at 155 °F (68 °C) in 3.0 qts. (2.9 L) of water. Remove bag and place in a colander over the brewpot. Rinse grains with 2 qts. (2 L) of 170 °F (77 °C) water. Add water to brewpot to make at least 3.0 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 90 minutes, adding hops at times indicated. Keep some boiling water handy and do not let boil volume dip below 3 gallons (11 L). Add liquid malt extract in the final 15 minutes of the boil. Chill wort and transfer to fermenter. Top fermenter up to 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C).

Tips for Success

For all of the five clone beer recipes, be sure to pitch an adequate amount of yeast. The yeast starter sizes on these pages should allow you to yield the correct amount of yeast cells for a healthy fermentation. Aerate the starter well, preferably with oxygen, before pitching your yeast to the starter wort. If you aerate by shaking the starter, multiply the size of each starter by 1.33.

For the dry hopped recipes, use whole hops if you can find them for dry hopping, and perhaps for the late kettle additions. Use only the freshest hops.

For the hoppy recipes, a little sulfate in your water will accentuate the hop character of the beer. You can add sulfate ions by adding calcium sulfate (gypsum) to your brewing water. All-grain brewers starting with RO or distilled water should add 2–4 tsp. per 10 gallons (38 L) of brewing water. Extract brewers can add 1 tsp. of gypsum to the boil.

SIERRA NEVADA CLONE RECIPES

Ruthless Rye IPA clone (5 gallons/19 L, all-grain)

OG = 1.061 FG = 1.012
IBU = 55 SRM = 16 ABV = 6.6%

Ingredients

11.25 lbs. (5.1 kg) 2-row pale malt
13 oz. (0.36 kg) rye malt
11 oz. (0.32 kg) caramel malt (40 °L)
1.5 oz. (43 kg) chocolate malt
8 AAU Bravo hops (90 mins)
(0.50 oz./14 g of 16% alpha acids)
9 AAU US Magnum hops (15 mins)
(0.75 oz./21 g of 12% alpha acids)
9 AAU Chinook hops (5 mins)
(0.75 oz./21 g of 12% alpha acids)
3 AAU US Magnum hops (5 mins)
(0.25 oz./7.1 g of 12% alpha acids)
1.0 oz. (28 g) Chinook hops (dry hop)
0.5 oz. (14 g) Citra® hops (dry hop)
0.5 oz. (14 g) US Magnum hops
(dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(1.33 qt./1.33 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Two or three days before brew day, make the yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast. On brew day, mash in at 153.5 °F (67.5 °C) in 16 qts. (15 L) of water. Hold at this temperature for 60 minutes. Raise mash temperature to 170 °F (77 °C), hold for 5 minutes then recirculate. Run off wort and sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Collect 7.0 gallons (26 L) of wort. (Check that final runnings do not drop below SG 1.010.) Boil wort for 90 minutes, adding hops at times indicated. Ferment at 68 °F (20 °C). Dry hop in secondary for 5 days.

Ruthless Rye IPA clone (5 gallons/19 L, partial mash)

OG = 1.061 FG = 1.012
IBU = 55 SRM = 16 ABV = 6.6%

Ingredients

2 lb. 6 oz. (1.1 kg) 2-row pale malt
1.5 lbs (0.68 kg) light dried malt extract
4.5 lbs. (2.0 kg) light liquid malt extract
13 oz. (0.36 kg) rye malt
11 oz. (0.32 kg) caramel malt (40 °L)
1.5 oz. (43 kg) chocolate malt
8 AAU Bravo hops (90 mins)
(0.50 oz./14 g of 16% alpha acids)
9 AAU US Magnum hops (15 mins)
(0.75 oz./21 g of 12% alpha acids)
9 AAU Chinook hops (5 mins)
(0.75 oz./21 g of 12% alpha acids)
3 AAU US Magnum hops (5 mins)
(0.25 oz./7.1 g of 12% alpha acids)
1.0 oz. (28 g) Chinook hops (dry hop)
0.5 oz. (14 g) Citra® hops (dry hop)
0.5 oz. (14 g) US Magnum hops
(dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(1.33 qt./1.33 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Mash grains at 153.5 °F (67.5 °C) in 5.5 qts. (5.2 L) of water. Hold at this temperature for 45 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 90 minutes, adding hops at times indicated. Add liquid malt extract in the final 15 minutes of the boil. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Dry hop in secondary fermenter for 5 days.

Ruthless Rye IPA clone (5 gallons/19 L, extract with grains)

OG = 1.061 FG = 1.012
IBU = 55 SRM = 16 ABV = 6.6%

Ingredients

6 oz. (0.18 kg) 2-row pale malt
2.0 lbs (0.91 kg) light dried malt extract
5.25 lbs. (2.4 kg) light liquid malt extract
13 oz. (0.36 kg) rye malt
11 oz. (0.32 kg) caramel malt (40 °L)
1.5 oz. (43 kg) chocolate malt
8 AAU Bravo hops (90 mins)
(0.50 oz./14 g of 16% alpha acids)
9 AAU US Magnum hops (15 mins)
(0.75 oz./21 g of 12% alpha acids)
9 AAU Chinook hops (5 mins)
(0.75 oz./21 g of 12% alpha acids)
3 AAU US Magnum hops (5 mins)
(0.25 oz./7.1 g of 12% alpha acids)
1.0 oz. (28 g) Chinook hops (dry hop)
0.5 oz. (14 g) Citra® hops (dry hop)
0.5 oz. (14 g) US Magnum hops
(dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(1.33 qt./1.33 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Steep grains at 153.5 °F (67.5 °C) in 3.0 qts. (2.9 L) of water. Rinse grains with 2 qts. (2 L) of 170 °F (77 °C) water. Add water to brewpot to make at least 3.0 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 90 minutes, adding hops at times indicated. Add liquid malt extract in the final 15 minutes of the boil. Chill wort and transfer to fermenter. Top fermenter up to 5.0 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Dry hop in secondary fermenter for 5 days.

SIERRA NEVADA CLONE RECIPES

Ovila Quad clone
(5 gallons/19 L, all-grain)

OG = 1.090 FG = 1.015
IBU = 18 SRM = 27 ABV = 10.4%

Ingredients

12 lb. 2 oz. (5.5 kg) 2-row pale malt
1.5 lbs. (0.69 kg) European Pilsner malt
11 oz. (0.32 kg) aromatic malt
3.7 oz. (0.11 kg) caramel malt (60 °L)
5.6 oz. (0.16 kg) Special B malt
3.7 oz. (0.11 kg) chocolate malt (60 °L)
2 lb. 5 oz. (1.1 kg) D2 candi syrup (20 mins)
2.5 AAU Styrian Golding hops (120 mins) (0.5 oz./14 g of 5% alpha acids)
1.3 AAU Styrian Golding hops (40 mins) (0.25 oz./7.1 g of 5% alpha acids)
1.3 AAU Styrian Golding hops (20 mins) (0.25 oz./7.1 g of 5% alpha acids)
Wyeast 1214 (Belgian Abbey) or White Labs WLP500 (Trappist Ale) yeast (3 qt./3 L yeast starter)
1.25 cups corn sugar (for priming)

Step by Step

Two or three days before brew day, make the yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast.

On brew day, mash in at 140 °F (60 °C) in 19 qts. (18 L) of water. Ramp temperature to 150 °F (66 °C). Hold at 150 °F (66 °C) for 60 minutes. Raise mash temperature to 170 °F (77 °C), hold for 5 minutes then recirculate. Run off wort and sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Collect 7.5 gallons (28 L) of wort. (Check that final runnings do not drop below SG 1.010 or above a pH of 5.8.) Boil wort for 90 minutes, adding hops at times indicated. Add candi syrup during final 20 minutes of the boil. Ferment at 70 °F (21 °C).

Ovila Quad clone
(5 gallons/19 L, partial mash)

OG = 1.090 FG = 1.015
IBU = 18 SRM = 27 ABV = 10.4%

Ingredients

1.0 lb. (0.45 kg) 2-row pale malt
1.5 lbs. (0.69 kg) European Pilsner malt
1.55 lbs (0.79 kg) light dried malt extract
5.75 lbs. (2.6 kg) light liquid malt extract
11 oz. (0.32 kg) aromatic malt
3.7 oz. (0.11 kg) caramel malt (60 °L)
5.6 oz. (0.16 kg) Special B malt
3.7 oz. (0.11 kg) chocolate malt (60 °L)
2 lb. 5 oz. (1.1 kg) D2 candi syrup (15 mins)
2.5 AAU Styrian Golding hops (120 mins) (0.5 oz./14 g of 5% alpha acids)
1.3 AAU Styrian Golding hops (40 mins) (0.25 oz./7.1 g of 5% alpha acids)
1.3 AAU Styrian Golding hops (20 mins) (0.25 oz./7.1 g of 5% alpha acids)
Wyeast 1214 (Belgian Abbey) or White Labs WLP500 (Trappist Ale) yeast (3 qt./3 L yeast starter)
1.25 cups corn sugar (for priming)

Step by Step

Mash grains at 148 °F (64 °C) in 5.5 qts. (5.2 L) of water. Hold at this temperature for 60 minutes. Collect 2.25 gallons (8.5 L) of wort from partial mash. Add water to make at least 3.0 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 90 minutes, adding hops at times indicated in the ingredient list. Add liquid malt extract and candi syrup in the final 15 minutes of the boil. Stir thoroughly to avoid scorching. Chill wort, transfer to fermenter and top up to 5.0 gallons (19 L). Aerate wort and pitch yeast. Ferment at 70 °F (21 °C).

Ovila Quad clone
(5 gallons/19 L, extract with grains)

OG = 1.090 FG = 1.015
IBU = 18 SRM = 27 ABV = 10.4%

Ingredients

0.5 lbs. (0.23 kg) European Pilsner malt
2.0 lbs (0.91 kg) light dried malt extract
7.0 lbs. (3.2 kg) light liquid malt extract
11 oz. (0.32 kg) aromatic malt
3.7 oz. (0.11 kg) caramel malt (60 °L)
5.6 oz. (0.16 kg) Special B malt
3.7 oz. (0.11 kg) chocolate malt (60 °L)
2 lb. 5 oz. (1.1 kg) D2 candi syrup (15 mins)
2.5 AAU Styrian Golding hops (120 mins) (0.5 oz./14 g of 5% alpha acids)
1.3 AAU Styrian Golding hops (40 mins) (0.25 oz./7.1 g of 5% alpha acids)
1.3 AAU Styrian Golding hops (20 mins) (0.25 oz./7.1 g of 5% alpha acids)
Wyeast 1214 (Belgian Abbey) or White Labs WLP500 (Trappist Ale) yeast (3 qt./3 L yeast starter)
1.25 cups corn sugar (for priming)

Step by Step

Place crushed grains in a steeping bag. Steep grains at 148 °F (64 °C) in 3.0 qts. (2.9 L) of water. (Do this in a separate pot and heat 2 gallons/7.6 L of water in your brewpot during this steep.) Remove bag and place in a colander over the brewpot. Rinse grains with 2 qts. (2 L) of 170 °F (77 °C) water. Add water to brewpot to make at least 3.0 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 90 minutes, adding hops at times indicated. Keep some boiling water handy and do not let boil volume dip below 3.0 gallons (11 L). Add liquid malt extract and candi syrup in the final 15 minutes of the boil. Stir thoroughly to avoid scorching. Chill wort and transfer to fermenter. Top fermenter up to 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C).

SIERRA NEVADA CLONE RECIPES

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

OG = 1.096 FG = 1.026
IBU = 100 SRM = 16 ABV = 9.8%

Ingredients

18.5 lbs. (8.4 kg) 2-row pale malt
1 lb. 7 oz. (0.64 kg) caramel malt (60 °L)
9 AAU Chinook hops (150 mins)
(0.75 oz./21 g of 12% alpha acids)
9 AAU Chinook hops (105 mins)
(0.75 oz./21 g of 12% alpha acids)
7.5 AAU Cascade hops (60 mins)
(1.5 oz./43 g of 5% alpha acids)
3.75 AAU Cascade hops (10 mins)
(0.75 oz./21 g of 5% alpha acids)
7.5 AAU Centennial hops (10 mins)
(0.75 oz./21 g of 10% alpha acids)
0.25 oz. (7.1 g) Chinook hops (dry hop)
1.25 oz. (35 g) Cascade hops (dry hop)
0.5 oz. (14 g) Centennial hops (dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(3.5 qt./3.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Two or three days before brew day, make the yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast.

On brew day, mash in at 154 °F (68 °C) in 24 qts. (23 L) of water. Hold at this temperature for 60 minutes. Raise mash temperature to 170 °F (77 °C), hold for 5 minutes then recirculate. Run off wort and sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Collect 9.5 gallons (36 L) of wort. (Check that final runnings do not drop below SG 1.010.) Boil wort for 150 minutes, adding hops at times indicated. Ferment at 68 °F (20 °C). Dry hop in secondary for 5 days.

Bigfoot Ale clone
(5 gallons/19 L, partial mash)

OG = 1.096 FG = 1.026
IBU = 100 SRM = 16 ABV = 9.8%

Ingredients

2 lb. 9 oz. (1.2 kg) 2-row pale malt
3.0 lbs (1.4 kg) light dried malt extract
7.5 lbs. (3.4 kg) light liquid malt extract
1 lb. 7 oz. (0.64 kg) caramel malt (60 °L)
9 AAU Chinook hops (150 mins)
(0.75 oz./21 g of 12% alpha acids)
9 AAU Chinook hops (105 mins)
(0.75 oz./21 g of 12% alpha acids)
7.5 AAU Cascade hops (60 mins)
(1.5 oz./43 g of 5% alpha acids)
3.75 AAU Cascade hops (10 mins)
(0.75 oz./21 g of 5% alpha acids)
7.5 AAU Centennial hops (10 mins)
(0.75 oz./21 g of 10% alpha acids)
0.25 oz. (7.1 g) Chinook hops (dry hop)
1.25 oz. (35 g) Cascade hops (dry hop)
0.5 oz. (14 g) Centennial hops (dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(3.5 qt./3.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Mash grains at 154 °F (68 °C) in 5.5 qts. (5.2 L) of water. Hold at this temperature for 45 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3.5 gallons (13 L) of wort. Stir in dried malt extract and boil wort for 150 minutes, adding hops at times indicated. Keep some boiling water handy and do not let the boil volume dip below 3.5 gallons (13 L). Add liquid malt extract in the final 15 minutes of the boil. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Dry hop in secondary fermenter for 5 days.

Bigfoot Ale clone
(5 gallons/19 L, extract with grains)

OG = 1.096 FG = 1.026
IBU = 100 SRM = 16 ABV = 9.8%

Ingredients

9 oz. (0.27 kg) 2-row pale malt
3.75 lbs (1.7 kg) light dried malt extract
8.0 lbs. (3.6 kg) light liquid malt extract
1 lb. 7 oz. (0.64 kg) caramel malt (60 °L)
9 AAU Chinook hops (150 mins)
(0.75 oz./21 g of 12% alpha acids)
9 AAU Chinook hops (105 mins)
(0.75 oz./21 g of 12% alpha acids)
7.5 AAU Cascade hops (60 mins)
(1.5 oz./43 g of 5% alpha acids)
3.75 AAU Cascade hops (10 mins)
(0.75 oz./21 g of 5% alpha acids)
7.5 AAU Centennial hops (10 mins)
(0.75 oz./21 g of 10% alpha acids)
0.25 oz. (7.1 g) Chinook hops (dry hop)
1.25 oz. (35 g) Cascade hops (dry hop)
0.5 oz. (14 g) Centennial hops (dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(3.5 qt./3.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Steep grains at 154 °F (68 °C) in 3.0 qts. (2.9 L) of water. Rinse grains with 2 qts. (2 L) of 170 °F (77 °C) water. Add water to brewpot to make at least 3.5 gallons (13 L) of wort. Stir in dried malt extract and boil wort for 150 minutes, adding hops at times indicated. Keep some boiling water handy and do not let the boil volume dip below 3.5 gallons (13 L). Add liquid malt extract in the final 15 minutes of the boil. Chill wort and transfer to fermenter. Top fermenter up to 5.0 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Dry hop in secondary fermenter for 5 days.

SIERRA NEVADA CLONE RECIPES

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

OG = 1.064 FG = 1.016
IBU = 65 SRM = 12 ABV = 6.8%

Ingredients

12.5 lbs. (5.7 kg) 2-row pale malt
15 oz. (0.43 kg) caramel malt (60 °L)
9 AAU Chinook hops (100 mins)
(0.75 oz./21 g of 12% alpha acids)
5 AAU Centennial hops (100 mins)
(0.50 oz./14 g of 10% alpha acids)
7.5 AAU Cascade hops (10 mins)
(1.5 oz./43 g of 5% alpha acids)
0.66 oz. (19 g) Centennial hops (0 mins)
1.33 oz. (38 g) Cascade hops (0 mins)
1.33 oz. (38 g) Cascade hops (dry hop)
0.66 oz. (19 g) Centennial hops (dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(1.5 qt./1.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Two or three days before brew day, make the yeast starter, aerating the wort thoroughly (preferably with oxygen) before pitching the yeast.

On brew day, mash in at 157.5 °F (69.7 °C) in 17 qts. (16 L) of water. Hold at this temperature for 60 minutes. Raise mash temperature to 170 °F (77 °C), hold for 5 minutes then recirculate until the wort clears. Run off wort and sparge with water hot enough to keep the grain bed around 170 °F (77 °C). Collect 6.75 gallons (25.5 L) of wort. (Check that final runnings do not drop below SG 1.010 or the pH climbs above 5.8.) Boil wort for 100 minutes, adding hops at times indicated in the ingredient list. Ferment at 68 °F (20 °C). Dry hop in secondary for 5 days.

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

OG = 1.064 FG = 1.016
IBU = 65 SRM = 12 ABV = 6.8%

Ingredients

3 lb. 1 oz. (1.4 kg) 2-row pale malt
2.0 lbs (0.91 kg) light dried malt extract
4.25 lbs. (1.9 kg) light liquid malt extract
15 oz. (0.43 kg) caramel malt (60 °L)
9 AAU Chinook hops (100 mins)
(0.75 oz./21 g of 12% alpha acids)
5 AAU Centennial hops (100 mins)
(0.50 oz./14 g of 10% alpha acids)
7.5 AAU Cascade hops (10 mins)
(1.5 oz./43 g of 5% alpha acids)
0.66 oz. (19 g) Centennial hops (0 mins)
1.33 oz. (38 g) Cascade hops (0 mins)
1.33 oz. (38 g) Cascade hops (dry hop)
0.66 oz. (19 g) Centennial hops (dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(1.5 qt./1.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Mash grains at 157.5 °F (69.7 °C) in 5.5 qts. (5.2 L) of water. Hold at this temperature for 45 minutes. Collect 2.25 gallons (8.5 L) of wort. Add water to make at least 3.0 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 100 minutes, adding hops at times indicated in the ingredient list. Keep some boiling water handy and do not let the boil volume dip below 3.0 gallons (11 L). Add liquid malt extract in the final 15 minutes of the boil. Stir thoroughly to avoid scorching. Chill wort, transfer to fermenter and top up to 5 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Dry hop in secondary fermenter for 5 days.

Sierra Nevada Celebration clone (5 gallons/19 L, extract with grains)

OG = 1.064 FG = 1.016
IBU = 65 SRM = 12 ABV = 6.8%

Ingredients

1 lb. 1 oz. (0.48 kg) 2-row pale malt
2.5 lbs (1.13 kg) light dried malt extract
5.0 lbs. (2.27 kg) light liquid malt extract
15 oz. (0.43 kg) caramel malt (60 °L)
9 AAU Chinook hops (100 mins)
(0.75 oz./21 g of 12% alpha acids)
5 AAU Centennial hops (100 mins)
(0.50 oz./14 g of 10% alpha acids)
7.5 AAU Cascade hops (10 mins)
(1.5 oz./43 g of 5% alpha acids)
0.66 oz. (19 g) Centennial hops (0 mins)
1.33 oz. (38 g) Cascade hops (0 mins)
1.33 oz. (38 g) Cascade hops (dry hop)
0.66 oz. (19 g) Centennial hops (dry hop)
Wyeast 1056 (American Ale), White Labs
WLP001 (California Ale) or
Fermentis US-05 yeast
(1.5 qt./1.5 L yeast starter)
1 cup corn sugar (for priming)

Step by Step

Steep grains at 157.5 °F (69.7 °C) in 3.0 qts. (2.9 L) of water. Rinse grains with 2 qts. (2 L) of 170 °F (77 °C) water. Add water to brewpot to make at least 3.0 gallons (11 L) of wort. Stir in dried malt extract and boil wort for 100 minutes, adding hops at times indicated in the ingredient list. Keep some boiling water handy and do not let the boil volume dip below 3.0 gallons (11 L). Add liquid malt extract in the final 15 minutes of the boil. Stir thoroughly to avoid scorching. Chill wort and transfer to fermenter. Top fermenter up to 5.0 gallons (19 L). Aerate wort and pitch yeast. Ferment at 68 °F (20 °C). Dry hop in secondary fermenter.

"The advantage of Beer Camp is that it allows us to brew beers we wouldn't normally brew," Brian Grossman said.

Earlier this year, the Churchkey in Washington, DC had a "Tap Takeover" with all 55 taps switching over to Sierra Nevada brews, the largest number of taps in one location featuring one brewery in craft beer history. Only 8 kegs of those 55 brews were older than 10 months; Bigfoot and a few barrel aged beers filled those tap lines while the other 47 brews were all fresh brews highlighting different styles and brewery collaborations.

Asheville Expansion

The Chico campus has a million barrel capacity per year. Current demand has Sierra Nevada brewing 24 hours a day, 7 days a week and now pushing close to 900,000 barrels of beer in production. Expansion was imminent and another campus had to be developed. With the carbon footprint of shipping beer as another reason to build on the other side of the Mississippi, locations on the East Coast were looked at and analyzed. Water played a big part in selecting the new brewery site just outside Asheville, North Carolina. Ken said, "We dug several wells before we bought the property. The first one was fairly deep, a 600-foot well that had great water, but not much volume, then we drilled a second one that had the same water and more volume, so we have our own well on-site, that has incredible water, low in minerals, no silica and none of the issues we had to deal with in Chico. Water made a big impact on our decision. The site we looked at just on the other side of the Smokys had slightly more challenging water from the river it flowed. The temperature flux, additional algal issues during the summer were just some of the reasons why we did not select that site."

Once fully built, the North Carolina brewery will have a 750,000 barrel per year capacity. The new brewery will feature the same 200 barrel brewhouse as Chico, but instead of two kettles, there will be a wort receiver, to increase productivity. New technology is going into their hop strainers, since their beers are very hop forward; small investments will pay big rewards down the line.

"The new brewhouse will be more efficient, with new technologies like a bigger lauter tun. When the 1997 brewhouse was installed in Chico, the thought process of having big year around beers like Torpedo (Extra IPA) wasn't in our thinking. This bigger lauter tun will get us better runoffs with bigger gravity beers like Torpedo," says Brian. As part of the expansion, Brian and his new bride Gina have moved to North Carolina to oversee the brewery installation and continue to immerse the Sierra Nevada culture to that location. "To see Brian start from a ten-year-old kid to the young man he is today, and take the reins and help build the new North Carolina brewery is very exciting and rewarding," said Terence Sullivan, Assistant Brew Master and Field Educator at Sierra Nevada.

"We harvested all the timber that we took off the land, yielding over 100,000 board foot of finished lumber that we had all kiln-dried and are going to utilize all in the construction. We try to be as environmentally conscious as we can and how cool will it be when people ask, 'Well what happened to all the trees that were here?' and I can literally point to the seats and tables they are sitting in, the bar they are standing next to, everything taken from the land will be utilized," Brian said of their commitment to being green and the underlying philosophy of what his father started.

Sierra Nevada will continue to follow their dedication to composting. However they will not do it themselves, but will work with farmers to compost the restaurant food waste and brewery by-products. They are also installing a rail spur to receive grain, not just for the new brewery, but to also have an extra silo dedicated for use with other breweries. This will allow them to be able to save on malt cost and buy in bulk, passing on those savings to the surrounding breweries and reducing the carbon footprint for that particular 2-row barley resource. This is a fundamental shift, helping the local competition in sharing their resources, purchasing power and leading the charge on "green" technology and preserving the Earth. Additionally, Sierra Nevada will open their lab services, sharing this resource with other local brewers allowing them technical information that they cannot get or afford, creating better beer in the surrounding area. A second beer camp will be built on the property as well to support local innovation. A packaging line will be installed with a canning line designed into the plans for North Carolina, but will not start with canned beer. "It will probably be a few years before other beers are canned," Brian said. So we will have to wait to see Bigfoot Barleywine in a can until the brewery is in full operation. According to Ken they are shooting to do some test batches in early July or August 2013 and have beer in the bottle by the end of the 2013.

Homebrewing Help

What can homebrewers learn from Sierra Nevada? When asked what homebrewers should do to brew the best beer possible, Sierra Nevada Brewmaster Steve Dresler starts with the basics: "Sanitation is job one," said Dresler. "Your first goal as a brewer is to ensure your beer comes out microbiologically clean. It's also important to find the best place to source your ingredients. Back in the '80s, finding quality ingredients was challenging. Today, between homebrew shops and mail order, it is easier to find fresh ingredients."

Hoppy beers are, of course, a key part of Sierra Nevada's success. When brewing hoppy beers, Dresler recommends using whole hops, as Sierra Nevada does. "The use of whole-cone hops has largely fallen out of favor, but I truly believe that for us, it made all the difference. Hop cones add depth and complexity that I have never found from pelletized versions or from hop oil extract. There are thousands of volatile aroma compounds in every varietal of hops that easily fade through mishandling or through the pelletizing process."

Torpedo Hopping

The hop torpedo came into existence after many years of tweaking what is essentially dry hopping. Each torpedo is designed to hold whole hops and push almost finished (carbonated) beer over the leafy flowers, extracting the hop oils and creating more flavor than standard dry hopping allows. The brewer packs each torpedo tube with a 20-lb. (9.1 kg) bucket of hops, using a recipe's special percentage blend, then uses a special almost football shaped tamper to compact the hop cones into all the corners of the bottom disk. They repeat this process with another 3 loads of hops, filling each torpedo with 80 lbs. (36 kg) of hops total. A hop torpedo is then connected to the 200 barrel tank via hoses and a pump. The pump is set to push 10–15 gallons (38–57 L) of beer at about 25-30 PSI, to re-circulate the whole tank twice through all the hops, over a 4-day period. Before filtration, the yeast has contact time over a few days to take out any of the grassy flavors that the torpedo might impart.

Torpedo Extra IPA is 100% Torpedo hopped with Magnum, Crystal and Citra® whole leaf cones, post-fermentation. Terence tells me, "It gets all its unique character by extracting out certain hop oils from the hops, that traditional dry hopping cannot achieve." Celebration Ale also gets some time with the Torpedo, with 50% of the beer getting torpedo hopped and 50% traditionally dry hopped, creating that amazing hop character in every glass.

For more information about brewing your own Sierra Nevada Torpedo Extra IPA clone, see *Brew Your Own*'s September 2009 issue.

Building a Homebrewed Torpedo

To make your own homebrew-scale torpedo, start with a water filter housing and create your own filter out of PVC pipe. Measure the pipe to the same length of the water filter that can fit into the housing. Using a ⅜-inch drill bit, create a pattern of holes, evenly spaced on the bottom half of the length of the pipe. This will force the beer deeper through the hops packed around it. Connect tubing to the inlet and outlet and perhaps hook up a pump to the inlet, moving the beer from either a conical or a Corny keg. Pack the hops carefully and purge the torpedo with CO_2, to avoid any oxygen pickup.

The beer should flow from the original keg (pushed by CO_2 or pump), through the filter, and into another keg (purged with CO_2). You will have to vent the receiving keg periodically to get the beer to flow. Adjust the speed of the pump and experiment with time and speed to get the best hop character from your torpedo.

Web extra:

Check out a recipe for Pumpkin Bacon and Sierra Nevada Tumbler Pasta Sauce:
www.byo.com/component/resource/article/2615

Your water chemistry matters when brewing hoppy beers. Dresler recommends adding some calcium sulfate to your hoppy beers to enhance their hop character. Every beer is different, though, so a blanket recommendation on how much to add can't be given.

"Play around with the salts (gypsum, calcium chloride, etc.) and take good notes," said Dresler. "Taste the beer and make adjustments, if needed."

When selecting hops, Dresler recommends reading the descriptions of hops provided on hop merchant's websites, and try to build a beer recipe based on that, something he calls "Drinking beer in your head."

When formulating hoppy recipes, remember that more isn't always better. Try to build a pleasing aroma profile and consider new hop varieties as they arise. "The first year we brewed Celebration, it was all Cascade. When we added Centennial to the mix, it didn't have a name, it was just a number," he said.

Many Sierra Nevada brews are dry hopped, and Dresler gives some advice for dry hopping without oxidizing your beer. "Add the dry hops when you still have 1 to 1.5 °Plato (SG 1.004–1.006) left in your fermentation. That way the oxygen introduced along with the hops will be scavenged by the yeast."

Although homebrewers pay a lot of attention to the alpha acid rating of their hops, they should also be aware of the oil content, especially for late kettle additions and dry hopping. "Oil trends with alpha," said Dresler, "There isn't an exact correlation, but higher alpha hops tend to have more oil. Sierra Nevada uses quite a bit of US Magnum these days, for example in our Torpedo, and this is a high oil hop. We also use Crystal, which has nice oils, and Citra®, whose oil is off the charts."

Aside from paying attention to the nitty gritty details of brewing, a brewer's outlook also matters. "Brewers should take a no holds barred attitude," said Dresler, "Beer is an expression of their creativity." BYO

Sean Z. Paxton, The Homebrew Chef, is a homebrewer from Sonoma, California and a frequent contributor to Brew Your Own.

Tesgüino

Story by **David J. Schmidt**

The Sacred Corn Beer of the Sierra Madre

The rickety bus pulls to a stop. "This is it, folks. End of the road," the driver tells us. He's not speaking metaphorically — the dirt road literally comes to an abrupt stop here, at the edge of the mountain.

Leticia and I disembark and grab our bags, walking down a thin trail into the wooded wilderness. We follow the path that crawls along the ridge of one particular mountain range, providing us with a spectacular panoramic view of the canyons, valleys, pine forests, mountains and gulches around us. To our east, a thick cluster of dark storm clouds has gathered. Jagged streaks of lightning are splitting the horizon in half, threatening to come closer.

"Let's head towards that cluster of houses down there," Leticia tells me. "We'll see if they can lend us a horse to ride to Rancho Repohuéachi; it's still a few kilometers away." Leticia, a middle-aged mother of five, invited me to join her on this trip to visit her relatives in the Sierra Madre. Her entire family is made up of indigenous people from this pristine wilderness. "My mother was born in a cave beyond that mountain range," Leticia tells me, pointing past a lightning-charred tree.

This is the Sierra Madre. This is tesgüino country.

The Sierra Madre Occidental is a long, jagged mountain range that cuts across the northern half of Mexico. This remote, inscrutable mountain range is home to one of the most reclusive indigenous ethnicities in all of Mexico — the Rarámuri natives (called the Tarahumara by outsiders). In pre-Colombian times, the Rarámuri used to occupy a much larger area. As they fled from the encroachment of first Spanish and then Mexican expansion, however, the Rarámuri were driven further and further into the hills and canyons of the Sierra. The Rarámuri have recently become famous for the long-distance marathons they run barefoot through the mountains. While I didn't witness one of these races when I visited the mountains in 2002, I did experience a different kind of marathon — one that my physique is much more up to snuff for.

I experienced the enormous quantities of homebrewed corn beer, known as tesgüino (pronounced "tess-GWEE-no"), which the Rarámuri have brewed for ages.

Boiling the Corn

Leticia and I come upon a cluster of houses — simple log cabins and adobe shacks. "Cuiravá!" a woman shouts out from one of the cabins as we approach. Leticia returns her greeting in the Rarámuri language, then switches to Spanish. The two women discuss the possibility of Leticia and me borrowing a horse from them; as they chat, they make liberal use of the curse word *cabrón*, speaking with the rough-around-the-edges, cowboy style common here in the Sierra.

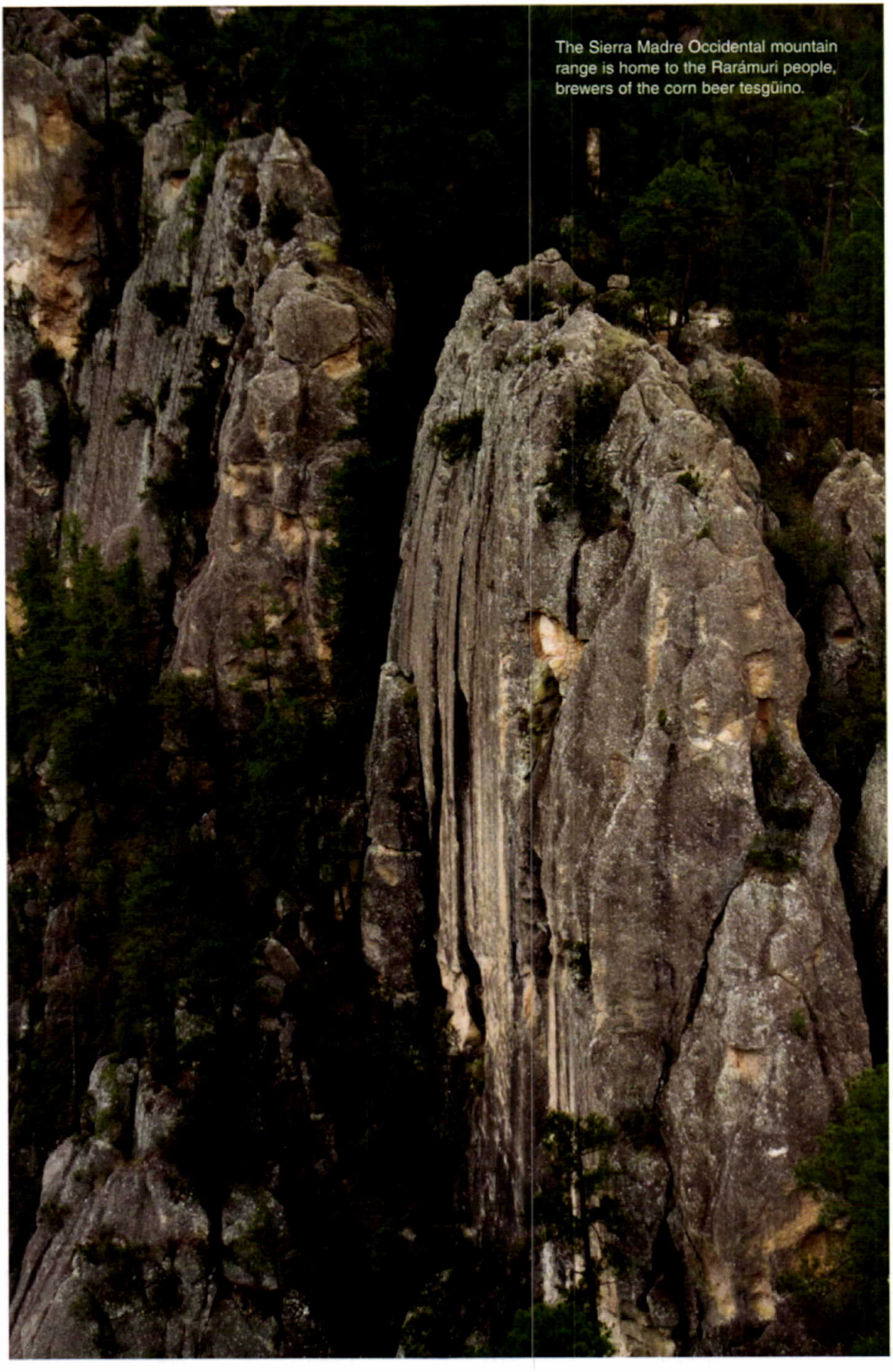
I wander around the cabins, noticing a *mestiza* woman (a woman of mixed European and native American ancestry) stirring something in an enormous iron pot over a fire outside her cabin. The woman greets me in Spanish. "What are you cooking there?" I ask.

"Tesgüino," she responds. I peer into the pot and see yellow corn mush bubbling slowly; steam rises from the pot.

"Can I try some?" I ask.

The woman gives me a toothy grin and laughs, her laughter coinciding with a peal of thunder in the distance. "It still has to ferment, *güero* (light-skinned person)," she says.

"Trust me, I learned how to make it from the Rarámuri around here. This tesgüino won't be ready to drink until a few days from now," she continued.



The Sierra Madre Occidental mountain range is home to the Rarámuri people, brewers of the corn beer tesgüino.

Photos courtesy of the Mexican Tourism Board

Tesgüino Recipe

This recipe is easy to reproduce in a modern homebrewery. In the recipe for easy tesgüino, the fermentable sugars are derived from sugar rather than corn.

Easy Tesgüino
(5 gallons/19 L)
OG = up to 1.046 FG = ~1.006
ABV = around 3.3%

Ingredients
4.4 lbs. (2 kg) dry, large-kernel corn
11 cones piloncillo sugar
(or ~44 oz./1.3 kg cane sugar)
ale yeast (your choice)

Step by Step
Grind the corn and boil with 2–3 gallons (7.6–11 L) of water and 11 cones of piloncillo cane sugar, stirring so that the sugar dissolves. As an option, you can add a few pieces of whole cinnamon. Cook the ingredients over low heat for one hour; remove from heat, add 2–4 more sticks of cinnamon (optional), and let sit in pot for 20 minutes. Cool and transfer to fermenter, leaving behind as much of the corn solids as feasible. Top up to 5 gallons (19 L) and ferment with ale yeast for about 4 days. Throw a party and drink the entire batch immediately.

More traditional option:
Some Latino specialty markets sell *jora* (malted corn) and you can substitute about 7.0 lbs. (3.2 kg) of this for the (unmalted) corn and sugar above. Heat mixture of 5 gallons (19 L) water and *jora* slowly to a boil. (Traditional tesgüino pots are heated over open flames.) Spend at least 1 hour ramping through the 140–162 °F/60–72 °C range. Simmer for 3 hours. Cool with immersion chiller and ferment in brewpot. (Traditional tesgüino pots cool in the cold mountain air.) Ferment with the yeast of your choice. (Traditional tesgüino is inoculated by stirring the mixture with grass leaves laden with suitable wild yeasts.) Serve lightly chilled (think cool mountain temperatures), unfiltered and uncarbonated with four friends. (Traditionally, most folks attending a *tesgüinada* consume around 4 quarts /~4 L of tesgüino.) In this version of tesgüino, your OG will be lower (around 1.034), but the "beer" will be stronger because it will contain less starch than the easy version above. The alcoholic strength will depend on how much extract you get from the *jora* and your yeast's attenuation, but roughly 4.0% ABV is a fair estimate.

Tesgüino is the Spanish term for the corn beer produced by the Rarámuri natives. Known in the Rarámuri language as *watari*, the beverage is simple and no-frills, made from just corn and water. The dry corn grains must be malted — they are moistened and kept in a warm location until they begin to germinate, producing fermentable sugars within the grain just like malted barley. After this is done, the corn is cooked over low heat to release the sugars. The entire cooked mush is then left to ferment with the wild yeasts in the air.

No additives or flavorings are added to tesgüino — it is a drink that is rough, unrefined and wild, like the mountains it was born in. Within the context of Rarámuri culture, however, the important thing about tesgüino isn't its aesthetic appeal, balanced flavor or mouthfeel — far more significant is the social context in which tesgüino is used. Much like the early forms of beer brewed by the ancient Egyptians and Babylonians, tesgüino occupies a central place in the economic, social, religious, and ceremonial life of the Rarámuri people.

Drinking with God

Leticia and I thank the woman in the cabin for lending us a horse, and head off towards Rancho Repohuéachi where Leticia's grandmother Catalina lives. It's close to dusk when we reach the home of the *mestizo* farmers who Doña Catalina lives with. The house is a small, whitewashed, adobe farmhouse at the edge of a cliff overlooking the valleys below. The rain has let up as we approach, and a brilliant rainbow appears on the horizon.

We greet the *mestizo* family as we approach — a middle-aged single mother, her teenage sons and their wives—and then walk around the back to say hello to Doña Catalina. She lives in a small room at the back end of the house, and sleeps in a depression in the dirt floor. Catalina is wearing a puffy colonial-style blouse in traditional Rarámuri fashion when she opens the door to greet us. I tell her I'm looking forward to getting to know life in the Sierra. Catalina asks if I plan on trying tesgüino during my visit. "Some of the Rarámuri around here are going to be gathering to drink it tomorrow," she says. "You can go with Chemo, my great grandson."

After a dinner of pinto beans, chopped cactus and homemade tortillas, I stand on the porch chatting in Spanish with the young *mestizo* men and their wives. As we watch another rainstorm assault the pine forests around us, the skyline punctuated with lightning every few seconds, they tell me stories of buried treasure in the area, guarded by vengeful ghosts. At some point, they ask me, "Doña Catalina says you're going to go drink with the Indians tomorrow?"

I say yes, and ask them what they know about *tesgüinadas*, the Rarámuri gatherings where people come together to drink the corn beer. One of the young men smiles; his face glows with light from the kerosene lanterns inside the house. "The Indians go up into the mountains and drink with God," he says simply.

Tesgüino is much more than a recreational beverage — it is the hub around which Rarámuri society revolves. Native legends tell how Onorúame, the Supreme Being, created tesgüino to ease the suffering of humans and fill our hearts with joy. (Perhaps Benjamin Franklin was channeling Rarámuri wisdom when he wrote, "Beer is proof that God loves us and wants us to be happy.") Anytime tesgüino is consumed, the first drink is poured on the ground, dedicated to Onorúame; it is believed that God becomes thirsty on a regular basis and wants to drink corn beer. For the entire duration of a *tesgüinada*, the Rarámuri believe that Onorúame is invisibly present, drinking right alongside them.

While *tesgüinadas* are public gatherings where the entire community comes together to drink enormous quantities of the beverage, there are other private ceremonies involving tesgüino, officiated over by traditional healers, priests and elders. The *curanderos*, or medicine men, go to holy spots on mountaintops to privately drink tesgüino with the Almighty and discuss important affairs of the com-

munity. When an infant is born, the elders baptize the child with a few drops of tesgüino, asking for Onorúame's blessing. When a new field is plowed, a ceremony involving corn beer is conducted to bless the field and bring fertility to it.

For the Rarámuri natives, tesgüino plays a role similar to that of beer in much of ancient medieval Europe. It is a sacramental drink which connects humans with the Divine, a liquid meal to be shared with the Almighty, a way of sacrificing the first fruits of the corn harvest to Onorúame out of gratitude. Tesgüino is sacramental wine, holy water and a sacrificial lamb all wrapped up in one.

An Alternative Economy

Chemo comes by the ranch house the following afternoon and invites me to go to a *tesgüinada* with him. We walk up and down mountain trails, through thick forests of pine trees, on our way to the social gathering. At one point, we pass by a clearing on a mountaintop. I discreetly take a look at it, and notice that there are three crude wooden crosses in the clearing, marking it as one of the sacred points where Rarámuri elders come to "drink with God" in private.

We eventually reach a large field where dozens of Rarámuri men, women and children are gathered. I can smell the yeast from a freshly brewed batch of corn beer. The women are sitting on the ground around a simple, three-walled wood cabin. Most of the men are working on the field, plowing the ground with a horse-drawn plow.

Chemo introduces me to the men, and they invite me to join them in the work. We take turns manning the plow, working for several hours until the host of this gathering tells us that's enough work for today — it's time to drink tesgüino. The host dips half a dry gourd shell into a 40-gallon (150-L) plastic trash barrel which is filled to the brim with corn beer. He says some words in the Rarámuri language, raises the gourd to the sky and the four cardinal directions, and pours the tesgüino on the ground for Onorúame. Then he invites the rest of us to join him and God in drinking the corn beer.

Chemo walks up to me holding the dripping gourd and smiles at me.

"Want some?"

The institution of the *tesgüinada* is central to the social and economic life of Rarámuri society. Not only is corn beer a ritual drink with spiritual significance, it is also the central pillar of the Rarámuri economy.

Like the Amish, each individual Rarámuri family holds its own plot of land, but much work is done collectively. When a Rarámuri man needs his fields plowed, planted or harvested, he invites the community to a *tesgüinada*. He brews a batch of corn beer — at least one barrel full — and invites the community to work in exchange for tesgüino. In this sense, the Rarámuri practice a mixture of communal labor and private property. This corn beer-based economy may very well be the "third way" which Pope John Paul II wrote about — neither fully communist nor capitalist.

The *tesgüinadas* are about more than just getting work done, however. They are social gatherings where elders give speeches of advice to the community. Business deals are made between farmers, and disagreements are discussed. Matchmakers set up young couples during *tesgüinadas*. Most married couples met each other at one of these gatherings. As anthropologist John G. Kennedy writes, "The *tesgüinada* is the religious group, the economic group, the entertainment group, and the group in which disputes are settled, marriages arranged and deals completed."

Corn Beer — a Social Release Valve

The mood of the *tesgüinada* lightens up as the gourd gets passed around several times. I notice young people flirting with each other; young men begin to make dirty jokes and pantomime copulating with each other in jest. One man named Goyo starts grabbing me, trying to wrestle with me for some inexplicable reason. My friend Chemo turns to me and offers to teach me the Rarámuri language. Most of the obscene phrases he teaches me bring raucous laughter from the crowd — one sentence translates as, "Hey everybody, I have the biggest 'chile' in this whole village."

After the fourth gourd of tesgüino, I notice a lovely young girl smiling at me. I smile back, and she says something in the Rarámuri language. The other young people around tease her, and Chemo tells me in Spanish that the girl is named Mariquita and she likes me. I respond that I like her too but I don't speak much Rarámuri, and I'm not yet buzzed enough to recite that phrase about the size of my "chile."

In addition to its religious, social and economic functions, tesgüino serves an additional, practical purpose — it provides people with psychological release. The Rarámuri culture is, in many respects, extremely conservative. When sober, men and women rarely speak with each other. Some people told me that Rarámuri couples even kept their clothes on while making love. Rarámuri men rarely show anger or aggression, and are usually quiet and reserved with each other.

At *tesgüinadas*, however, people let it all hang out. Psychologists and anthropologists have described the *tesgüinada* as an institutionalized "release valve" which lets out all the pent up sexuality, rage, laughter, and sadness which Rarámuri people hold inside. I saw this to be true during my stay in the Sierra Madre — at each of the *tesgüinadas* I attended, I noticed that otherwise repressed villagers felt free to finally be themselves.

It's not an ideal situation, of course. I imagine it's healthier to let your feelings out while sober as well as during a tesgüino buzz. And yet, this balance between repressed sobriety and drunken release has been maintained for millennia of Rarámuri history. And, interestingly enough, anthropologists have observed that alcoholism as an individual pathology is historically absent from Rarámuri society.

Epilogue: Repohuéachi Ten Years Later

When I visited the Rarámuri people of

Rancho Repohuéachi in 2002, I was a skinny, idealistic college student. As my beer belly continued to expand over the past ten years, the outside world expanded into this formerly isolated mountain community, bringing about a series of profound changes.

Rancho Repohuéachi is no longer as secluded as it was in 2002. A gringo missionary built a landing strip to fly airplanes into the region, bringing "short-term missionaries" who explain to the Indians that they will go to hell unless they reject tesgüino and convert to fundamentalist Protestantism. A year after the landing strip was created, Mexico's federal government extended the paved road all the way into Repohuéachi. With the road, new vices and problems have made their way into this previously isolated region — distilled liquor and hard drugs are now available, challenging the balance of a tesgüino-only society and introducing the foreign concept of "alcoholism" to the Rarámuri natives.

And yet, for the most part, Rarámuri society continues to plug along just as it has for thousands of years. The Rarámuri of Repohuéachi still plow and plant each other's fields, and still gather to drink barrels of corn beer together. Their elders and shamans still hike to the sacred mountaintops to consult with Onorúame, discussing each year's harvest season with the Almighty over a shared gourd of tesgüino. And when the mountain folk loosen up after a few drinks of corn beer, they still tease Mariquita about flirting with that strange, light-skinned visitor years ago. Some of them ask if she hasn't been hiding some secret blue-eyed children this whole time.

In a place as remote as the Sierra Madre, it wouldn't be hard to keep them hidden. BYO

David J. Schmidt is a freelance writer and translator, and fifth generation homebrewer, from San Diego, CA. He speaks eight languages, has been to 28 countries, and has spent the last eleven years exploring rural Mexico and experiencing folk brews, making him a veritable Indiana Jones of homebrewing. (Think Harrison Ford with a beer gut.)

Filtering Homebrew

by Dave Miller

FILTRATION IS A HOT TOPIC AMONG HOMEBREWERS. THE MAJORITY DO NOT DO IT, AND MANY ARE STRONGLY OPPOSED TO THE PRACTICE, CLAIMING THAT IT IS UNNECESSARY AND DETRIMENTAL. ON THE OTHER HAND, THE MAJORITY OF MICROBREWERS FILTER MOST IF NOT ALL OF THEIR OUTPUT, REGARDING IT AS THE BEST WAY TO CONSISTENTLY PRODUCE CLEAN-TASTING BEER. A MINORITY OF HOMEBREWERS AGREE, AND I AM ON THEIR SIDE.

The Benefits of Filtration

It is quite true that filtration always removes a certain amount of color, body, and flavor from the finished beer, as well as reducing its foam retention. So a filtered beer will always taste and look different from the same beer unfiltered. Whether it will look or taste worse is another matter. Filtration removes colloids and yeast cells that add harsh and sometimes astringent notes to the flavor. A clear beer will almost always taste smoother than the same beer, prior to clarification. Only a few mildly hopped styles of beer, such as Belgian Witbier, benefit from the presence of hazy material.

This, however, is not really the question. The question is how to remove the yeast and other haze components and how thorough that removal needs to be. Many homebrewers feel that a slightly hazy unfiltered beer is fine, as long as it does not have a distinct "yeast bite." They also contend that it is possible to clarify the beer adequately without resorting to a filter. I would agree, in the majority of cases. Given a low enough temperature and a long enough settling time, many beers will drop remarkably bright without any help. Once you pull out the sediment from the bottom with the first pint or two, the remainder of the keg will pour clear. Perhaps not as clear as filtered beer, but surprisingly close.

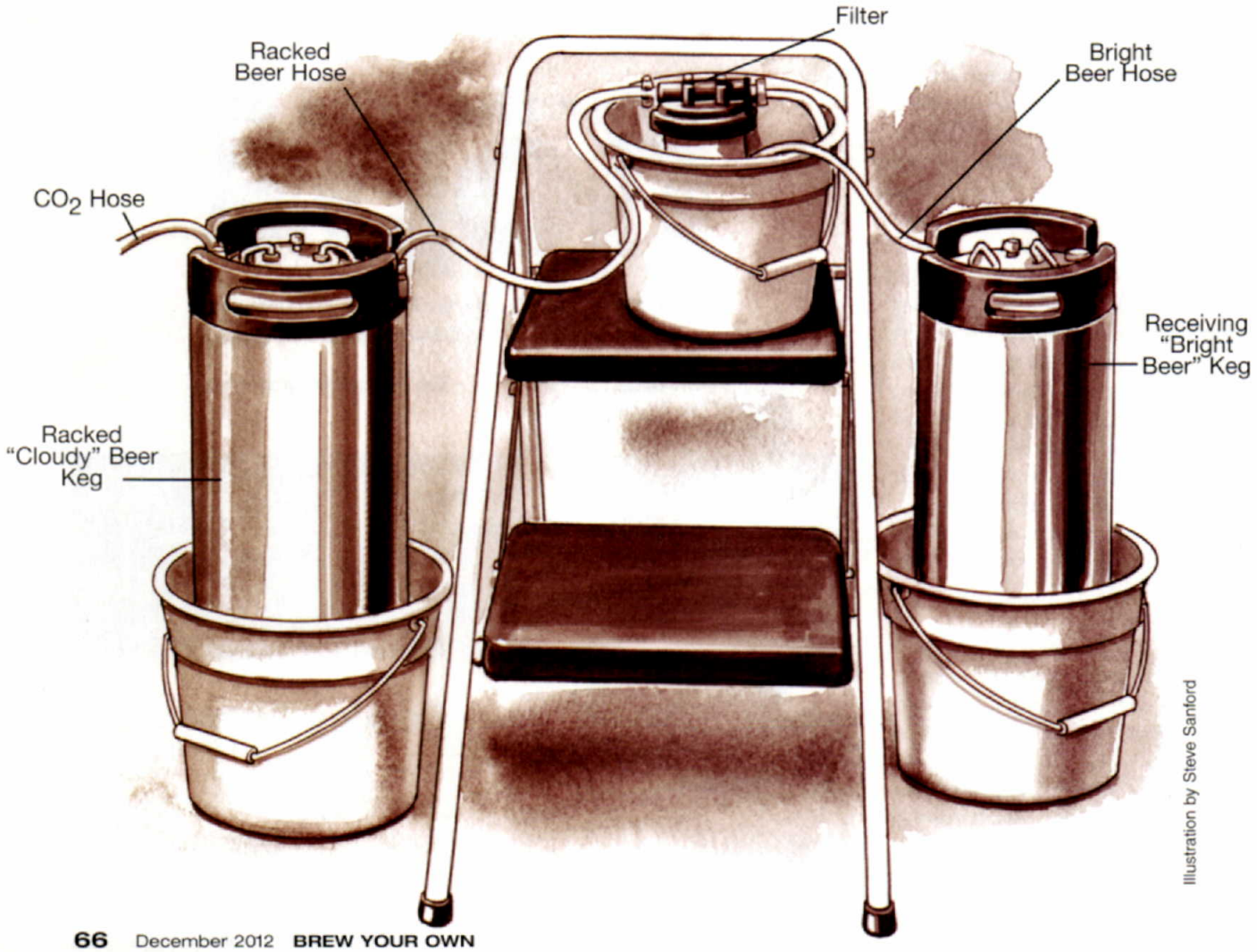


Illustration by Steve Sanford

In my experience, the hands-off method of beer clarification requires (1) a cooperative yeast and (2) at least six weeks. It also requires that you leave the keg in one place from start to finish, because any movement will disturb the sediment on the bottom and recloud the beer. The yeast issue is big: few homebrewers want to limit their choices in this way. Time is an issue too. How many refrigerators do you have?

Practically speaking, if you only have one refrigerator, the choice comes down to filtration versus fining and settling. Both of these methods will allow you to make a clean-tasting ale in two to three weeks. I use both, and I used both when I was brewing professionally. I found that filtration is more consistent and usually faster. Settling works, but the effectiveness of finings depends on proper handling, which may not be easy. It also depends very much on wort quality. The cleaner the wort that went into your kettle, and then into your fermenter, the clearer and faster the beer will drop. In other words, if you are looking to avoid filtration, you'd better do everything right on brew day.

The Drawbacks of Filtration

As far as the drawbacks of filtration go, this is in large measure a matter of design — in other words, recipe formulation. If filtration is a regular part of your process, then as you develop your beers you will automatically compensate for the color, body, and flavor changes. You'll use a bit more colored malt in the darker beers, perhaps a touch more hops in some of the aggressively bitter beers, maybe an extra ounce of flaked barley or Cara-Pils® in a heavy beer. Filtration does not take away that much. It certainly will not turn a pale ale into a light lager. Blackstone St. Charles Porter has been winning awards for 15 years, and for 15 years it has also been garnering criticism from the judging panels. From the judges who think it is not medal-worthy, one charge is consistently laid against it: it is too heavy, too malty, and too hoppy for the style. Its foam retention has never been criticized. St. Charles Porter is a filtered beer and always has been.

That is all I have to say about this question. I believe that filtration is something every brewer, sooner or later, should learn; it is a powerful tool and, in my view, a requirement in some situations. On the other hand, it is possible to brew great beer without ever coming near a filter. You just have to accept the limitations that come along with that decision.

Sheet Filters and Cartridge Filters

There are two types of filters that are widely used for homebrew: one is the plate-and-frame sheet filter, and the other is the ordinary household water-filter housing with a cartridge. Both work, and both, as you would expect, have their advantages.

The advantage of the sheet filter is that the material is specifically designed to filter yeast and colloidal matter out of fermented beverages. The sheets are strictly single use, but the cost is reasonable, and the frame is easy to take apart and clean.

There are three disadvantages of sheet filters. First, the small units sold for homebrew will not take pressure, so it is impossible to filter carbonated beer through them. Most homebrewers filter their beer flat, so this is usually not a concern. Second, by their design the units inevitably leak a little. Losses are small, but you have to place the unit in a shallow pan to avoid making a mess. Again, this is easy to deal with. Third — the most serious drawback — is that the base material of the sheets is cellulose. It is an excellent filter medium, but it needs to be flushed with water prior to use, in order to remove loose fibers and avoid a papery taste in the filtered beer. Again, this can be dealt with. Best practice in any case is to sanitize the filter before the run, and flushing can be incorporated into the sanitizing routine.

Cartridge filters do not leak if properly assembled, and the housings will take pressures well above what is encountered in handling carbonated beer. The filter media come in a broad range of types, but many are based on inert materials that impart no taste to the finished beer. Cleanup of the housing is quite simple. Cartridges can be cleaned by back-flushing and reused, potentially for dozens of batches, which cuts down on cost.

The problem is finding a filter cartridge that actually works. Many types of cartridges are available, and I have tried several. In my experience, micron numbers mean very little. The word "absolute" should mean something, but unfortunately, even among absolute rated filters there are large differences in performance. My experience with filters designed for water has been uniformly unsatisfactory. I have tried several types that failed to deliver bright beer. I finally shelled out for a pleated unit from The Filter Store, and I am happy to report that the one I chose works as advertised. Manufactured by Graver Technologies, it is designed for filtering beverages. As of this writing, the 0.5-micron unit costs $45 plus shipping. The 1-micron unit, which I have not tried, is a few dollars cheaper. I am sure there are other filters out there that also work, but if you want to filter beer on the cheap, you may have to search long and hard.

Filter Housings

Filter housings are available from many sources. Clear bodies often cost more, but I feel they are worth it because they let you observe the flow of beer through the filter. You can find them online at a reasonable cost. A pressure release valve is not absolutely necessary but can be helpful to deal with foaming, especially if you want to try to filter carbonated beer. You will also need two keg couplers, some tubing, and barbed adapters for the housing.

A word of advice on filter housings: buy a new one for your beer filter and use it only for beer filtration. Take care of it. Never forget that what makes the seal between the "dirty" and "clean" (input and output) sides of the unit is a pair of simple knife-edges cast into the housing pieces, and the neoprene washers on either end of the cartridge. The seal depends entirely on compression. The knife edge therefore must be perfectly smooth. Take care how you store it. Also, to extend the life of the cartridge washers, I suggest that you assemble the unit and tighten it down only for filter runs, and otherwise store it covered but open.

How to Filter

Filtration is basically a process of using carbon dioxide pressure to push the beer out of one keg, through the filter, and into a second keg.

As with any brewing operation, the most important thing is to make sure that everything that touches the beer is clean and has been sanitized ahead of time. The next most important, with fermented beer, is to minimize air pickup during filtration. These goals point to a tedious but straightforward prep routine.

The easiest way I have found to sanitize the filter, lines, and kegs, is to basically do a "prefilter run." I use a 40 ppm activated Oxine solution as my filter sanitizer.

The Routine is as Follows:

Step 1. Set everything up and put all equipment together as for the filter run. Make sure the gas valve on the regulator is closed. The racked beer keg connects to the input of the filter. The output plug of the bright beer keg connects to the output of the filter. Leave the keg lids off or hanging loose.

Step 2. Make up 5 gallons (19 L) of activated Oxine solution in the racked beer keg. Set the carbon dioxide regulator to 6 PSI or whatever the filter instructions recommend. Put the lid on the keg and then open the gas valve on the regulator. Push the Oxine solution through the filter housing into the bright beer keg. At the end of the run turn the filter upside down to empty it as well as possible.

Step 3. When carbon dioxide starts bubbling up in the bright beer keg, detach the beer and gas hoses from the racked beer keg. Also detach the beer hose from the output of the filter. Put the lid on the bright beer keg, put the end of the beer hose in a bucket, then connect the gas hose and push the Oxine solution out of the keg into the bucket. When finished, disconnect the gas hose from the keg and close the regulator valve. Set the bucket of Oxine aside. Reattach the bright beer hose to the filter output.

Step 4. Now it's time to filter. Rack the cold beer out of the fermenter into the racked beer keg.

Step 5. Close up the keg and reconnect it to the gas. Leave the racked beer hose connected to the filter, but not to the keg.

Step 6. Purge the headspace of air. Adjust the regulator to 6 PSI. Then open the gas valve and pressurize the keg full of racked beer. Release the pressure by pulling on the ring attached to the relief valve. If the relief valve cannot be operated manually, you will have to disconnect the gas line and press down on the poppet of the gas plug. Repeat three times.

Step 7. With head pressure at zero, reconnect the racked beer line to the keg. Open the pressure relief valve on the bright tank and leave it that way until the filter run is over. Set the carbon dioxide pressure to the lowest value recommended by the filter instructions. Stop for a minute and

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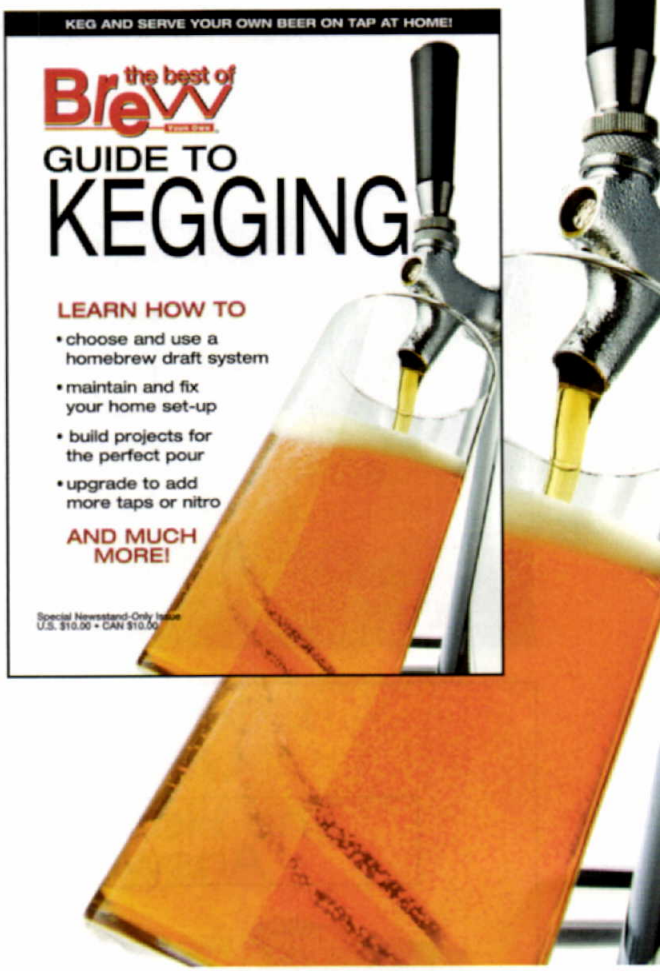

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double-check that everything is connected together just as it was when you sanitized the filter. Then open the gas valve and run the beer through the filter. If necessary, increase the pressure as the run goes along, but note the maximum pressure specified. The Filter Store states that the maximum is 35 PSI. With its 0.5-micron filter cartridge, filtration should take 10 to 15 minutes. I find that 6 PSI is enough to push the beer through the filter.

Step 8. When all the beer is in the bright keg, close the pressure relief valve. Disconnect the gas hose from the empty keg, set the regulator to 30 PSI, and attach the hose to the bright keg. Turn on the gas. Purge the headspace three times, but this time leave it pressurized after the last fill. Set it in the beer fridge and proceed to cleanup.

Step 9. To clean a cartridge filter, make up 1 gallon (3.8 L) of PBW solution in the bottom of a 5-gallon (19-L) bucket. Disassemble the cartridge housing and clean by hand. Put the hoses and couplers in the solution to soak. Make sure they are filled. The cartridge itself is best cleaned by soaking. I leave it in the bucket for an hour, spinning and swirling it several times. To keep it submerged, I set a small plastic bucket over it — this is just heavy enough to hold it under.

The Graver cartridge has a polypropylene mesh wrapped around the pleated element, and this protects it. If you have a cartridge without such a protective sheath, you will have to weight it down in some manner, but be careful not to bend or fold the pleats. While the cartridge is soaking, clean all hoses, racking arm, kegs, and fermenters by hand. On plastic, use nothing rougher than a sponge and avoid scrubbing. Let the PBW do the work. The best way to clean small tubes, including the dip tube in a corny keg, is to siphon or push solution through them, then stop the flow and leave them to soak a while. BYO

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Soaking the Oak

Homebrewing styles good for wood

by Terry Foster

Back in the 1980s and 1990s brewers would often ask whether beers that spent a long time in oak casks, such as IPAs, would have an oak flavor. I would reply (accurately) that they did not, largely because the casks were treated before use, and were used over and over again. Indeed, they were often lined with pitch or even paraffin wax to make certain that no flavors would be extracted from the wood.

But American craft brewers and homebrewers are unquestionably innovative and looking to push the envelope, aren't they? Right now many craft brewers have at least one beer maturing in an unlined wooden cask. In fact, sitting somewhere in the cellars of Wynkoop Brewing in Denver is an ex-bourbon cask containing a version of my Chancellor Ale (*BYO*, May/June 2006). A lot of craft brewers like aging in used bourbon barrels, which is a step on from introducing straightforward oak flavors, but the latter is also widely popular, and I'll look at that first.

Adding oak flavors

The obvious way to add oak flavor to a beer is to age the beer in an oak barrel, but that really is not all that practical for a homebrewer. Small oak casks (5-10 gallons/19-38 L) are available but difficult to use in practice. The first problem is surface area; a 5-gallon (19-L) cask has about twice the surface area per unit volume of that of a typical commercial wine cask. This means that it is easy to overdo the "oaking" and to overwhelm all other flavor components. Also, because of the surface area effect, evaporative loss of beer through the porous staves of the cask can be significant during long aging, and will also result in loss of carbonation. And finally, the first use of a wooden cask will take out pretty much all of the extractable oak flavors, so it cannot be used again for the same purpose.

The more common approach, which avoids most of these problems, and whose effects are easier to control, is to add oak in some form or another directly to the beer. These "additives" were discussed by James Alexander in *BYO*'s January-February 2008 issue, so I won't go over them in detail here, I'll just summarize them in the table on page 72.

These are all much cheaper ($3-10 depending upon type) than a full-blown barrel, which can cost more than $200. I have not listed the different flavors to be expected from these since it will clearly vary according to the time of immersion (all these are usually added in the secondary fermenter). But the materials themselves, especially the cubes, come in a wide variety depending upon the source (commonly American, French and Hungarian oaks) and on the degree of toasting (light, medium and heavy). I have also seen cubes with whisky and Sherry flavors.

It seems homebrewers favor cubes; I know that at least one major craft brewer has used them and I have used them successfully myself. As to what type of oak and degree of toast you should try that is a purely personal choice, decided by your own taste. I suggest starting with American oak at the lighter end of the toasting range. When it comes to addition rate and residence time in the beer start at the lower end of the range – you can always work up from there with later brews. As always make detailed tasting note on your early efforts in order to guide you on the next beer. Above all, do not assume that more is always better, and remember that the degree of oaking required will depend upon the style of the beer you are brewing. Adding oak flavor is definitely not a procedure where "one size fits all."

Which beer should you oak?

As with most changes in your

> "Right now many craft brewers have at least one beer maturing in an unlined wooden cask."

Photo courtesy of Northern Brewer

Homebrewing Oak Alternatives

MATERIAL	APPROX. AMT. (add to 5 gal.)	TIME to MAX EXTRACTION
GRANULATED OAK	0.5 - 1 oz.	10-14 days
OAK CHIPS	0.5 – 2 oz.	14 days
OAK CUBES	1 – 3 oz.	4-6 weeks
OAK SPIRALS	1 - 2 sticks	20 weeks

approach to adding extra flavor to a beer you should always think carefully about what it is you want to achieve; do not just charge ahead or you may finish up with something undrinkable. Mainly you need to think about the normal flavor of the style you are planning to brew and whether oak flavor would just throw it out of balance, or would it add some welcome complexity.

The main flavors we are concerned with come from vanillin (that is, vanilla like) and tannins (which impart astringency), though there are many other less well-defined contributors to oak-derived flavor, such as pepper and roasted notes. If you bear vanilla and astringency in mind it will be clearer as to which of your beers will benefit from oaking. There are no hard and fast rules, and much will depend upon your own taste threshold and like or dislike for these main flavors.

Low alcohol beers (below 4.5% ABV), such as milds, English brown ales, ordinary bitters and cream ales generally suffer from this procedure. They are likely to be dominated by oak flavors and prone to being spoilt completely by too much tannin. Much the same is true for light-flavored lagers, such as American Pilsner and Kölsch, as well as for the various forms of wheat beer (which are meant to showcase other flavors, particularly those derived from the yeast used). Any beer where full-bodied, well-balanced maltiness are the normal characteristics, such as bock beers, Scotch ales and wee heavies will not really benefit from excessive amounts of vanilla and astringency.

Hoppy pale beers are another story, however. Even a relatively low-alcohol beer like pale ale can benefit from a little oaking. Go very gently here though, and opt for light-toasted American oak cubes at a low rate, say 1 oz. (28 g), and let it sit only for two to three weeks on the cubes. More highly-hopped brews such as IPA, double and imperi-

Guthrie's Woody Imperial Stout (oak aged)

(5 gallons/19 L, extract with grains)

OG = 1.088 FG = 1.028 IBU = 68 SRM = 100+ ABV = 7.9%

Ingredients:

8 lbs. (3.63 kg) amber liquid malt extract
3 lbs. (1.36 kg) pale dried malt extract
0.75 lbs. (0.340 kg) Belgian Special B malt
0.75 lbs. (0.340 kg) chocolate malt
0.75 lbs. (0.340 kg) black malt
18.5 AAU Columbus pellet hops
(1.5 oz./43 g at 12.3% alpha acids)
(60 min.)
Nottingham Ale dry yeast
1.5 oz. (43 g) medium toasted French oak cubes

Step by Step

Put the grains in a muslin bag and steep in 2 qts. (2 L) of 150–160 °F (65–71 °C) water for 20 to 30 minutes. Rinse the grains with an additional 2 qts (2 L) of hot water and transfer the liquid to a brewpot. Top up to 5 gallons (19 L) with water. Carefully dissolve the malt extracts and bring to a boil. Add hops and boil for 60 minutes. You could add the liquid malt extract towards the end of the boil if you want to, but you will have to adjust the hop rate (see "Techniques" in the September 2012 issue of *Brew Your Own*).

Cool to 65–70 °F (18–21°C) and pitch the yeast, preferably having previously prepared it as a 2-qt. starter. When primary fermentation has finished rack the beer onto the oak cubes in a secondary fermenter if you wish. I prefer not to add the oak at this time, but to rack a second time after about five to six days and add the cubes then. This is because I want the beer to be as clear as possible during oaking; if there is a significant amount of yeast in the secondary it will merely coat the cubes and reduce the efficiency of extraction from the oak. At any rate leave the beer on the cubes for no more than two weeks before racking it and then bottling or kegging it in the usual way.

One other step I like to do with this beer is to very lightly rinse the cubes with bourbon whiskey before adding them to the beer in the secondary. This step helps to sanitize the cubes, and also adds just a hint of bourbon to the finished beer's flavor — a taste that goes well with this kind of stout. Some brewers like to pretreat the oak cubes with very hot water, but I don't like to do that as you will remove a good deal of the oak flavors you want to get into the beer.

al IPAs, not to mention the ludicrously titled black IPAs, can be oaked to advantage. The high levels of bitterness and hop character will tend to hide astringency from the tannins, and the vanilla and roasted notes from the oak will help to smooth out the hop bitterness.

Oak is definitely not welcome in fruit beers for me as it will easily overwhelm the desired fruit character. I know a number of craft brewers have barrel-aged fruit beers, but that is usually done when they are looking for more funky flavors from *Brettanomyces* yeasts, which ferment very slowly. And you might be thinking at this point that I am going to say only big, high alcohol beers will benefit from oak contact. But I don't think that is true for Belgian golden and tripel beers, since these are generally designed to be dry tasting (often via a candi sugar addition). That allows the flavors from the Belgian yeasts to come through, and oak tannins would certainly smother those flavors. Of course, high alcohol beers such as barleywines can be improved by adding oak flavors, even if they are not highly hopped. That's because such beers tend to be quite sweet and the tannin bite helps make them seem drier, allowing the vanilla flavor to come through nicely.

Above all, beers using highly roasted malts (chocolate, black malts) are the prime candidates for oaking. All the flavors that can be conferred by oak tend to balance out the harshness of the roasted character and add to the depth of the beer's palate. But again you have to be careful about which beer you pick for this. It is easy to spoil a well-balanced, low alcohol (say, 4.3% ABV) brown porter. You would be better off considering a robust porter at the top end of the alcohol range, perhaps around 6% ABV. Baltic porters are often somewhat bland and could definitely be improved by judicious oaking. I don't think an Irish dry stout should be oaked, since its characteristic flavor is only that of high roasted malt. Cream stouts, with their typical luscious flavor from unfermentable lactose, are not likely to be improved by adding astringency from the oak. The same might be said for oatmeal stouts since the oatmeal is usually incorporated to give the beer some extra smoothness. However, that does not mean that this style cannot be improved by adding oak as long as you do so at the low end of the addition rate and residence time (say adding one spiral in 5 gallons/19 L and letting it sit in the beer for no more than three to four weeks). But finally the style that really works very well with added oak flavor is imperial stout (which includes imperial porter). These beers can carry the strong oak flavors very well, even the astringency from the tannins. In fact, since these beers are often aged over long periods, the tannins will degrade and lose their harshness (as happens in aged red wines too). BYO

Terry Foster writes "Techniques" in every issue of BYO.

Oxidation and Staling

Slowing the development of off flavors

by Chris Bible

Most styles of beer are at their very best when fresh. When a well-made beer is fresh, it provides the delicious flavor and aroma experience that the brewer intended. Beer is a "living" beverage. As beer ages, the flavors and aroma associated with the beer will change.

As beer ages, it may eventually begin to have a stale flavor. The stale flavor is often described as having characteristics similar to cardboard, paper or wet paper. It might also be described as Sherry-like. Although Sherry-like flavors may not be unpleasant in Scotch ale or some strong Belgian ales, it is certainly not desired in most beer styles.

These stale flavors will continue to change as a beer ages and may evolve into tastes that are even less pleasant. A very stale beer may be described as having flavors reminiscent of rotten fruit or even garbage. Obviously the flavor of cardboard, rotten fruit or garbage is never a desired taste in any beer.

Although some of the "bigger" beer styles (e.g. Belgian strong ale) might benefit from the complexity provided by some of the staling flavors, beers that are less robust and lower in alcohol content do not usually benefit from these kinds of changes.

The cause of stale beer

The majority of the flavor and aroma changes that develop as beer ages are the result of oxidation. Molecules of the various flavor compounds and alcohols within the beer undergo a chemical combination with oxygen to form the flavor and aroma molecules that are responsible for the stale taste. Early research into beer oxidation focused on trans-2-nonenal, but a variety of molecules are responsible for the off-flavors associated with stale beer, including the oxidized products of fusel oils, aldehydes, esters, sulfur compounds and polyphenols.

Oxidation impacts the flavor and aroma of beer in a way that depends on many details that are specific to the particular type of beer in question. If trans-2-nonenal is formed in a lighter, less robust beer, it may cause a lipstick-like or papery flavor to develop within the beer. Trans-2-nonenal (an aldehyde compound) has a flavor threshold of approximately 0.1 parts per billion (ppb), so even very small amounts of this compound in a beer will likely be noticeable.

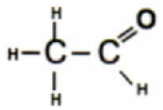
The aroma characteristic of many lighter beers is also affected by oxidation. Malt character in the aroma of a lighter, fresh beer may change in a way that causes the aroma to be perceived as somewhat "honey-like." This honey-like aroma is due to the formation of 2,3-pentanedione. While this particular change to the beer's aroma may not be particularly unpleasant, it is probably not what the brewer originally desired.

Fuller-bodied, darker beers tend to be impacted by oxidation in a way that is different from how lighter beers are affected. When a fuller-bodied, darker beer becomes oxidized, distinctive roasty, malty flavors and aromas are replaced by sweeter, more cloying, Sherry-like flavors. These Sherry-like flavors are the result of the oxidation of melanoidins within the beer. Melanoidins are the roasty, malty-tasting chemicals in beer that are the by-product of the Maillard reaction. (The Maillard reaction happens during the kilning of malt and darkening of the wort during the boil.) Darker, fuller-bodied beers contain lots of different kinds of melanoidins. There are many different oxidation products of melanoidins, and they have a very wide range of flavors.

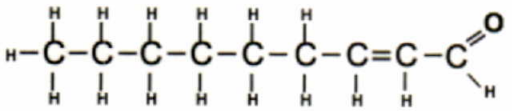
One of the products of the oxidation of melanoidins is benzaldehyde. Benzaldehyde has a characteristic almond-like flavor. It is also the primary contributor to the Sherry-like flavor in darker, oxidized beer. A small

"As beer ages, it may eventually begin to have a stale flavor. The stale flavor is often described as having characteristics similar to cardboard, paper or wet paper."

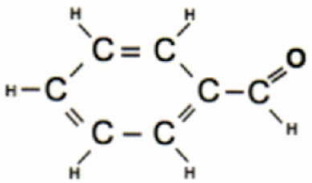
Figure 1



acetaldehyde



trans-2-nonenal



benzaldehyde

amount of the Sherry-like flavor from benzaldehyde may add complexity to the flavor and aroma of a strong beer style like a dark Belgian ale, but even a small amount of the Sherry-like flavor from benzaldehyde is generally not considered to be desirable in lighter beer styles. Too much oxidation of the melanoidins, even in a full-bodied, dark beer, will eventually cause the original rich malt flavor to take on a more sweet, toffee-like taste. If oxidation of the melanoidins is sufficiently advanced, the malt character will eventually be entirely lost.

Another flavor that may be caused by oxidation is the buttery or butterscotch flavor of diacetyl. The precursor to diacetyl (alpha acetolactate) is formed by the yeast during the fermentation process and excreted into the beer. There, it oxidizes to form diacetyl and the intensity of the characteristic buttery or butterscotch flavor will increase as the beer ages. Diacetyl can appear in an otherwise fresh beer, long before other oxidative products are noticed.

Chemical structures for several of the compounds that are associated with oxidation off-flavors are shown in Figure 1 (on this page).

The effect of heat on oxidation and beer flavor

Oxygen and heat are enemies of beer. Heat increases the rates of the chemical oxidation reactions that are responsible for many of the stale off-flavors that are associated with beer that is past its prime. Oxidation reactions are occurring in beer from the moment the beer is created, but the rate of oxidation, as with most chemical reactions, is accel-

erated by heat. This means that storing beer cold will help preserve it by reducing the rates of the oxidation reactions associated with the development of off-flavors. Conversely, exposing beer to heat will increase the rates of these oxidation reactions and will increase the rate at which undesired off-flavors are developed within the beer.

Practical implications

The best practice for a homebrewer is to ensure that a finished beer's exposure to oxygen and heat is minimized. There are many opportunities for beer to be exposed to oxygen during the brewing and packaging process. All hot-side operations (mashing, boiling) occur under atmospheric conditions in which the liquid is exposed to air. The process of wort chilling may also happen in open air. All of these events occur before the chilled wort is intentionally aerated to ensure yeast health, so there is no reason to attempt to shield your wort from oxygen at this point. (You should avoid excessive "abuse" of the mash and hot wort, but do not need to worry about routine splashing or stirring or the wort's exposure to atmospheric oxygen.)

To minimize oxygen pickup in finished beer, treat it "gently." Avoid agitation or stirring of beer in a vessel (such as a fermenter) if oxygen may be present. Minimize the number of times that finished beer is transferred between vessels. Avoid splashing of finished beer into kegs or bottles during the packaging process. Transfer beer with tubing rather than pouring from one vessel into another. Be sure to keep the end of the transfer tube beneath the liquid level. The act of pumping can introduce air into the beer, especially if the discharge from the piping system results in the splashing of beer into the receiving vessel.

Keep the airlocks on fermenters full and move the finished beer to completely airtight vessels (kegs or bottles) as soon as possible. Plastic buckets are fine for primary fermentations, but extended aging in them is not recommended. If you bottle your beer, leave no more than ½" (1.3 cm) of headspace in the bottle, and cap on foam if possible. Use oxygen-absorbing caps for your bottles. If you keg your beer, purge the kegs with CO_2 prior to filling with beer. One sure way to do this is to fill the keg with water, then force the water out with CO_2. Then, fill the keg quickly before the CO_2 diffuses away. Purge the headspace with CO_2 after the transfer.

No matter how much you try to avoid it, there will always be some oxygen in your finished beer. As such, cold storage will always be the best way to slow its oxidation. Consuming the beer in a timely fashion, when it is in peak condition is also recommended. This is usually not a problem with homebrewers. BYO

Chris Bible is BYO*'s "Advanced Brewing" columnist.*

The Beer Tower

Dispense with style

by Mike Lindel

Several years ago, my family and I decided to remodel our basement. As we looked at the space, we saw the potential to put in a bar to highlight my homebrews. Thus, was born our terrific basement space: bar, shuffleboard, big TV, game area and a sewing room for my wife Jenn. The kids love it and have enjoyed having a place where they can invite friends over. Since the remodel we started hosting an annual Oktoberfest, which is now eagerly anticipated by our friends.

A little over a year ago, one of my partners at work and I started brewing together. He had brewed on a basic level years ago and was ready to get back into the hobby. We had a great time and decided to do a "SpringFest" as we didn't want to wait until the fall to highlight our beers for Oktoberfest. It was a great success.

For both events we had two taps in the bar, and put two kegs in a garbage can on ice with picnic taps outside on the deck. It worked fine, but the more I thought about it, the more I wanted a way to serve the homebrew that reflected the time, effort and quality of the beer I served. I looked everywhere for something nice and there just wasn't anything out there that I liked. I considered getting or making a jockey box, but it still looked like a plastic cooler, and I felt like they were too expensive. Using my skills from my other hobby, woodworking, I came up with the "beer tower." I have gotten so many compliments on the design from my guests that I decided to share the design with the rest of the homebrew community.

The cost for basic materials to build one tower can be had for under $50 (you can customize however you like, which will increase the cost). When I made my first tower I actually wanted to make two at the same time, so I used full 4-ft. x 8-ft. (1.2 x 2.4-m) sheets of plywood (see the materials list to the left). Depending on how you want your tower to look, it can be very basic and it will function just as well. I wanted mine to look like miniature versions of my home bar that I designed and built, so I added ¼-inch (0.6 cm) oak to the corners and bead board in between.

I made the sides of the top thicker, which allowed me to use a 12-in. x 12-in. (30.5 x 30.5 cm) matte of slate tiles covered by an epoxy resin, just like my bar top. The overall height of the tower allowed for both a comfortable height for the tap, room inside for the keg, connectors and tubing plus dry ice and efficient use of the standard sheet goods.

Materials & Tools

- ½ sheet of ½-inch- (1.2-cm-) thick plywood
- ½ sheet of ½-inch- (1.2-cm-) thick styrofoam insulation
- Stainless wall-mount drip tray
- Silicone caulk
- Wood glue
- Waterproof paint (such as Dry Lock)
- Paint
- Table saw
- Power drill with bits

Cutting List, Plywood

Front and back: 34½-in. x 12-in. (87.6 cm x 30.5 cm)
Sides (2): 34½-in. x 11½-in. (87.6 cm x 20 cm)
Bottom (2): 11½-in. x 11 1/2-in. (20 cm x 20 cm)
Top: 12-in. x 12-in. (30.5 cm x 30.5 cm)

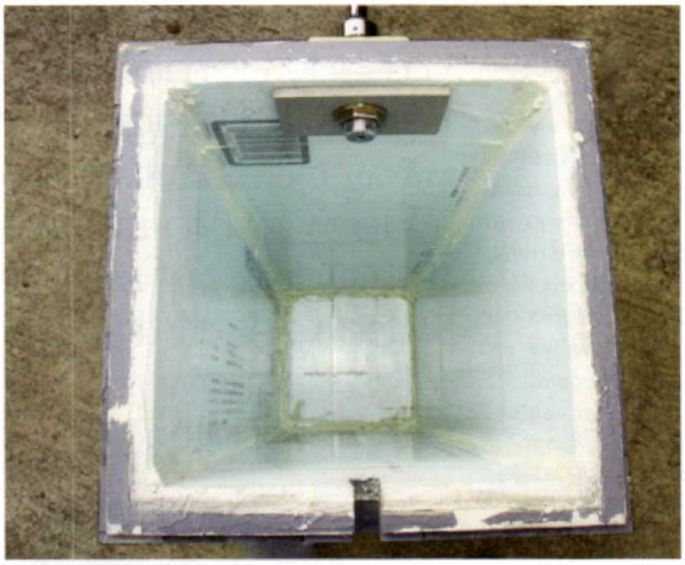
Cutting List, Styrofoam

Front and back: 32 ½-in. x 11-in. (82.5 cm x 28 cm)
Sides (2): 32 ½-in. x 10-in. (82.5 cm x 25 cm)
Bottom (1): 11-in. x 11-in. (28 cm x 28 cm)
Top (1): 11-in. x 11-in. (28 cm x 28 cm)

> "I have gotten so many compliments on the design from my guests that I decided to share the design with the rest of the homebrew community."

1. CUT THE JOINTS AND PIECES

Start by cutting the pieces in both cutting lists. On the inside long edges of the front and back pieces, cut rabbets ½-inch (1.25 cm) wide and ¼-inch (0.6 cm) deep. On the inside bottom edge of all of the sides, cut a rabbet joint (a recessed groove) 1-inch wide and ¼-inch (0.6 cm) deep to accept the two bottom pieces. (Some materials listed as ½-inch (1.25 cm) are a bit more or less than that. Make your rabbets as wide as the material and for the bottom, twice the material thickness.) Dry fit the pieces together, including the insulation and make any adjustments to your cuts at this point. To help keep water from getting to the interior wood surface, apply a coat of a waterproofing paint to the interior surfaces. Painting now before construction is easier. Make sure to not paint ¼-inch (0.6 cm) on the long edges of the sides and the rabbeted areas as these are areas that will be glued later. The bottom consists of two identical pieces, which need to be glued together. Paint one side of this as well, leaving ¼-inch (0.6 cm) on the edges.



2. CONSTRUCTION

Lay the back outside surface down on a flat surface. Apply glue to the rabbet joints. Apply the glue on three sides of the bottom and put it in place with the unglued side facing up. Next, put the two sides in place and place a clamp from side to side on the bottom. The combination of this plus the rabbets will help keep the sides square and vertical without needing to hold them.

You can use wood glue to attach the insulation pieces. Start with the bottom piece followed by the back, as it will go from side to side. Next, add the sides. Caulk all of the insulation joints between the sides and the back and the three joints on the bottom. To finish, put the remaining piece of insulation in place and put glue on the side edges and the remaining bottom edge. Put the front in place and stand the tower vertically. Apply clamps from front to back and side to side on the bottom and let dry. Make sure that the insulation is pushed up against the inner walls. Finish the remaining caulking of the front insulation joints.

3. DRILL THE HOLES

For the tap shank, drill a 1-inch (2.5 cm) hole about 2 inches (5 cm) from the top on the front side of the tower. Make sure to support the insulation with pressure on a scrap piece of wood to prevent tear out. For the gas line, cut a ¾-inch (1.9 cm) hole the same distance from the top. If you want, you could thread gas line through this and then connect it to a ball lock disconnect and leave it there. I, instead, cut down from the top of the box to the hole for gas line so I could use my existing gas line/regulator set up. If you do plan to leave your gas line in permanently, make sure the gas line is not snug in the hole. You want some gap, because if you use dry ice to cool the beer (read more on the next page), there will need to be some way for the CO_2 to vent.

4. FINISH THE EXTERIOR

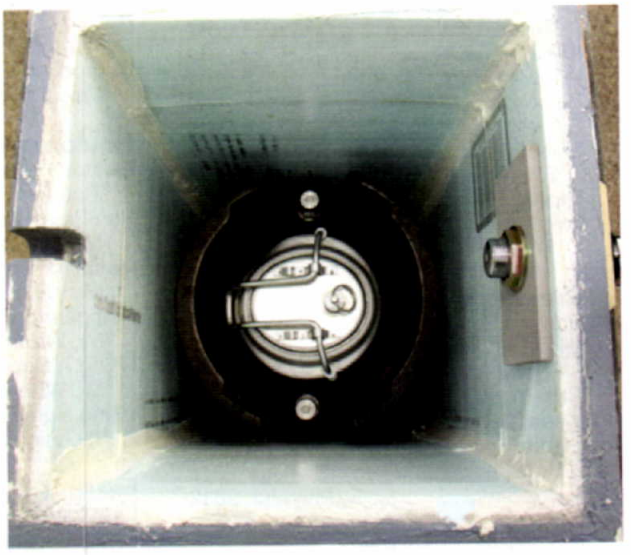
At this point the design of the tower is up to your imagination. The top can be as simple or elaborate as you wish. One 12-inch x 12-inch piece of plywood with the 11-inch x 11-inch piece of insulation centered on the inside is all you need. As you can see, I chose to tile mine. I dadoed (a slot or trench cut) my top into 3-inch (7.6 cm) pieces of ¼-inch (0.6 cm) oak as I covered my "box" with ¼-inch (0.6 cm) oak corner edging and bead board. It gave me an area 12 inches square (30.5 cm square) that was perfect for me to put in my slate tiles and epoxy resin covering. The sides stand up ¼-inch (0.6 cm) above this surface, which can contain a spill.

There are exposed edges of plywood on the corners, which can be covered by pre-made corner edging. You can paint it, stain it, cover it with stickers — whatever.

I added a 6-inch stainless wall mount drip tray about a foot below the tap. You can add any drip tray you choose.

5. KEEPING IT COOL

The first time I used my tower there was very little melt and the beer stayed very cold. I was still worried about leaking water, however. Then Jenn said, "What about using dry ice?" Dry ice could keep the interior of the tower cold for prolonged periods, minimize the risk of wood being exposed to water. From my own experiments, I found that with 3 lbs. (1.3 kg) of dry ice (wrapped in newspaper to protect from freezing the keg) I could keep the temperature stable for hours on end, both inside and outside the keg, with no water or mess. A note about dry ice safety: Dry ice is much colder than regular ice (-109 °F/-79 °C) and can cause severe frostbite within seconds of direct contact. Never handle dry ice with your bare hands, put it in your mouth or put it in beverages to cool them. Dry ice also does not melt, instead it sublimates from a solid to CO_2 gas, which is heavier than air. CO_2 gas can accumulate and can cause asphyxiation in confined, unventilated and low-lying spaces. Only use dry ice in a well-ventilated area. If there is any dry ice remaining, place it in a well-ventilated area or outside, away from children, to sublimate — do not dispose of it in the garbage or in a sink.



6. HOOK IT ALL UP

I used a 3⅛-inch (9.8 cm) shank for the tap. When attaching the shank lock nut to the shank, I use a piece of ¼-inch (0.6 cm) scrap, about 2-inch x 4-inch (5 cm x 10 cm) up against the insulation. This way the lock nut did not cut into the insulation and gave a solid foundation to support the tap. I used 5 feet (1.5 m) of beer line to prevent foaming, and there is enough space along the sides of the keg to let this line loop down and then back up, which helps keep the beer cold all the way to the tap. Put in your keg and add your CO_2 lines through the opening in the back, pop on the top and you are set to go. You can make it a true stand-alone unit if you use a CO_2 cartridge and mini regulator. BYO

Mike Lindel is a homebrewer from Winston-Salem, North Carolina. This is his first article for Brew Your Own.

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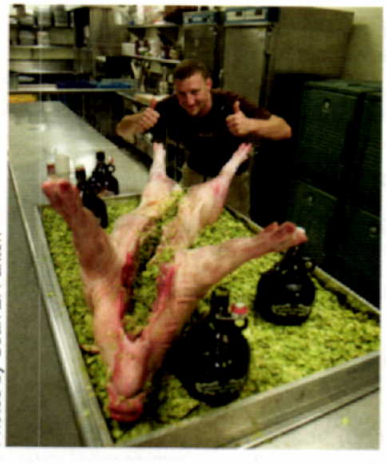
Hops in the Hog

Farm to table at Sierra Nevada

Sean Z. Paxton • Sonoma, California

> "I asked him if it would be possible to raise two pigs on Sierra Nevada spent grain, hops and yeast."



Photos by Sean Z. Paxton

Sierra Nevada Brewing Company's Brian Grossman (son of Sierra Nevada Founder Ken Grossman) and I were discussing our love for pigs and all things pork two years ago, when I asked him if it would be possible to raise two pigs on Sierra Nevada spent grain, hops and yeast. I had wanted to raise animals on brewery by-products for a long time, and now I thought it could actually be a possibility. Brian's eyes lit up when I asked the question, and together we knew we had to make our pig project happen.

At the time when we started our beer and swine project I was working on a beer and food pairing menu for the Brewer's Dinner at the annual Northern California Homebrew Festival at Lake Francis in Dobbins, California. Three months before the date of the dinner, our pigs were fed Sierra Nevada brewery by-products by the animal science students in the agriculture department at California State University at Chico. The two pigs were then slaughtered a week before they were to be served at my homebrew festival dinner.

After slaughter, we injected the first pig carcass with freshly brewed and chilled first runnings from a Sierra Nevada Celebration Ale brew day using a special stainless steel needle. We used a gallon (3.7 L) of this wort and targeted all the major and minor muscle groups. The second pig had a similar treatment; however, the injection was infused with a collaboration brew Sierra Nevada made with Dogfish Head Craft Brewery called Life and Limb Ale. This brew was made with maple syrup from Dogfish Founder Sam Calagione's family farm in New England.

After the wort was injected, Brian pulled out special pig pans that Sierra Nevada uses for large events and we lined two of them with Cascade hops by the handful (see photos at left). We placed each pig carcass belly up in each of the pans and filled the cavities with more hops. The two carcasses were then placed in a walk-in refrigerator to "hop age," letting the hop flavor and aroma penetrate the flesh, and also to let the wort and beer marinate the meat.

After six days in the coolers with the hops, I took the hopped and marinated pig carcasses to the dinner location, along with a "make any BBQ head jealous, over the top, totally custom, spit made from a leaking grundy tank lid." The first whole pig was then tied with stainless steel wire to a stainless steel post and roasted over mesquite and oak wood overnight, basted in a Sierra Nevada Tumbler Autumn Brown Ale adobo mop. The second whole pig was wrapped in a hop burlap sack, rehydrated in water and buried into a pit that was filled with river rock and a half-ton of wood, burned down to coals and covered to slow cook for 14 hours.

The pork delicacies were served as two different courses with a dinner theme of hops and IPA. Both pigs were amazing, complex and unique to the preparation. Working with Brian on this project was not only a blast, but is an example of "Eat Beer" at its finest and fulfilled a long beer cuisine dream of mine! BYO

Sean Z. Paxton, The Homebrew Chef, wrote the feature story on page 48 of this issue of Brew Your Own *about the Sierra Nevada Brewing Company in Chico, California. Sean lives and homebrews in Sonoma, California and he organizes several beer and food events and menus each year. Visit Sean's website at www.homebrewchef.com where you can track his latest events and read sample menus. You can also listen to Sean on* The Brewing Network's *show "The Home Brewed Chef" at http://thebrewingnetwork.com /shows/The-Home-Brewed-Chef*

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