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THE HOW-TO HOMEBREW BEER MAGAZINE

DECEMBER 2022, VOL.28, NO.8

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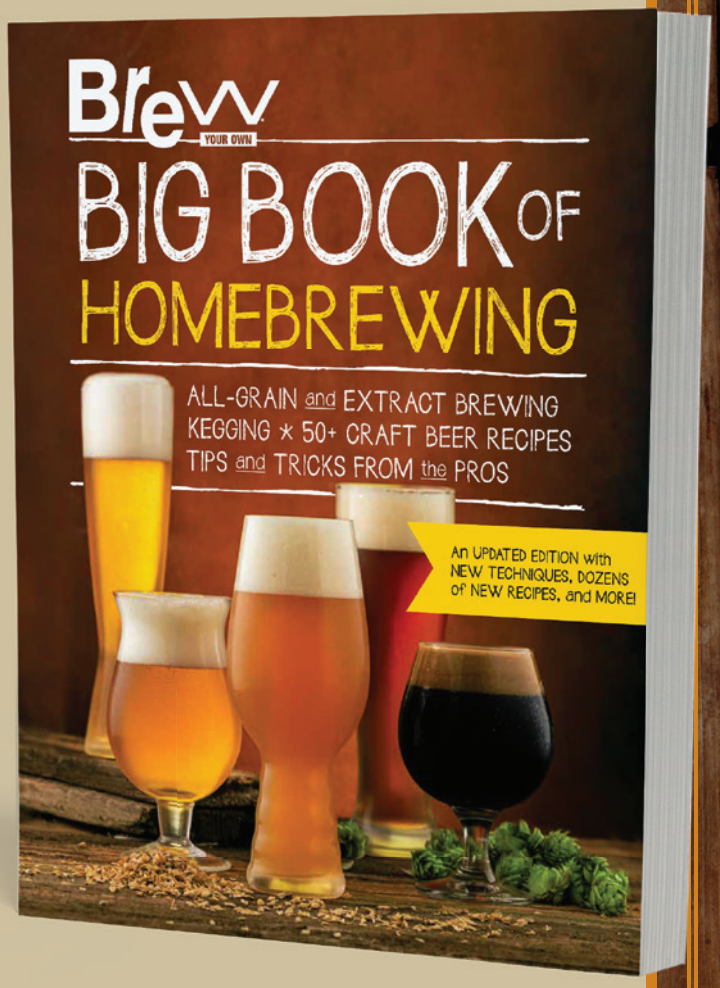
- **More to learn: All-new information on creating mouthwatering hazy IPAs, pastry stouts, and kettle sours.**
- **New recipes to brew: Find 25 new clone recipes from popular craft brewers, including Bierstadt, Trillium, Bell's, and Allagash.**
- **Everything you need to up your game: From extended info on brew-in-a-bag to the latest dry-hopping techniques.**

Whether you're looking to get into brewing, become a better brewer, or find inspiration for your next beer, you'll find it in the big book!



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Brew YOUR OWN THE HOW-TO HOMEBREW BEER MAGAZINE

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DECEMBER 2022, VOL.28 NO.8

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RECIPE INDEX

RECIPE STANDARDIZATION

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

EXTRACT VALUES FOR MALT EXTRACT:
liquid malt extract (LME) = 1.033–1.037
dried malt extract (DME) = 1.045

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

HOPS:
We calculate IBUs based on 25% hop utilization for a one-hour boil of hop pellets at specific gravities less than 1.050. For post-boil hop stands, we calculate IBUs based on 10% hop utilization for 30-minute hop stands at specific gravities less than 1.050. Increase hop dosage 10% if using whole leaf hops.

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We use U.S. gallons whenever gallons are mentioned.

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Cover Photo:
Charles A. Parker/Images Plus

Q What is your favorite holiday meal and what beer will you pair it with?

My favorite holiday meal is Christmas breakfast — which in my family is traditionally stuffed French bread. The recipe came from a close family friend — her prized recipe in her church's community cookbook. A decidedly decadent mix of puffy grocery store "French" bread chunks, maple syrup, eggs, milk, and cream cheese that gets mixed the night before and popped into the oven. It's rich, sweet, over the top, and in need of a good beverage. While we usually think of a mimosa as the breakfast drink of choice, a big Belgian golden strong or tripel with its spritely carbonation and dry finish would make the perfect breakfast pairing. Look, it's the holidays — have the beer!

I've got two favorite holiday meals: Thanksgiving and St. Patrick's Day. My traditional salt-brined turkey, along with all the fixins, is served with Moonlight Brewing's Reality Czech Pilsner. My corned beef, cabbage, and roasted potatoes will get washed back with Smithwick's Irish Ale.

I make different meals every year but it always seems like I choose a Belgian beer for a holiday meal. If I'm serving fish or poultry, I usually pick a saison, but if it's red meat I like a Belgian dubbel. Homebrew, if I have it, or commercial. Belgian dark strong or a fruit lambic for dessert with almost anything.

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The Science of Hygienic Brewing
Quality cleaning begets quality beer. Longtime professional brewer Colin Kaminski breaks down the science and your options to combating the grime and potential contaminants to your brews. https://byo.com/article/a-clean-fight-the-science-of-hygienic-brewing/

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Pastry Beers
Often brewed with adjunct culinary ingredients and featuring flavor profiles of baked goods and desserts, pastry beers push the boundary of what beer is. Get tips to brew your own pastry beer, plus four clone recipes. https://byo.com/article/pastry-beers/

Master The Spice
One spice, two spice, red spice, blue spice. While mixing beer with spices offers an unlimited array of options, the approach to spicing beer can be handled in stride using a few key guidelines. https://byo.com/article/master-the-spice-options-and-approaches-to-additions/

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Build A Fermentation Chamber
Just because you don't have a spare refrigerator to convert into a fermentation chamber, that doesn't mean you can't build one. Here is a design utilizing a used air conditioner to keep an insulated box cool during active fermentation. https://byo.com/project/build-fermentation-chamber/

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MAIL

FESTBIER IS THE BEST BEER

I brewed the Festbier recipe from the "Germany's Beers of Autumn" feature in the September 2022 issue of *BYO* (page 53). Hit all the numbers. Everything went according to the recipe (of course, tweaked for my brewing equipment).

I kegged it on Monday, October 10 and forced carbonated. Enjoying my first glass on the evening of Friday, October 14.

THIS IS THE FESTBIER I'VE BEEN SEEKING!

Thank you, *BYO*.

Kraig Krist • *Manassas, Virginia*

We are so happy to hear that this recipe hit the mark that you were looking for. Sounds like we have a recommendation for next year's Oktoberfest office celebration!

GLUTEN-FREE BREWING

I have been diagnosed with celiac disease and am no longer able to enjoy traditionally brewed beers using barley, malt, wheat, or rye. Do you have any resources for homebrewing gluten-free beers?

Bob Labozetta • *via email*

Sorry to hear about the celiac disease diagnosis, but we are happy to help keep your mash tun filled and homebrew hobby cruising because there has been quite a bit of information regarding gluten-free brewing made available in recent years. To start, Brewers Publications just released their first book on the subject written by Robert Keifer earlier this year titled Gluten-Free Brewing. *This is probably the most extensive resource available to homebrewers looking to brew flavorful gluten-free beers at home. In addition to this book, Robert founded Divine Science Brewing Co. (Tustin, California) and has written articles on gluten-free homebrewing for numerous publications including* BYO *(find his article "Hold the Gluten" in the May-June 2019 issue or online for digital members at https://byo.com/article/hold-the-gluten).* BYO *has published many other articles on gluten-free grains and gluten-free (as well as gluten-reduced) brewing that can be found using the search function on our webpage.*

Another great source for gluten-free brewing information and

contributors

Paul Crowther is a beer writer and homebrewer based in Newcastle, England. He has a regular homebrew piece in *Pellicle Mag* and bylines in *Vittles and Ferment*. He enjoys pushing the boundaries of homebrew and making innovative and unusual new brews. Paul lives with his wife, son, and three rescue dogs. He is a keen gamer and loves long walks in the country. He can often be found wittering about beer and politics through his Twitter persona the mad brewer (@themadbrewery).

Paul also loves to imagine what historic (and even fictional) beers would taste like and then brew them after doing his research. Starting on page 34, Paul shares the story of a group of French priests who fled to Northumberland, England, during the French Revolution where they set up a brewpub and brewed a beer that had been lost to history, until now.

Dave Clark lives in Phoenix, Arizona and is a connoisseur of all things homebrew and craft beer. A former professional brewer with Hoppin' Frog Brewery of Akron, Ohio, Dave is a member of the Beer Judge Certification Program, currently ranked Master, as well as a Certified Cicerone. He has worked in virtually all facets of the beer world from production, to sales, to marketing. Dave is a full-time musician, performing throughout the state of Arizona and beyond. He is also a part-time journalist, writing primarily about craft beer and music. Dave is the author of *Phoenix Beer: A History Rising to New Peaks*. He also writes the "Replicator" column in every issue of *BYO*.

Beginning on page 38, Dave shares the unique story of how Prairie Artisan Ales grew from a contract-brewed brand in rural Oklahoma to a fan favorite across North America and beyond.

Dan Jablow is a self-taught, all-grain homebrewer with a passion for brewing beer in single-gallon (4-L) batches. He is a graduate of the Beer Brewing Professional Certificate program at the University of Richmond, as well as a formally trained chef and graduate of the Cambridge School of Culinary Arts. Dan's first business, a smoked meat company called Jablow's Meats, was voted in 2012 by *SF Weekly* as having one of the best sandwiches in San Francisco (pastrami). Today, Dan can be found tinkering with recipes, experimenting with ingredients, and sharing a behind-the-scenes look into small batch brewing at home on his Instagram feed (@small.batch.brewing) and his blog, *Welcome to Homebrewing* (welcometohomebrewing.com).

In his first article for *BYO*, Dan combines his culinary and brewing expertise as he details how to process and cook with spent grains, beginning on page 52.

MAIL

ingredients is the website Gluten Free Home Brewing (glutenfreehomebrewing.com), which sells many of the hard-to-find grains that make up the backbone of so many gluten-free recipes.

There are certainly numerous other sources available with some digging, but one final one that may not be the first to come to everyone's mind but we'd recommend is searching for commercial gluten-free breweries and reaching out to some of them for advice. From our experience, most brewers are happy to pass along helpful information to homebrewers, but this is even more true of pro brewers who face the same challenges that come with a gluten-intolerance that you know too well. These are brewers who have done the research and often have years of experience doing testing and trial-and-error batch-after-batch brewing with unique ingredients most brewers are hardly familiar with. If they can help a fellow gluten-intolerant homebrewer out, most will.

We hope this information is useful. Be careful with what you consume, but don't think that gluten intolerance means the end of enjoying a cold beer or the fun of brewing beer yourself!

LET'S GET CANNING!

I was pumped when I saw the cover story in the October 2022 issue of *BYO*. I had the thought in the back of my mind about getting a canner and canning my homebrews for a while but didn't know too much about the process. After reading this story I dove down a rabbit hole and watched videos featuring each of the canners mentioned in the article and now know what I'll be asking for this Christmas. Thanks!

Mike Strange • *via email*

STAR SAN pH CORRECTION

From Ashton Lewis, author of the "Mr. Wizard" column: "I spotted an error in my column from the October 2022 issue about Star San. I indicated that the pH should be less than 2.5 when storing, but the correct pH is less than 3.5 (this is direct from the Star San Q&A on their website). I just calibrated my pH meter (2-point) and checked the pH of a Star San solution that has been in a keg for a few months and the pH is 2.2. The less than 2.5 that is in my column is not wrong, just conservative. The good news is folks are not going to make a fresh solution and find that the pH is greater than 2.5. Sorry for the fat finger fumble." BYO

WRITE TO *BYO*

Have a question about something you've seen in *BYO*? Want to show off your latest DIY homebrewing gear or recipe? Write to us at: edit@byo.com, find us on Facebook: www.facebook.com/BrewYourOwn, Instagram: @brewyourownmag, or reach out to us on Twitter: @BrewYourOwn.

BEGINNER'S BLOCK

BY DAVE GREEN

SPICED BEER

While some traditionalists scoff at the idea of adding anything other than malt, hops, yeast, and water to their beer, nothing is more traditional than adding spices other than hops to beer. Gruit is much older than the ales and lagers we drink today. And when things go right and a recipe comes together seamlessly, marrying the beer and spice perfectly, it can lead to memorable drinking experiences. But when poorly made, spiced beer can be heartbreaking . . . trust me, I know from experience.

GETTING A GAME PLAN

Executing a well-made spiced beer all starts in the recipe development stage. If attempting something new, it's nice to have a tested recipe already developed for you. Visit byo.com/recipes to explore a huge array of previously tested recipes. You can find inspiration for a beer or find quantities for spicing that you may want to incorporate into your recipe. There is an endless array of possible combinations, but a common theme is to look to the culinary world for inspiration. Dessert-themed beers have become common style in both the commercial and homebrew scenes, but there are so many other possibilities too.

If you are looking to create a recipe on your own, there are a couple concepts that can help get you on a road to a successful beer. First off, if you are doing a concept beer based on something from the culinary world like a dessert, I would recommend that you forgo directly adding the finished product to the beer but rather deconstruct the ingredients and add those in place. So instead of adding a dozen jelly donuts or two boxes of Thin Mints® to the fermenter, look at the ingredients used and pick out the key flavors and ingredients you may want to incorporate into beer. For that jelly donut beer, maybe you'll want to get some strawberry puree and/or extract to get the jelly aspect to pop. Maybe you'll want to add some melanoidin and/or aromatic malt to the mash to get a little toasted character to the beer. For the Thin Mints® beer, you'll want some peppermint (leaves or extract) along with some chocolate element — chocolate malts, cocoa powder, and cocoa nibs. Both would probably benefit from a little vanilla addition as well, either chopped beans or vanilla extract.

HONING IN THE DETAILS

Next up, it's important to match up the base beer with the spicing. It may be pretty easy for certain concept beers but can be more of a challenge when exploring further reaches of the culinary world. A death by chocolate cake concept is most likely to be matched to a big, chewy stout and that winter warmer will probably get a nutty amber or brown ale to go with it. But that candy cap mushroom beer may be a little more difficult to pin down.

When it comes to how much of each element you should add, I like some advice that Josh Weikert gave in a story he wrote for the January-February 2019 issue on the topic. Weikert suggests to start with the quantity of spice you may add to a common 6-serving meal. So let's say you want to make a mole sauce-inspired beer. When trying to come up with quantities of each spice to add, check out a recipe for making mole sauce for a family. Those are ballpark amounts you should consider to incorporate into your 5-gallon (19-L) beer recipe.

Here is some advice I've learned through a few failures of my own. For the most part, stay away from the onion family (garlic, shallots, chives, leeks, etc.). They may go great in that culinary dish, but I've never found success using them in beer. One idea that may work is to put them through a caramelization step. It would give them a sweeter and more rounded flavor. Cloves are a spice I tend to stay away from as it is very easy to overdo it. If you want clove flavors, I suggest using a phenolic off-flavor positive (POF+) yeast strain. You also want to stay away from fatty things as it can ruin the head retention on beer. For example, PB2 powder is a great substitute for peanut butter. PB2 contains 1.5 g of fats per 2 Tbsp. compared to 16 g of fats per 2 Tbsp. of peanut butter.

TIMING IS EVERYTHING

Finally, I want to spend some time talking about when spices should be added. Almost all my spice additions are made after fermentation is complete. But what about sanitation issues? I deal with that by giving my spices a long soak in vodka, which technically makes them a tincture. How long of a soak depends upon the spice I'm using. Vanilla and cocoa nibs are two tinctures that I always keep in my kitchen. But generally I'll start my tinctures 1–2 weeks prior to brew day.

There are some exceptions that may make you adjust the spice addition to the boil. Cinnamon is one spice that will have a different flavor when added to hot liquids versus cold liquids. Cocoa powder is often "bloomed" (added to hot liquids) in order to draw out its rich flavors. Thyme and rosemary are two herbs that may be considered for addition on the hot side. One benefit to any spices added to hot wort above 175 °F (80 °C) is that they will not need to be previously sanitized.

VISTA HOPS

A new hop variety released at the end of 2021 from the USDA's (U.S. Department of Agriculture) public breeding program, Vista is another New-World hop with a lot of character. While IPAs and its relatives may be where this hop shines, there are plenty of other styles where it might find a home. With descriptions ranging from ripe honeydew, papaya, and white peach to tangerine and green tea, the oil composition found in Vista is perfect for that big hop-forward beer you may be looking to brew.

They are now available from a wide range of hop providers on the spot market and professional brewers can contract out. On the agricultural side, Vista hops have shown strong drought-resistance and resiliency from heat waves. And since it was bred by the USDA's public breeding program, homebrewers can grow them too with no minimums for purchase. If you would like to learn more about either brewing with Vista hops or obtaining rhizomes, visit: https://www.vistahops.com/

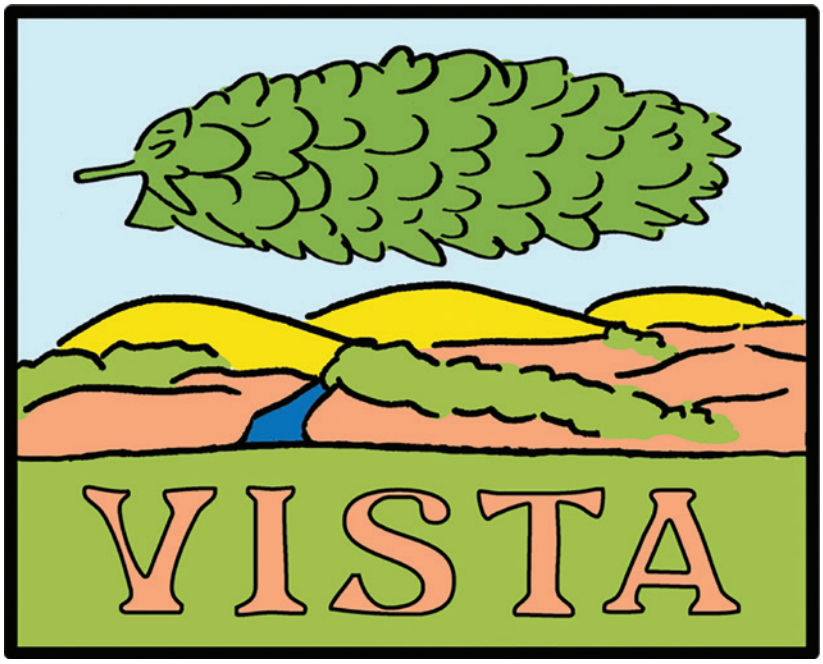

Image courtesy of www.vistahops.com

WHAT'S NEW

WHITE LAB'S PUREPITCH® NEXT GENERATION

New packaging for White Lab's PurePitch® yeast includes a reseal-able cap, meaning an end to sanitizing scissors or separating packaging layers before pitching, while also allowing for storage of any unused yeast. Also, a new proprietary fused two-layer film packaging is designed for one-way off-gassing to reduce product inflation and maintain yeast health. They have also doubled the cell count to 7.5 million cells/mL per 5 gallons (19 L) — in a no-starter-needed modular size. PurePitch® Next Generation has a four- to six-month shelf life. https://www.whitelabs.com/ppng?id=65

NEW INCOGNITO® SIZES

New sizing for the INCOGNITO® line of flowable hop extract allows homebrewers an affordable option to experiment with this product. At the time of printing, the 20-g size is available for Citra® and Mosaic® varieties. INCOGNITO® is designed specifically for use in the whirlpool stage of brewing and is generally a 1:6 replacement ratio. Usage of 1 g/L INCOGNITO® in the whirlpool is equivalent to 1.5 lbs./bbl pellets (0.8 oz./gal. or 5.8 g/L). The maximum recommended dose is 2 g/L. Each 20-g container is roughly equivalent to 4 oz. (113 g) of T90 pellet hops in the whirlpool. https://yakimavalleyhops.com/products/incognito

NEW MASCOMA SOURVISIAE® SIZE

The folks at Lallemand have released the popular Sourvisiae® bioengineered ale yeast strain in a homebrew-sized, 10-g sachet. Thanks to a single modification, the yeast is capable of producing high levels of lactic acid during primary fermentation. This strain produces both alcohol and lactic acid and can complete primary fermentation in five days with little off-flavors, which are often associated with some other souring microoganisms. This means brewers don't need to perform a souring step or require a sanitation step post-souring. The level of souring can be controlled with co-inoculation with another brewer's yeast or post-fermentation blending of beer. https://www.lallemandbrewing.com/en/united-states/product-details/sourvisiae/

Photo courtesy of Yakima Chief Hops

TOUGH GROWING SEASON FOR MANY EUROPEAN HOPS

Hop growers across Germany and the Czech Republic faced a very challenging summer growing season with both extreme heat waves and droughts across the Bavaria region. The Czech Republic was the hardest hit with an estimated 56% drop in hop production compared to 2021. The German hop harvest saw an estimated 20% drop in production in a country that supplies, on average, 36% of the world's hops, second to the U.S. Spalt was the hardest hit region in Germany, seeing an estimated 33% drop in hop cones compared to average. The good news was that newer, drought-resistant varieties showed resiliency in the face of the adverse conditions. Both Slovenia and Poland reported modest increases in their 2022 harvests when compared to 2021. https://www.barthhaas.com/fileadmin/user_upload/downloads/barth-berichte-broschueren/marktberichte/barthhaas-hop-report-august-2022-en.pdf

In North America, the 2022 hop harvest also looks down from 2021. But to put it into context, the 2021 hop harvest was the largest in the history of the U.S. and total hop acreage is actually down this year compared to last. Washington State saw the largest acreage decrease, with over 1,300 acres less of hop bines. At the time of publication, the 2022 U.S. hop harvest was on pace to be the second largest in history with Citra® leading the way, followed by Mosaic®, Cascade, Simcoe®, and finally CTZ rounding out the top five varieties. These five hops account for over 50% of the total hop acreage grown here in the U.S. So while Czech Saaz or German Hallertau Mittelfrüh may once again be hard to come by in the open market, the overall world hop supply should remain stable. https://cdn.shopify.com/s/files/1/0365/4598/6693/files/USDA_NASS_2022_Estimates.pdf

BYO REPLICATOR

BY DAVE CLARK

DEAR REPLICATOR, I visited Lexington, Kentucky for a family wedding and was informed that Blue Stallion Brewing was a "must visit." Popping into a local pizza spot I noticed Blue Stallion's Dunkel on draft and was eager to give it a whirl. One sip and I knew why . . . crisp, clean, delicious, and easy-drinking. This was my go-to beer for the rest of the trip. Before long it was the exclusive sipper of our group of five, with the exception of when we went to the brewery proper and worked our way through their extensive tap list. So here I am back home and I can't get that Munich dunkel out of my head. Can you work your magic?

Jeremy Bersano
St. Charles, Illinois

Reading a magazine dedicated to homebrewing, it's refreshing to come across a successful pro brewer who got his start the old fashioned way — by homebrewing! JR Redmon may be the new Head Brewer at Lexington, Kentucky's Blue Stallion Brewing Co., but his brewing history goes back to modest roots of stovetop brewing.

ROOTS IN HOMEBREWING

"I was going to the University of Kentucky, majoring in agricultural economics," said Redmon. "I hoped to work for a grain supply company or a hop yard. I serendipitously met a homebrewer, talked about brewing my own beer and eventually upgraded to a SABCO BrewMagic® system. My friend and I brewed 300 or so batches on that system, some of which have transcended to Blue Stallion Brewing."

Redmon took on the hobby that would become his life for the next several years around the same time that the future owners of Blue Stallion Brewing Co. were formulating a brewery business plan. The Donnelly brothers, Kore, Xavier, and Zac, along with Nico Schulz and Jim Clemons, wanted to be part of a burgeoning Lexington craft beer scene. Each person brought unique attributes and ideas to the table, which are showcased in the brewery's beers.

ENTER BLUE STALLION

Schulz' German heritage is on display with the brewery's core beers based on classic German styles such as hefeweizen, helles, and Pilsner. The Donnellys' contributed a popular Irish red as well as its most popular beer, the Dunkel. Blue Stallion also brews popular American styles such as hazy IPAs and sours. Being located in Bourbon country, the brewery taps into a huge local resource, spent Bourbon barrels, used for aging some of the brewery's finest offerings.

Blue Stallion's name is an ode to its local roots. Central Kentucky is horse country, while the local college's (University of Kentucky) main color is blue. Combining these two local references created a name that locals would easily embrace. Redmon's addition to the team took an already popular and successful venture to yet another level.

"We focus on safety, quality, and efficiency," said Redmon. "We went from owner-operated to manager-operated since I started here. My industrial engineering experience, especially my knowledge of lean manufacturing processes, helped me to have the autonomy I have now. That, and my time spent living in Germany, learning to understand and appreciate all that goes into some of the world's greatest beers." At Blue Stallion, the goal is to brew "boldly traditional craft beer."

"When we brew the Dunkel, as well as our other German offerings, everything is done with the Reinheitsgebot (German purity law) in mind," said Redmon.

BLUE STALLION DUNKEL

The mainstay of the Blue Stallion Brewing lineup is the extremely popular Dunkel. The 5.5% ABV, 25 IBU lager showcases rich, sweet aromas with bready flavors and a hint of caramel/toffee. At 18 SRM, the reddish-amber Munich dunkel is on the light side of the color spectrum (28 SRM is considered the high side), while containing all the flavor of darker versions of the style.

A base of Munich malts complemented by character malt additions of CaraMunich® III and CaraAmber® (which provide most of the color), are balanced with a light dosing of noble hops to create a true-to-style Munich dunkel. A touch of CaraFoam® and/or dextrine malt helps to provide head retention and the desired mouthfeel. Carbonating to 2.7 v/v gives the beer additional effervescence.

The area's water plays a huge role in the finished product.

"People call our Dunkel one of Lexington's best beers made," said Redmon. "The reason is the water. We have a lot of limestone in the water. Calcium content is really high because of the limestone and that accentuates the caramel and toffee notes."

Employing a single infusion mash, a 60-minute saccharification rest at 152 °F (67 °C) is followed by a 15-minute vorlauf before being transferred to the kettle for a 60-minute boil. After whirlpool, the beer is chilled and fermentation starts at 52 °F (11 °C). After a few days of high kräusen, the beer is allowed to rise one degree per day until it reaches 60 °F (16 °C). The temperature rise helps complete fermentation and doubles as a diacetyl rest.

Besides ensuring a proper pitch rate for lagers, Redmon encourages adding a second dose of oxygen 8–16 hours after knockout to ensure a complete fermentation.

The Dunkel is best served in an Oktoberfest-style half- or full-liter mug. The brewery's in-house restaurant recommends a pairing with tomato bisque and grilled cheese or beef dishes, such as their popular beef crudo.

BLUE STALLION BREWING CO.'S DUNKEL CLONE

(5 gallons/19 L, all-grain)
OG = 1.053 FG = 1.012
IBU = 25 SRM = 15 ABV = 5.4%

A single infusion-mashed Munich dunkel on the light side of the color spectrum with rich, sweet aroma notes, bready flavors, and a hint of caramel/toffee.

INGREDIENTS

8.25 lbs. (3.7 kg) German Munich II malt (8 °L)
1.25 lbs. (0.57 kg) pale malt
14 oz. (397 g) CaraAmber® malt (26 °L)
14 oz. (397 g) CaraMunich® III malt (56 °L)
8 oz. (227 g) dextrin malt
4.9 AAU Hallertau Magnum hops (60 min.) (0.35 oz./10 g at 14% alpha acids)
2.1 AAU Hallertau Magnum hops (20 min.) (0.15 oz./4 g at 14% alpha acids)
0.25 oz. (7 g) Hallertau Mittelfrüh hops (0 min.)
SafLager W-34/70, Imperial Yeast L13 (Global), White Labs WLP830 (German Lager), Omega OYL114 (Bayern Lager), or Wyeast WY2124 (Bohemian Lager) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Build your water profile to an "amber balanced" one with a 75:60 ppm sulfate:chloride while also making sure your mash pH is between 5.2 and 5.4. Mill all the grain and add 3.2 gallons (12.2 L) of strike water to achieve a mash temperature of 152 °F (67 °C). Hold temperature for 60 minutes. Raise mash temperature to 168 °F (76 °C) for mashout, if possible. Then start a 15-minute vorlauf. Collect 5.7 gallons (21.6 L) of wort into your kettle. Bring wort to a boil and boil for 60 minutes, making the hop additions accordingly. Add any finings such as Irish moss, Whirlfloc®, or Koppakleer®, if desired, in the last 5–10 minutes of the boil.

At the end of the boil, whirlpool, then let settle for 15 minutes. Cool wort and send to your fermenter. Pitch more yeast (about double) than you would a traditional ale targeting about 1.5 million cells per mL degree Plato. Oxygenate thoroughly if using a liquid yeast strain. Ferment at 52 °F (11 °C) for the first two days and then slowly raise the temperature to 60 °F (16 °C).

After terminal gravity is reached and there is no presence of diacetyl, you may cool down to 52 °F (11 °C) . . . this is a good opportunity to harvest yeast to use again for another batch. If not harvesting, then cold crash down to 34 °F (1 °C) and hold for a minimum of 30 days. After approximately 30 days, remove all of the yeast from the bottom of the fermenter and add a clarifying agent such as Biofine® or gelatin. Let beer clarify for a few days then keg or bottle. Bottle with priming sugar or force carbonate the serving keg to 2.7 volumes of CO_2.

BLUE STALLION BREWING CO.'S DUNKEL CLONE

(5 gallons/19 L, extract with grains)
OG = 1.053 FG = 1.012
IBU = 25 SRM = 15 ABV = 5.4%

INGREDIENTS

4.4 lbs. (2 kg) Munich dried malt extract
6.6 oz. (187 g) extra light dried malt extract
14 oz. (397 g) CaraAmber® malt (26 °L)
14 oz. (397 g) CaraMunich® III malt (56 °L)
8 oz. (227 g) dextrin malt
4.9 AAU Hallertau Magnum hops (60 min.) (0.35 oz./10 g at 14% alpha acids)
2.1 AAU Hallertau Magnum hops (20 min.) (0.15 oz./4 g at 14% alpha acids)
0.25 oz. (7 g) Hallertau Mittelfrüh hops (0 min.)
SafLager W-34/70, Imperial Yeast L13 (Global), White Labs WLP830 (German Lager), Omega OYL114 (Bayern Lager), or Wyeast WY2124 (Bohemian Lager) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Since there won't be any mashing, simply raise 2 gallons (7.6 L) of water to a temperature somewhere around 150 °F (66 °C). A little higher or lower is fine. Put your CaraMunich®, CaraAmber®, and dextrin malts in a muslin bag and steep for 30 minutes. Remove the bag, letting the liquid drip without squeezing the bag. Next, remove the pot from the heat source, and slowly pour in about half of your total extract, stirring the entire time. Return to flame, raise to boil and boil for 60 minutes, adding hops as indicated. If you want to add a clarifier such as Whirlfloc® or Irish Moss, or a yeast nutrient, do it with 5–10 minutes left in the boil. Add the remaining extract with 5 minutes left in the boil, but be sure to take pot off the heat source, pour extract very slowly, and stir in. At the end of the boil, top up to 5.5 gallons (21 L). Follow the all-grain recipe for the fermentation and packaging instruction.

TIPS FOR SUCCESS:

Water profile, mash temperature, oxygen additions, and aging are all keys in making a crisp and refreshing lager. Blue Stallion's JR Redmon recommends a second dose of oxygen 8–16 hours after knockout to ensure a solid and full fermentation. BYO

BY DAWSON RASPUZZI

BREWING WITH LACTOSE

Milk stout to smoothie sours and beyond

Lactose contributes creaminess and boosts the body of beer, as well as adding a perceptible sweetness in higher amounts that is desirable in some recipes. Learn how three pros put this unfermentable sugar to use in their brews.

The unfermentable sugars of the lactose add body and will increase your original gravity, and subsequently the final gravity, above where you'd see the same beer without lactose.

Chris Davison has been the Head Brewer at Wolf's Ridge Brewing in Columbus, Ohio, for the past eight years and spearheaded the brewery's ever-growing barrel and sour programs. He is also the President of District Midwest of the Master Brewers Association of the Americas.

We typically only add lactose to some stouts with regularity, however, we have added it for various reasons to several other styles that are brewed less often. We've done one or two milkshake IPAs, and years back I used to add lactose to our imperial red ale in an effort to mimic the character of Three Floyds' Apocalypse Cow. We've also added lactose to an imperial cream ale we do called All the Breakfast. Lactose can be used in a range of styles, but I hate beer that is cloying and lacking in balance, and any style can be thrown out of whack with an over-usage of lactose.

How lactose is used can differ depending on the base style and what you're after. For milk stout it's as much about keeping the beer on-style and true-to-form as it is for the flavor impact. Depending on the usage rate, lactose can add a slight creaminess and smoothness to the mouthfeel, while increased quantities can also lend perceptible sweetness. We are usually aiming to hit the creamy mouthfeel without making the sweetness of our beers overbearing. Also, if you use *too much* it's possible for the beer to take on an unwanted tartness as well. We will use 50–100 lbs. (23–45 kg) in a 15-bbl batch. Much more and you begin to see significant sweetness, increasing as the usage rate goes up.

I don't think usage and efficiencies are linear, but using our ratios, homebrewers could use 0.5–1 lb. for a 5-gallon (0.23–0.45 kg/19L) batch for a beer that exhibits a nice mouthfeel and mild increase in body without being significantly sweeter. I imagine you could use 1.5–2 lbs. (0.7–0.9 kg) before entering the "too sweet" realm.

We add most sugars, including lactose, to our beer near the end of the boil or in the whirlpool. As with anything in brewing, the more heat or time boiling a product, the more you're going to affect the flavor or chemical composition of that product. If I want some caramelization to happen with candi sugar I may boil it much longer, but for lactose I just want to add it hot so it's sanitary/pasteurized, but avoid the risk of caramelization.

We don't make any dramatic changes to recipes based solely on the addition of lactose. On the malt side, you just need to account for the anticipated sweetness or body impact from the lactose. You may wish to alter the amount of crystal malt or mash temperature to compensate things to achieve the flavor and balance you desire. The unfermentable sugars of the lactose add body and will increase your original gravity, and subsequently the final gravity, above where you'd see the same beer without lactose. Make sure you're accounting for this in your recipes or it can be easy to anticipate a higher alcohol content or lighter body than you'll actually wind up with.

There are options to get similar effects of lactose without actually using lactose. If the main reason for using it is to impart body, mouthfeel, and sweetness in your beer, this can be achieved to varying degrees with the addition of things like flaked oats, using higher mash temperatures, and working with dextrin malt or maltodextrin. The only beer I think you can't substitute out the lactose without altering what you call it would be milk stout. But sub in maltodextrin and call it a "sweet stout" and you're golden.

Paul Schneider is Head Brewer and Partner of Cinderlands Beer Co. in Pittsburgh, Pennsylvania, where he and his team of brewers produce 3,000 barrels of beer across two brewpubs and the range of styles from IPA and fruited sour to mixed-fermentation saison and classic lager.

We have used lactose in a range of styles and found that we really like it in two places in our range of beers; we especially find that it plays a nice counterpoint to the acid of a gently kettle-soured beer and it lifts the roast and chocolate character of a really big imperial stout. Lactose gives a really luscious, creamy mouthfeel without adding a ton of sweetness. To my taste, it definitely does not add a "sweetness" in the way that some claim, but it's really a unique character that sticks out like a sore thumb if not used judiciously.

We've found that for many styles there is a better option for adding depth, body, texture, or creaminess than lactose. We really didn't care for what lactose did in hazy IPAs or barrel-aged imperial stouts. I know some people like a subtle lactose addition in hazy IPA, but we've found that oats, wheat, yeast strain, water profile, and mash regimen are all we need to get the mouthfeel to the level that we want. In barrel-aged stout, we found that getting all of the extract from malt provided a more viscous mouthfeel and intense flavor than using lactose.

As an ingredient, lactose needs to be built into the recipe with consideration for every other ingredient. Every beer we make is delicate, though in these cases intense, so we are always thinking about the arrangement and balance of components. Lactose has to find balance with other components too. We have gone to the extreme of 10 lbs. per barrel (about 5 oz./gallon or 37 g/L) on the high end for lactose additions. The effect at this high of an addition rate is VERY pronounced up there, as is the calorie count! This is a more common addition rate for our imperial stouts and our Tartshake fruited sours. On the low end we've tried as little as 3 lbs. per barrel (about 1.5 oz./gallon or 11 g/L), but we don't find a lot of benefit at that rate for the two styles we like lactose in. We always add lactose in the last five minutes of the boil, though you could add it earlier.

My advice for homebrewers experimenting with lactose and new styles, methods, and ingredients is to try a lot of different things! Play around with usage rates and building texture, body, and flavor around it. Make sure you understand the differences between the end results and difference between a dextrin-promoting mash, flaked oats, malted oats, wheat, spelt, low-attenuating yeast, and lactose. Figure out which of those pieces should be part of your directed effort to fluff up your body and mouthfeel.

Garrett Hickey is the Managing Brewer and Owner of Streetside Brewery in Cincinnati, Ohio. He is a graduate of Brewlab, in Sunderland, England. Garrett started homebrewing with his father and, after working for breweries in England and the U.S., they opened Streetside together.

We brew a lot of milkshake IPAs at Streetside Brewery. We are mostly using lactose to add sweetness to this style; it is frequently used to add body, but that's not our goal here. I've found that we get better results by mashing hotter and using different grains if adding body is the only goal when brewing this style. We've also added lactose to milk stouts (obviously), as well as brown ales and blondes to give a little sweetness and add body as well.

All of our lactose additions are done in the boil. The addition rate depends on the style, but it is generally 6–12 lbs. per barrel (3–6 oz. per gallon or 22–45 g/L). For milkshake IPAs we aim for the higher end of that scale. The lactose addition doesn't play a role in yeast or base ingredient selection for us, but we do consider the impact of it on our fruit selection for fruited milkshake IPAs. We definitely try to use fruit that plays well with the sweetness — orange or tangerine with lactose makes for creamsicle flavors, and strawberry pairs great too. We always think in terms of desserts for this style — it's easier to work within a pre-existing idea. For instance, a milkshake IPA hopped with Belma® and Citra® and fruited with strawberry is a recipe for success.

If you want to try to replicate lactose additions but keep your beer lactose-free, my best advice would be to mash hotter and/or use maltodextrin, which may get you in the ballpark.

HELP ME, MR. WIZARD

BY ASHTON LEWIS

A KETTLE/FERMENTER CONVERSION

Also: The time traveling brewer has some advice

Q I RECENTLY WAS GIVEN AN OLD STAINLESS STEEL COKE CO_2 TANK. THIS BEAST IS ABLE TO WITHSTAND 300 PSI AND I'M GUESSTIMATING IT WILL HOLD AT LEAST 30 GALLONS (114 L). I WAS HOPING TO MAKE A BREW KETTLE/FERMENTER COMBO OUT OF IT. I WAS PLANNING ON PUTTING AN 8-IN. (20-CM) FERRULE ON EACH END WITH DIFFERENT SIZE TRI-CLAMP PORTS. ARE THERE ANY RECOMMENDATIONS OR DESIGNS OUT THERE TO FOLLOW? HOW MANY HEATING ELEMENT PORTS DOES IT NEED TO HAVE? WHAT'S THE BEST WAY TO COOL WORT/TEMPERATURE CONTROL? I WAS HOPING TO HAVE A DESIGN BEFORE I STARTED CUTTING THIS THING UP AND RUINING IT.

KEVIN RICKS
MACOMB, MISSISSIPPI

In my opinion, insulation for small tanks can add more expense and time to install than it's worth.

Photos by Kevin Ricks

An old, pressure-rated stainless steel CO_2 tank and its outer jacket (top) is the starting point for one homebrewer's DIY build.

A Wow, this is a fun question and a fun project! Looking at the photos, it appears this vessel was insulated and covered by an outer jacket, essentially a second tank. The inner tank is perfect for a fermenter and the outer jacket, if that is indeed what your pictures show, will be great for a kettle. I will start by offering some ideas about the fermenter and then cover the kettle project.

For starters, your tank is a great example of a used vessel with some relevant documentation; it's a real-deal, 300 psig-rated vessel carrying both an ASME stamp and CRN designation. Vessels that have this sort of data plate have been designed, built, and tested in accordance with the American Society of Mechanical Engineers requirements for pressure vessels (defined as vessels with working pressures greater than 15 psig or 1 atmosphere greater than atmospheric pressure). CRN stands for Canadian Registration Number and signifies that this tank also conforms with Canada's Technical Standards and Safety Authority. Really a wonderful freebie!

Just for full disclosure, I am not an engineer, but I did work for a U.S. stainless steel design, engineering, and fabrication company from 1997 to 2016 and am not shooting from the hip with the ideas that follow. Fabrication projects need to be clear, so I am going to be concise with words.

VESSEL PENETRATIONS AND FERRULES

Because you are starting with a stamped vessel, I strongly suggest finding a sanitary stainless welder who can make proper penetrations and weld ferrules on this vessel that conform to pressure vessel codes. The modifications will negate the original stamp, but so-called ASME R-stamps are used for vessel repairs that allow one to maintain the code. It's definitely something to consider if you want to retain the value of that stamp.

Another thing to note before starting is the vessel alloy. Your tank is made using Type 201 stainless (you can see some numbers on the steel and part of those indicate alloy type), which is a lower-cost alternative to Type 304. Type 201 contains 15% chromium and 5% nickel, compared to 18% chromium and 8% nickel for Type 304 stainless. Your plan is to weld 8-in. (20-cm) ferrules to this vessel and most of those

ferrules are made from Type 316L stainless steel. You need to make sure the welding wire used is compatible for T201 to T316L welds. Another reason to find a local welder to make the weld. That's it for suggestions related to the pressure vessel itself.

One related comment about welds; you should have the ferrule you soldered on the bottom of the second vessel, the one I assume to the outer jacket, removed and have it welded with the correct weld wire.

BITS AND BATS

For your fermenter project, you will need a way to fill, empty, vent and pressurize the headspace, measure and control temperature, draw samples, add dry hops, and clean the fermenter after use. You can do all of these things with (1) 1.5-in. (3.8-cm) ferrule welded to the bottom of the tank, (1) 8-in. (20-cm) ferrule welded to the top of the tank, the addition of legs, an instrument for temperature monitoring and control, a handful of purchased parts, and some more welding not associated with the tank. You can also use an 8-in. (20-cm) ferrule on the bottom of the vessel if you want to, but this is not necessary to make a functional fermenter.

Here is a suggested list of purchased parts:

(1) 8-in. (20-cm) tri-clamp blind cap, gasket, and clamp to serve as a "top plate" for the fermenter. Commercial fermenters in the 10,000 gallon/40,000 L+ size category oftentimes use so-called top plates to consolidate all valves, instruments, special fittings, etc. on a single chunk of stainless steel that is connected to a single flange installed on the top of the vessel. This makes fabrication much easier. Turns out this method is also very handy for small vessels because the 8-in. (20-cm) ferrule is large enough to reach inside of the vessel for welding and grinding.
(1) 8-in. (20-cm) tri-clamp blind cap, gasket, and clamp to serve as a "bottom plate" for the fermenter.
(1) Stainless immersion coil — I suggest buying this because bending stainless coils is not an easy task without special tools. The easiest way to install is to weld it into the top plate. Make sure your welder does not go crazy with the power and burn through your coil. You may want to use a small weld to attach a sleeve to the OD of the inlet and outlet connections on the coil to provide thicker material to weld to the top plate.
(5) 1.5-in. (3.8-cm) tri-clamp ferrules, gaskets, and clamps.
(2) 1.5-in. (3.8-cm) tri-clamp blind caps.
(1) ½-in. (13-mm) tri-clamp ferrule, gasket, and clamp.
(1) Spunding valve with 1.5-in. (3.8-cm) tri-clamp ferrule.
(1) CIP (clean-in-place) tube and spray ball.
(1) Racking line.
(2) 1.5-in. (3.8-cm) tri-clamp butterfly valves for tank bottom.
(1) Sample valve with 1.5-in. (3.8-cm) tri-clamp ferrule to attach to racking valve when samples are taken (not required, but a nice feature).
(1) Connection for whatever is chosen for temperature measurement and control. A thermowell in the side of the tank is really the best design, but is not cheap. There are several solutions for this.

GRINDING/POLISHING

A key step to producing sanitary welds is removal of heat tint and/or weld grinding, a.k.a. polishing. This is a separate skill set from welding; not all welders are good grinders and good grinders are often not very good at welding. But a good grinder can make a poor welder look awesome! For your project, you want to find someone who can weld and grind.

PROPOSED DESIGN COMPARED TO COMMERCIAL FERMENTERS

The main differences with the proposed design compared to commercial fermenters are: 1) The lack of insulation and outer jacket encasing the insulation, and 2) External heat transfer. This proposed design uses an internal cooling coil and has no insulation. This may sound like an incomplete design but it's a common type of fermenter used in very large beer fermenters that were designed and built up until the early 1970s. I am suggesting this for your project because it is the easiest way to retrofit your pressure vessel for use as a sweet little beer fermenter.

In my opinion, insulation for small tanks can add more expense and time to install than it's worth. Most beers ferment in the 50–77 °F (10–25 °C) range in a room that is usually somewhere around 68 °F (20 °C). No insulation really required, even in commercial operations (check out the total lack of insulation on most wine tanks). When beer temperature is lowered for cold-aging at about 32 °F (0 °C), uninsulated tanks will sweat and gain heat from the environment. This may or may not be a big deal to you; if it is, consider using a temporary wrap.

KETTLE ASPECT

The kettle project is much easier and it looks like you are off to a great start. The main design question relates to the heating method and knowing the heating requirement will help guide how you go about heating your kettle. For the sake of discussion, let's assume your kettle is large enough to hold 30 gallons (114 L) of liquid. You need headspace in your kettle and can probably safely begin the boil with about 24 gallons (90 L) of wort; that's about how much wort your fermenter can hold without having too much foam blowing out during fermentation.

Kettles are typically designed to evaporate 5–10% per hour, so let's err on the high side and size the heater to evaporate 10% or 2.4 gallons/9.1 L (20 lbs./9.1 kg) of water per hour. This is where the English system is easier than metric for quick calculations because ~1,000 BTUs is the energy required to convert 1 lb. (0.45 kg) of water from liquid to vapor. Therefore, you need to supply ~20,000 BTUs/hour to your kettle plus a bit extra to make up for losses and inefficiencies. Sticking with high-level math, let's make this simple by oversizing the element by 25% for a total of 25,000 BTU/hr.

Time to do some parts shopping. Let's first look for immersion coils powered by 220 volts. Heating elements are typically rated by wattage at some voltage; 25,000 BTU/hr. is equal to 7,327 watts. Skipping the shopping details, this is a fairly large power requirement and pushes this design above the range for home-type heaters. The good news is that this

is a fairly common element and it is easy to find something large enough that is equipped with a tri-clamp ferrule. You should be able to find a good supply of elements in this range with 2-in. (5-cm) ferrules. The simplest installation for this will be to install a single ferrule on your kettle located a few inches above the bottom dish-to-shell weld seam. You can simply clamp the heating element into place, power it up, and you are good to go! Two key tips. The first is to make sure the element is covered with liquid before powering it up. And the second is to use either a rheostat or a type of switch that allows control of the heater. 7500 watts at 220 volts equals 34 amps; not a small device.

I see that you have laid out a whirlpool nozzle on your kettle. While whirlpools are great brewing tools, they work best when the aspect ratio of the wort level is about 2–3 times wider than the wort depth. Your vessel puts the wort height at about 2 times greater than the width; far from the ideal wort level. Another very key design detail to a properly functioning whirlpool is either the absence of internals, like wort heaters, or unobtrusive and symmetrical internals, such as smooth-walled internal calandrias (shell and tube heaters that are installed vertically in large kettles). Not a big deal as long as you use something to either contain hops during the boil or something to strain hops from wort after the boil. And if you purge the bottom of your fermenter about 6–8 hours after filling you can easily remove any sediment that falls before the onset of fermentation.

My answer offers a few ideas of how you can approach your project. One thing I know about equipment design is that there are many great ways to boil wort, separate trub, and contain beer during fermentation that are as different as the beers we brewers like to brew. No single design is the hands-down winner and the best equipment designs provide brewers tools that can be safely and effectively used to brew a very wide range of beers. I look forward to seeing some pictures after your project is complete!

Q

YOU ARE DROPPED INTO MEDIEVAL EUROPE AS A BREWER FROM THE 21ST CENTURY. YOU HAVE YOUR KNOWLEDGE BUT ARE USING THEIR EQUIPMENT AND RAW MATERIALS. THE CHALLENGE IS TO MAKE A HIGH-QUALITY PACKAGED BEER. HOW WOULD YOU DO IT?

JOHN CARROLL
CHICAGO, ILLINOIS

A

Thanks for the fun question, John! I am pretty sure whatever I suggest will be impossible to verify, so let's go back to the year 1569, 400 years before my birth year, somewhere in the vicinity of Bamberg, Germany. There were plenty of breweries in that part of the world brewing with ingredients that will hopefully be familiar once I exit my time machine.

The first task on my hypothetical to-do list is to find a local watering hole, preferably one with a great beer list, to wet my whistle and to shine some light on how beer back then actually tasted. Best plan is to stroll the streets smelling for signs of a brewery . . . wort, spent grains, and that great smell of open fermentation will hopefully lead my nose to brewing. I will need to determine how many of my modern assumptions about beer from 1569 are accurate. My top three assumptions are:

- All beers will likely taste contaminated to my modern palate.
- All beers are likely to contain very little dissolved carbon dioxide and will be perceived as flat by modern standards.
- All beers will be much darker than the modern norm and will probably have a smoky flavor associated with what was used to dry the malt.

I like your rules because I have to use their ingredients and brewing equipment. Otherwise it would be too tempting to consider introducing modern knowledge related to raw materials and the brewing process, and that process is not the fastest route to a winning beer. So here is how I would address the assumptions above almost immediately.

My most important tool is myself: Eyes, nose, and mouth. Let's just assume that I determine, after a careful evaluation of at least 20 different beers, that contamination is rampant, beers are generally flat, and all of the beers I have tasted seem to be some sort of brown beer that has an obvious, but not objectionable, smoky character. On a positive note, I assume beers from the past must have tasted decent enough to drink because beer was pretty darn popular and the alcohol content was probably high enough that folks were not drinking foul-tasting beer. My strategy is to befriend one of the better brewers in the area, and avoid being killed by not talking about really weird things like yeast, bacteria, stainless steel, process control, cans, and fruited Russian imperial stouts.

As far as the brewing challenge, I will certainly take advantage of my knowledge of sterilization using hot water. Although I have no idea of how wort and beer were moved around in 1569, sterilizing something is probably going to get me closer to my goal of brewing great beer. I figure I can sneak this modern knowledge in the brewery under the guise of some regional practice from my town without breaking the news about yeast being the invisible life force that converts wort into beer.

I'm also going to add some bubbles to my brew by accidentally adding honey to the beer when filling into the barrel. *Scheisse*! I cannot use honey because of the Reinheitsgebot. No worries, I will accidentally add a bit of fermenting beer to the barrel and hope the braumeister doesn't fire me before I can taste some of my awesome beer. Definitely should hide this barrel somewhere in a dark corner of the cellar and only share with vagabonds and heretics.

One thing to know about barrels is that they have been

used for thousands of years and probably were not too shabby in 1569. But even today, no sane brewer is going to fully carbonate beer in any old wooden barrel. My plan is to use my modern knowledge of cask/bottle conditioning to add just a bit of carbon dioxide. For this project, I will use a small barrel and pour the beer using a wooden tap. If this sounds like British cask ale, that's exactly what I am thinking, complete with tight fitting bungs, shives, and hard and soft spiles. Hydrometers don't exist in 1569 and I plan on using my knowledge of water density to estimate wort original gravity (OG) using a balance. Trust me, I got this! Knowing wort OG allows me to estimate the volume of priming wort to add to the cask.

The last hurdle is going to be finding a yeast that's up for the task. I may be wrong about this part, but I am going to assume that there must be some brewer in the area who has a decent yeast stored on a magic stick that I can use. Another assumption is that the magic stick may also contain some level of spoilage critters. My plan is to sour my beer using malt as the source of lactic acid bacteria. We know in the modern world that malt is a good source of *Lactobacillus brevis*; things were probably not so different 452 years ago. Sour wort has a low enough pH to keep many spoilage bugs at bay and I am hoping this works to help produce a cleaner flavor.

Breweries of this time did boil wort, so I think I am going to do a kettle sour by starting a brew on Friday that somehow gets delayed and ends up sitting in the kettle over the weekend. I'll need a ruse. Maybe plan this while the braumeister is away for a big beer fest over in Nuremberg. This will take a little planning. After the kettle sour is complete, boiling is finished, and wort is cooled, I will use the magic stick to inoculate the low pH wort with yeast along with some funk that I am hoping will be stymied by the low pH environment.

I'm not looking to rock the world here as some sort of time traveler from a Hollywood brewery. I just want to sneak in a couple modern tricks under the cloak of being a clumsy new brewer and hope to open some eyes.

Now that my short and imaginary journey is complete, I am wondering if this information has any use to our *BYO* readership. And I think it does. When in doubt, always remember that hot water is a super-effective sanitizer. Just exercise caution when using it. Bottle conditioning is a great method to boost beer carbonation, is simple, and the beer math is easy (not covered in my revery). One volume of carbonation is equal to 2 grams of carbon dioxide per liter of beer, and 4 grams of sugar yields right about 2 grams of carbon dioxide when fermented. Knowing your beer volume and how to ballpark brewing calculations is brewing gold. Once basic beer math is learned, a brewer does not forget. And finally, wort pH can be effectively used to weed out beer spoilers. Those are my basic tools and I am sticking to them, in 1569 or now!

BY GORDON STRONG

PASTRY STOUT

Have your cake and drink it too

Pastry stout is a modern craft beer phenomenon that takes specialty beers to the extreme. Packing massive sweetness and the flavors often found in desserts and pastries into a strong dark stout, the beers are often sought-after commercial creations popular in the modern era of social media. While having a cult following, the relatively young style has few rules and emphasizes brewer creativity in executing the concept. Many breweries make one-off versions and are constantly trying new variations, which makes it difficult to define the beer in the traditional sense. It is best thought of as an ingredient-driven specialty beer with several commonly used attributes.

As a specialty beer, the base style often cannot be defined as a classic style, like imperial stout. Rather, it is dark and usually quite strong, but is also sweet, thick, and heavy. Due to the darkness, it is called a stout, but often the beers lack the strongly roasted character typical of most stouts. The notion of balance is also somewhat hard to pin down since the essence of the style is a beer that is unbalanced in sweetness, possessing well beyond the typical sweetness level of other beers.

Neither the Beer Judge Certification Program (BJCP) nor the Brewers Association (BA) list pastry stout as a named style, preferring to let existing specialty and experimental styles address it. I think this reflects the fact that the beers can vary widely and that they are very ingredient-driven. The most typical place to put pastry stouts in a BJCP competition would be category 30D Specialty Spice Beer, which allows variations of spice, herb, and vegetable (SHV) beers (a base style with a number of SHV ingredients) with sugars, sweeteners, and unfermentable sugars added. The base styles in these beers can be used loosely, such as stating a style family (e.g., "stout") or giving a general description of the beer. Versions not using spices might be placed in 31B Alternative Sugar Beer, and those versions using fruits along with spices should go in 29C Specialty Fruit Beer (which allows a fruit and spice base beer, along with additional sweeteners).

Due to the darkness, it is called a stout, but often the beers lack the strongly roasted character typical of most stouts.

PASTRY STOUT
BY THE NUMBERS

OG:	1.100–1.150
FG:	1.040–1.080
SRM:	40+
IBU:	0–50
ABV:	8–12%+

Photo by Charles A. Parker/Images Plus

HISTORY

While beers that are today called pastry stouts have been made for some time, they really didn't start to be noticed until after 2000. I recall trying beers like Southern Tier's Choklat and Mikkeller's Beer Geek Breakfast in the mid-2000s, and finding them very sweet for their description. The trend of making experimental beers accelerated after hazy IPAs started to be made into milkshake IPA variations in the mid- to late-2010s, and sweetness caught on as a desirable beer component after years of consumers chasing bitterness in IPA, sourness in wild beers, and barrel-aged beers of all forms.

The name pastry stout seems to have first been used around 2017 as a somewhat derogatory term to criticize these excessively sweet beers, but the name stuck and was actually embraced by those making it to the point where it routinely appears on the label of commercial beers. Articles about the style started appearing in 2018 and 2019 and more brewers are creating these variations based on customer demand and excessive hyping on social media. Since those times, the number of commercial breweries making the beer continues to grow.

SENSORY PROFILE

Pastry stouts are meant to invoke the mental impression of a sweet dessert (or even a sweet breakfast). Since they are called stouts they should be dark but often don't have the heavily roasted or burnt flavors of some stouts. As

they mention pastries, they should be sweet and have the flavors associated with pastries or desserts. They should be fairly strong, at least 8%, often over 10% ABV, and be very sweet with a high finishing gravity. Really, these are the only things that seem to be generally accepted as guidelines among brewers (I hesitate to call them rules since they seem very flexible).

The dark flavors can have coffee, dark chocolate, and cocoa qualities, and are often combined with very dark crystal malt flavors that have caramel, dried or dark fruit, and burnt sugar flavors. There typically are not strongly roasted, acrid, harsh, tarry, ashy, or burnt flavors. This is similar to how beers like black IPA and schwarzbier use darker malts and grains without bringing in the sharp notes.

These beers typically have thick or chewy body and mouthfeel, often with silky or dextrinous qualities. The high sugar content can give a heavier mouthfeel as well, and can sometimes approach something cloying, although the alcohol tends to offset this impression. The alcohol level is high, which often makes it similar to an imperial stout in strength but the balance will seem very different since the bitterness levels are usually quite restrained to avoid challenging the sweetness for dominance.

BREWING INGREDIENTS AND METHODS

This is going to be hard, as there are so many choices to make. The grist sounds somewhat similar to an imperial stout in that it chooses from four main groups: Base malts, dark malts and grains, crystals and sugars, and adjuncts. But the proportions are often quite different. The base malts are often pale ale malt or blends of pale malts. Dark malts and grains can include roasted barley, black malt, chocolate malt, and other roasted grains such as chocolate wheat, chocolate rye, and the various dehusked/debittered variants of these dark grains. Lighter color versions of these grains are sometimes used as well as the debittered versions to keep the roastiness down.

Crystal malts can be any range of color. Starchy adjuncts such as flaked wheat, barley, rye, and oats can be used to build body. Sugars can include fer-

SAPWOOD CELLARS' FLAKE CLONE

(5 gallons/19 L, all-grain)
OG = 1.126 FG = 1.050
IBU = 36 SRM = 71 ABV = 10.5%

INGREDIENTS

14.5 lbs. (6.6 kg) pale ale malt
2.75 lbs. (1.2 kg) U.K. medium crystal malt (60 °L)
2.75 lbs. (1.2 kg) flaked oats
2 lbs. (907 g) Carafa® Special II malt
1 lb. (454 g) U.K. roasted barley
0.5 lb. (227 g) U.K. black malt
2.25 lbs. (1 kg) maltodextrin
19 AAU U.K. Warrior hops (60 min.) (1.25 oz./35 g at 15% alpha acids)
3.35 lbs. (1.5 kg) shredded coconut (blend of toasted and untoasted)
0.5 oz. (14 g) vanilla beans, split and chopped
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale), or SafAle US-05 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

This recipe uses reverse osmosis (RO) water. Adjust all brewing water to a pH of 5.5 using phosphoric acid. Add 1 tsp. of calcium chloride to the mash.

This recipe uses an infusion mash. Use enough water to have a moderately thick mash (1.5 qts./lb. or 3.1 L/kg). Mash in the pale malt and oats at 151 °F (66 °C) and hold for 60 minutes. Add the crystal malt and the three dark grains, stir, begin recirculating, raise the mash temperature to 169 °F (76 °C), and recirculate for 15 minutes. Sparge slowly and collect 7 gallons (26.5 L) of wort.

Boil the wort for 120 minutes, adding hops at the times indicated in the recipe. Add the maltodextrin when 15 minutes remain in the boil.

Chill the wort to 64 °F (18 °C), pitch the yeast, and ferment until complete, allowing the temperature to rise as high as 70 °F (21 °C) during fermentation. Cold crash the beer, transfer onto coconut and vanilla beans, and allow to condition for one week.

Rack the beer, prime and bottle condition, or keg and force carbonate.

SAPWOOD CELLARS' FLAKE CLONE

(5 gallons/19 L, extract with grains)
OG = 1.126 FG = 1.050
IBU = 36 SRM = 71 ABV = 10.5%

INGREDIENTS

11.5 lbs. (5.2 kg) light liquid malt extract
2.75 lbs. (1.2 kg) U.K. medium crystal malt (60 °L)
2 lbs. (907 g) Carafa® Special II malt
1 lb. (454 g) U.K. roasted barley
0.5 lb. (227 g) U.K. black malt
2.25 lbs. (1 kg) maltodextrin
19 AAU U.K. Warrior hops (60 min.) (1.25 oz./35 g at 15% alpha acids)
3.35 lbs. (1.5 kg) shredded coconut (blend of toasted and untoasted)
0.5 oz. (14 g) vanilla beans, split and chopped
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale), or SafAle US-05 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Use 6.5 gallons (24.5 L) of water in the brew kettle; heat to 158 °F (70 °C).

Turn off the heat. Add the crystal malt and three dark grains in a mesh bag and steep for 30 minutes. Remove and rinse grains gently.

Add the malt extract and stir thoroughly to dissolve completely. Turn the heat back on and bring to a boil.

Boil the wort for 60 minutes, adding hops at the times indicated. Add the maltodextrin when 15 minutes remain in the boil.

Chill the wort to 64 °F (18 °C), pitch the yeast, and ferment until complete, allowing the temperature to rise as high as 70 °F (21 °C) during fermentation. Cold crash the beer, transfer onto coconut and vanilla beans, and allow to condition for one week.

Rack the beer, prime and bottle condition, or keg and force carbonate.

> **Don't feel constrained to think of the base as being like an imperial stout.**

mentable types (often brown sugars or various syrups that add flavors) or unfermentables such as lactose and maltodextrin. Malt extract can be used to raise the starting gravity as well, depending on the system used. The amount of base malt can seem somewhat low, in the 50–70% range of the grist, while the specialty malts and starchy adjuncts can be in the 30–40% range. Sugars and sweeteners are on top of these grist percentages and might be added until a desired starting gravity is hit.

Don't feel constrained to think of the base as being like an imperial stout. It could also be considered to be a sweet stout or oatmeal stout brewed to a stronger strength, or something like a double brown ale or imperial porter as a base. Since the underlying style isn't really considered as long as it is something dark, I wouldn't worry too much about this part of the calculation.

Not all sugars have the same level of sweetness. Lactose is fairly sweet, but maltodextrin (technically not a sugar) is much less sweet but often has a marshmallow kind of aroma and adds body. Simpler sugars can ferment out (but leave residual flavors), but the unfermentable sugars will remain sweet.

Mashing is usually done as a single infusion. I almost want to say that the mash temperature doesn't matter since the body and sweetness are often coming more from the adjuncts than a high mash temperature, and that any deficit in body and sweetness can be adjusted after brewing by adding more of the unfermentable sweeteners or body builders used in the recipe. You want to reach a higher alcohol level but that can often be controlled by adding fermentable sugars or malt extracts to the boil. So, I would say that you should mash at your normal or favorite mash temperature for stouts, something around 151 °F (66 °C) is fine, for example.

Hops almost don't matter since the bitterness is frequently low and the late hop character is non-existent. I would choose a high-alpha bittering hop with a relatively clean profile (something like Magnum or Warrior). Similarly, the yeast is typically an ale yeast that can handle high alcohol fermentations without leaving much additional character. The Chico-type ale yeast strains work well, as do some that are used in stronger IPAs. I would not use Belgian-type strains that might work in higher alcohol beers but that would leave phenols and esters that may clash with your specialty ingredients. You want the hops and yeast to get out of the way of the signature flavors.

When I was visiting my friend Michael Tonsmeire and his brewing partner Scott Janish at their Sapwood Cellars Brewery in Columbia, Maryland, last year, they described a categorization system of specialty ingredients that I really liked. They said that most pastry stouts seemed to have at least two or three out of about 13 common ingredients. They said beers often had at least one but up to three of the Tier 1 ingredients of coconut, maple syrup, vanilla, and cacao. Tier 2 ingredients are common "modifiers" to the Tier 1 ingredients and include peanut, hazelnut, cinnamon, coffee, and marshmallow. Finally Tier 3 ingredients are less common but can be used for special goals: Graham cracker, banana, almond, and Oreos. Of this list, maple syrup and marshmallow are sugars, banana is a fruit, and the rest are categorized as SHV-type ingredients in BJCP competitions, which goes back to why I see this style as mostly a specialty SHV beer.

Natural flavors and ingredients often give cleaner, more pure, flavors than extracts and essences. Some commercial brewers will add actual pastries or dessert products to their beers, which I think is a little goofy, but not that much more than the beer already is. I did want to stress that pastry stouts do not necessarily have to include actual pastries, but that they aren't disallowed either. When using pastries, the finished beer is usually conditioned on them. The other ingredients are added either at the end of the boil, in the whirlpool, or on the cold side when the beer is finished fermenting. Some ingredients benefit from some heat, while others taste better without it. Some experimentation is necessary to see where they work best – I tend to look towards their use in cooking to help decide what to try first.

HOMEBREW EXAMPLE

Since I mentioned Sapwood Cellars, I'll give you one of their recipes that they generously agreed to share. This is their Flaked (2021) beer, which is described as an imperial oatmeal stout with coconut and vanilla, and weighs in at 10.5% ABV. I tried this on New Years Eve 2021 with Mike and Scott and it was a great way to close out the year. My thanks go to them for their generosity. If you are in the Columbia, Maryland, area, check them out; they are worth a visit for not only their stouts, but their cutting edge IPAs and flavorful wild ales.

One of the things I liked about the beer is that it retained its beer-like qualities and wasn't a parody of itself. Yes, it had a strong character of specialty ingredients, but it still seemed to have not forgotten the stout part of the style. You can see that in the ingredients where they are still using a little roasted barley and black malt to give some balance to the sweetness. They don't actually call it a pastry stout, but they wanted it to have some of those features without sending me into a diabetic coma.

The recipe uses a blend of toasted and untoasted coconut (a 50/50 mix is fine) and split vanilla beans. These flavorings are added into the secondary after fermentation is complete. Oats are providing the silky body and also help support the description as an imperial oatmeal stout. Their base malt is a blend of Maris Otter and Briess 2-row and they use Simpsons crystal malts. I've adjusted their recipe to the homebrew scale, and to fit the *BYO* recipe standards.

This is a great winter beer, and I hope you enjoy it as much as I did. BYO

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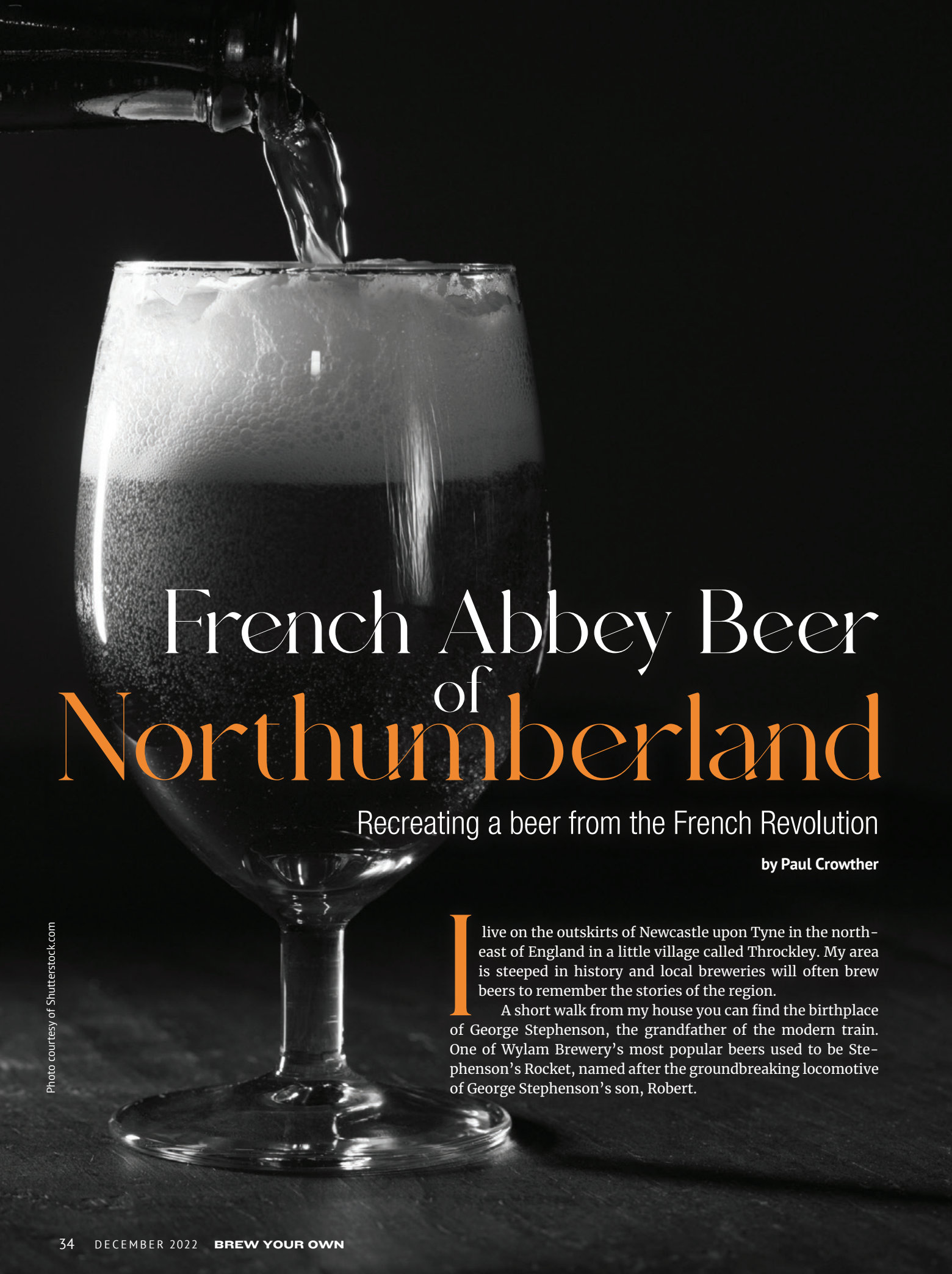

French Abbey Beer of Northumberland

Recreating a beer from the French Revolution

by Paul Crowther

Photo courtesy of Shutterstock.com

I live on the outskirts of Newcastle upon Tyne in the north-east of England in a little village called Throckley. My area is steeped in history and local breweries will often brew beers to remember the stories of the region.

A short walk from my house you can find the birthplace of George Stephenson, the grandfather of the modern train. One of Wylam Brewery's most popular beers used to be Stephenson's Rocket, named after the groundbreaking locomotive of George Stephenson's son, Robert.

Throckley is located along the route of Hadrian's Wall, the 73-mile long Roman wall that stretched the entire width of England (and served as inspiration for *The Wall* from *Game of Thrones*) and the ruins of the Roman fort of Vindolanda is a short drive away. Twice Brewed Brewery in Northumberland often names their beers after Roman Gods with beers including Juno, Saturn, and Mithras, as well as a recently brewed beer named When in Rome, a gruit flavored with mugwort, meadowsweet, and elderflower to recreate a brew similar to that enjoyed by the legionnaires stationed nearby nearly 2,000 years ago.

One piece of history that has remained somewhat more obscure, though, is that around the end of the 18th century a group of French priests ran a pub around the corner from my house, the Royal French Arms. I became fascinated with the story as I began to research and learn more about its history, which eventually led me to set about following the example of Twice Brewed and create a beer the like of which may have been brewed by the clergymen of the Royal French Arms.

ROYAL FRENCH ARMS

Before getting to the beer they brewed and my attempt to recreate it, I should explain how it was a gaggle of French priests came to be running a pub in Northumberland; it goes back to 1789 when the French Revolution sent ripples throughout Europe. Catholicism permeated every pore of French society before the revolution. The French church was a wealthy landowner, collected a tithe of 10% of all agricultural produce, and the king wielded great influence over the mechanisms of the church — it was seen as part of the state and a threat to the revolution.

Over the next few years, a slew of anti-Catholic laws were passed by successive revolutionary governments. Church buildings were seized and either sold or converted into factories and warehouses. Crosses and church bells were melted down and turned into weapons. Religious statues and vestments were banned. French priests were forced to declare an oath to the French constitution and recognize the government's authority as superior to Rome, or they were imprisoned, arrested, or executed.[1,2]

In this backdrop it is unsurprising that some French clergy decided they didn't feel France was a safe place for them and fled across Europe seeking asylum. On October 5, 1796, nearly 300 such fleeing clergy arrived on the Tyne on a convoy of three transports escorted by the warship Serpent. They were received with a "kindness and hospitality honorable to the English character."[3]

These priests were housed across Newcastle, most of them going to live with Catholic families but 38 of these priests came to live in a row of newly built houses in Heddon-on-the-Wall, the village bordering my own. This row of houses, previously called Heddon Square, became known as Frenchman's Row after its new occupants. Although the priests were given an allowance of one shilling a day by the British government to live on, apparently quite a handsome amount in 1800, they also brewed their own beer and used their easternmost cottage as an inn to sell beer to the locals.

Six years later the clergymen would leave Newcastle and sail back to France in 1802 as it became safer following an armistice that was declared between Britain and France. The clergymen left a sundial as a gift to the people of the Northeast, in gratitude for the kindness the people had shown them. The sundial reads, "Time flies, memory remains," and a Latin inscription that reads, "As your friendly race are glad to mark each hour with kindly gifts, so may every hour be prosperous for you."

In 1897 a larger building would be built on the site of the eastern cottage and was named The Royal French Arms in remembrance of the old brewhouse run by the priests. The new pub was a pillar of the community for nearly a century before closing in 1995. A quarter-century later and a block of apartments called Royal French Court now stand in its place.[4,5]

RECREATING THE BEER

My approach to recreating the recipe brewed by these French priests is historical, yet somewhat whimsical. If you asked a historian what kind of beer these priests made and served, their answer would be, "There isn't enough evidence to say." And while that is true, it leaves us without a beer and failing in our objective. And avoiding a beer recreation because of some holes in the recipe has never stopped me before (heck, I've even created a recipe for a beer that has never truly been brewed before — see my story on

Photo by Paul Crowther

The site where the French priests brewed beer during the tail end of the 18th century was turned into a pub called The Royal French Arms a century later. It's now home to apartments, however a sign for the Royal French Arms remains affixed to the building bearing the Royal French Fleur de Lis.

Photo by Paul Crowther

My resulting Newcastle Brun Ale.

the Hollywood prop beer Heisler from the November 2021 issue of *BYO*). So the recipe on page 37 is my best guess based on the available evidence, filling in a lack of historical evidence with things that feel right and producing a beer that honors the memory of this little story the best I can. Like in *Jurassic Park* where they fill in the missing dinosaur DNA with frog DNA, except beer.

Being the early 1800s there is little documentation of the priests' lives while they were in England, and certainly there are no dusty scrolls listing the malt bills and hopping rates hanging around in cupboards of the local village hall (I checked, there's just a bunch of yoga mats and an inordinate amount of old mugs), but I still wanted to make a beer that they *might* have made, as close to what I can ascertain French priests might have brewed in the 18th century.

There aren't really any records of significance regarding what pre-revolutionary French monastic beer was like. A lot of these records were lost in the fires of the revolution and all such monastic brewing stopped after the revolution due to the seized buildings and fleeing priests. Although some abbey brewing did start again in the 19th century, it was limited and sporadic. When the Abbey of Saint Waldrille began brewing in 2016 it was the first French abbey to do so in over 80 years.

So we don't have recipes from the time nor we do have a French abbey beer that has carried on down the years. So I was struggling for a starting point for my recipe until I remembered there was another group of priests that fled France at the same time as the priests of the Royal French Arms, but instead of fleeing to England they fled to Belgium and set up a Trappist community near Antwerp. In 1836 this religious community was raised to the status of abbey, which is also when they began brewing beer and are now a world-renowned brewer of Trappist beers. None other than Westmalle Brewery, somewhat more grand than the Royal French Arms but both founded in the same historical backdrop.

Westmalle is most well known for its Dubbel and Tripel but these are relatively modern innovations. What became the Dubbel was first brewed in 1856 and was the first example of such a style from a Trappist brewery, and the Tripel was not first brewed until 1934.[6] The Royal French Arms was, thus obviously, not selling these types of strong Belgian-style beers 50 years earlier. Instead, my starting point in recipe development is the beer the monks of Westmalle Abbey drink themselves: Westmalle Extra.

Westmalle Extra, at 4.8% ABV, is much more suitable for the austere life of a monk than the 7% and 9.5% ABVs of the Dubbel and Tripel, which are strictly for outsiders. This beer has had somewhat of a transformation over the years, however. Extra, or Extra Gursten as it was originally called, was the first beer the monks brewed in 1836, however records from the time show it wasn't the pale beer it is today, but instead a 3.5% dark table beer. By the early 20th century it had slowly changed to the stronger, paler beer it is today.[7]

So it would seem plausible to me, if the first beer French priests in 1836 would make would be a brown, malty, and sweet table beer, that might be the kind of beer French priests would make 30 years earlier. That was my starting point: A 3.5%, brown, sweet, and malty table beer.

Ingredient choices were a lot more limited in 1796 than they are today; roasted and crystal malts would only be invented later in the 19th century. Brown malt was in use but pale malt had been in common usage in Britain since around 1780 so a brown beer in 1796 would very likely have been a mix of brown and pale malt.[8] The brown malt of the past isn't exactly like the brown malt we find today, which at the time had more diastatic capability and could be used for a larger portion of a malt bill. No maltsters make this heritage style of brown malt anymore, however, so I did resort to using modern brown malt. For the pale malt I selected Crisp's Chevallier® Heritage Malt as this was a popular barley variety in the 19th century and adds a rich, sweet character that works well for this beer.

For hops, most would normally associate monastic brewing with the noble hops of continental Europe, but our brewers were in exile and Europe was engulfed in war, so getting hold of their usual hops would have been impossible. Instead, the priests would in all likelihood have relied on British hops. Britain in 1796 did have a few varieties but only one — the majestic Goldings — is still grown today. Goldings can add a honey-like sweetness to a malty beer so I was comfortable with this choice.

It's very difficult to know what the yeast the priests used would have been like (this was pre Louis Pasteur so brewers of the time didn't even really know what yeast was or that yeast was the cause of fermentation). I was torn between a couple of choices when it came to the yeast I would use on my own recipe. The first option I considered using was White Labs WLP530 (Abbey Ale) because that is the strain used by Westmalle today and with the original Westmalle Extra as my starting point for this recipe, it seemed to make sense. Another option was using an English ale strain and including some *Brettanomyces* if the priests were relying on local breweries for their starter yeast. Ultimately it felt weird making an abbey beer and not using an abbey yeast so I went with WLP530 and imagined the priests had smuggled some barrels of beer from

home to use their own yeast, but if you're brewing this yourself feel free to try an English strain and see what differences it makes!

THE FINISHED BEER

The beer came out with a creamier mouthfeel than I expected and with caramel notes lingering on the tongue, much sweeter than you'd expect from its final gravity of 1.007. The floral notes of the Goldings had room to shine in such a low-ABV beer as well. The Belgian yeast didn't really come through as prominently as I expected — there were no fruity notes or the distinct plum character the strain is known for. The dominant esters were spice, specifically a strong black pepper note especially as the beer first hits the tongue. This may have had to do with the beer being lower in alcohol than the beers generally brewed using this yeast strain.

The resulting beer feels rustic and it is. The recipe might be improved with some crystal malt and a little bit of chocolate malt. A stronger ABV might accentuate the sweetness, and a bouquet of continental hops might accentuate the esters. But I feel, as much as I can, I achieved my aim of honoring history and the sentiment of the words left on the sundial: *Time flies, memory remains.*

References:

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[8] www.anchorbrewing.com/blog/the-tale-of-pale-ale

Newcastle Brun Ale

(5 gallons/19 L, all-grain)
OG = 1.034 FG = 1.007
IBU = 18 SRM = 15 ABV = 3.6%

INGREDIENTS

4.8 lbs. (2.2 kg) Crisp Chevallier® Heritage Malt
2.4 lbs. (1.1 kg) Crisp brown malt (50 °L)
3.5 AAU East Kent Golding hops (60 min.) (0.7 oz./ at 5% alpha acids)
5 AAU East Kent Golding hops (5 min.) (1 oz. at 5% alpha acids)
White Labs WLP530 (Abbey Ale), Wyeast 3787 (Belgian High Gravity), or LalBrew Abbaye Belgian-style Ale yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Mash grains at 154 °F (68 °C) for 60 minutes. Batch sparge for 15 minutes, raising the mash to 162 °F (72 °C). Once the wort is collected in the kettle, bring wort to boil. Conduct a standard 60-minute boil. Add 3.5 AAU East Kent Golding hops at the beginning of the boil. Then add another 5 AAU East Kent Golding hops at 5 minutes. Cool wort down to 75 °F (24 °C) and transfer to fermentation vessel. Add yeast as packet directs.

Start fermentation at 75 °F (24 °C). After high kräusen, raise to 78 °F (26 °C) to allow the yeast to finish strong. Allow 1 week to condition after active fermentation then package the beer. Carbonate to 2.4 v/v.

Newcastle Brun Ale

(5 gallons/19 L, partial mash)
OG = 1.034 FG = 1.007
IBU = 18 SRM = 15 ABV = 3.6%

Due to the high percentage of specialty malts that should be mashed, this is a difficult recipe to translate into an extract version. Here is an approximate that will come out a little more roast coffee rather than roast nutty flavors.

INGREDIENTS

3.3 lbs. (1.5 kg) Maris Otter liquid malt extract
1 lb. (0.45 kg) Crisp Chevallier® Heritage Malt
1 lb. (0.45 kg) Crisp brown malt (50 °L)
2 oz. (28 g) pale chocolate malt
2 oz. (56 g) Carafa® III Special malt
3.5 AAU East Kent Golding hops (60 min.) (0.7 oz./ at 5% alpha acids)
5 AAU East Kent Golding hops (5 min.) (1 oz. at 5% alpha acids)
White Labs WLP530 (Abbey Ale), Wyeast 3787 (Belgian High Gravity), or LalBrew Abbaye Belgian-style Ale yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Mash Chevallier® and brown malts at 154 °F (68 °C) for 45 minutes, then add the chocolate and Carafa® malts. Allow an extra 15 minutes steep time. Wash all the grains with 1 gallon (3.8 L) of hot water. Add water to have 6 gallons (23 L) in the kettle. Bring wort to boil. This is a standard 60-minute boil. Add 3.5 AAU East Kent Golding hops at the beginning of the boil. Add the liquid malt extract with 10 minutes left in the boil, then add another 5 AAU East Kent Golding hops at 5 minutes left. Cool wort down to 75 °F (24 °C) and transfer to fermentation vessel. Add yeast as packet directs.

Follow the remainder of the instructions in the all-grain recipe. BYO

From Bootlegging to Bootstrapping: Prairie Artisan Ales

by Dave Clark

The story of Prairie Artisan Ales can be described as one brewery with two unique personalities. The concept for Prairie Artisan Ales came about through a partnership between two brothers with big ideas, Chase and Colin Healey, and a brewery that once existed as a bootlegging operation. Together, these two entities created one of Oklahoma's most exciting brewing stories and a brewery that now distributes beer across the world.

Photo by Charles A. Parker/Images Plus

Before telling the story of Prairie Artisan Ales, we have to first tell the story of Krebs Brewing Company and a unique beer style few have heard of outside the region of its founding. Krebs Brewing Company is named after, and located in, the one-time dry, southeast Oklahoma town of the same name. Led by Brewery Owner Zach Prichard and Head Brewer/Jack-of-all-Trades Michael Lalli, Krebs Brewing, or KBC, was known mainly for brewing a local, indigenous brew called Choc beer.

Popular in the region, brewed by natives and non-natives alike, Choc beer is short for Choctaw, the Native American region of its founding. An indigenous brew, it had many variations, made with whatever ingredients could be found. As traditional brewing ingredients were difficult to source in this remote, dry area of Oklahoma, creativity was key. (A more in-depth description of Choc beer is provided in the sidebar on page 42.)

CHOC BEER AND A NEW BREWERY

Eventually, as laws changed and brewing became legalized, Choc beer went public, no longer needing to be brewed and distributed behind closed doors. Zach's father, Joe Prichard, owned and operated a local restaurant called Pete's Place, originally founded by Zach's great-grandfather, Pete.

Capitalizing on newfound opportunities, Pete's Place started brewing on site — legally — including their own version of Choc beer on a modest seven-barrel brewing system. (Zach admits they had been brewing Choc beer on the "down low" long before that.) Incidentally, being the first to use the name in trade, Pete's Place has the commercial rights to the name Choc Beer.

A young Zach Prichard never homebrewed a batch of beer in the traditional way, but his family had been brewing beer for at least 100 years so he was familiar with the process. At the time, Zach was working wherever his Dad needed him; often as a busser or a cook at Pete's Place.

In 1995, with brewing now legal, Lalli took on the additional duties of Brewing Coordinator while still running the front of house operation in the restaurant. Lalli, and on occasion the younger Prichard, brewed beer for Pete's Place specifically over the next decade or so.

"Literally, when my great-grandfather Pete started brewing Choc beer, he was doing this out of his home," said Zach Prichard. "The person who helped my father open his brewpub, Michael Lalli, was an experienced homebrewer. Lalli worked as a Kitchen Manager for the restaurant and he evolved into the Brewmaster. He's been here ever since."

"My mother was a hairdresser and Zach's grandma was a client for many years," said Lalli. "When I turned 16, I got a job working at Pete's Place washing dishes. It was July 1984. I moved up the chain to cook, then became a server. After college, I became the Kitchen Manager. I originally became interested in beer because craft was non-existent in Oklahoma and imports were few and far between. I started homebrewing with my older neighbor in 1990, and the rest is history."

As popular as Choc beer may have been in the region, word began to travel in the early 1990s about the popularity of a newfound beer movement known as "microbrewing," later called "craft brewing." Now with the transformation of Pete's Place from a traditional restaurant into a brewpub, Lalli wanted to experiment with new beer styles besides their single offering of Choc Beer. And the locals embraced it.

ENTER KREBS BREWING COMPANY

As the years went by and the popularity of the brews took off, the brewing entity eventually needed its own name; its own identity, as well as more space. Naming breweries after the towns they were located was common, and as such, Krebs Brewing Company was officially born in 2004. Using the same 7-bbl brewery originally used at Pete's Place, KBC brewed Choc Beer as well as other styles, and also had a stream of revenue contract brewing for other businesses.

While the younger Prichard dabbled in the brewhouse, running the operation was never on his radar. He went to law school and graduated with a degree in 2009, fully expecting to go

Photo courtesy of Prairie Artisan Ales

A young Zach Prichard didn't dream of owning a brewery, but coming from a long line of brewers and offering cheap labor to his father's restaurant/brewpub did teach him the work that was involved in the business, including cleaning out the mash tun at Pete's Place.

Photo courtesy of Prairie Artisan Ales

Krebs Brewing Co./Prairie Artisan Ales Head Brewer Michael Lalli (left) and Owner Zach Prichard have been the driving forces behind the sought-after beers coming out of Oklahoma.

into law practice. A change of heart ensued, and he decided he'd rather take over the brewery arm of the family business. He believed at the time the brewery needed a new direction; a new vision, including a focus on these new-to-Oklahoma craft beer styles, especially sour beers.

BREWING OUT OF NECESSITY

Besides brewing Choc Beer, it was no coincidence that Krebs Brewing Company focused on sour beer styles. It was the still "behind-the-times" Oklahoma brewing laws that necessitated it.

"At the time, gas stations and grocery stores couldn't sell alcohol over 3.2% alcohol by weight," explained Prichard. "You had to go to a liquor store for higher alcohol products, but liquor stores couldn't refrigerate the beer. That distribution model didn't lend itself to things that needed refrigeration, like hoppy beers or delicate beers. So we made funky beers and, later, big stouts, so they'd keep."

With Lalli as his right-hand man, new beer styles began entering the fray. And as the beer laws modernized, the brewery was able to venture into uncharted territory. Focusing on sour beers and higher ABV styles, KBC grew quickly and developed a following among craft beer drinkers in the region. This popularity resulted in the brewery upgrading to a 15-barrel brewery in 2007 to keep up with demand. Eventually, KBC created a line of beers known as the Choc Brewmasters Series, including a Belgian Dubbel that won a Great American Beer Festival (GABF) gold medal.

Lalli's decision to harvest and grow the brewery's own *Lactobacillus* for souring was a game changer (read more about the brewery's *Lacto* process in the sidebar on page 44.) Having a brewery-specific strain of *Lacto* not only helped make Krebs' Brewmaster Series of beers possible, it later became the cornerstone for the Prairie Artisan Ales sour program. The house *Lacto* produces a special character that make its beers pleasantly unique.

SETTING THE STAGE

Little did Lalli and Prichard realize that some of their early decisions would greatly impact the direction the brewery would eventually take. It was KBC's familiarity and adeptness with sour beer styles such as Gose, Grätzer/Grodziskie, and others that made it a natural fit to eventually contract brew the Prairie brands.

"This was one of the things that drew Chase to us,'' said Lalli. "He knew we were willing to do things some people considered crazy. We were open to contract brewing using *Brettanomyces*. And we were already doing our Brewmaster Series of beers in 750-mL bottles with cork and cage, something that appealed to Chase."

The change in approach, however, did not come without challenges and high stress for KBC. Trying to produce Choc Beer while making sours and having a whole line of cork and caged beers was becoming too much to manage with just a few workers and obstacles became difficult to overcome. By 2012, facing challenge after challenge, Prichard grew frustrated, even contemplating getting out of the business altogether.

"We struggled," recalled Prichard. "I was at the point in 2012 where I felt like I failed."

Just when the future looked bleak, a new opportunity presented itself. It was then that one brewery with two unique personalities was born.

ENTER PRAIRIE ARTISAN ALES

There were only a handful of breweries in Oklahoma in 2012. Chase Healey was a brewer at another Oklahoma brewery (Coop Brewing) at the time, with some big ideas and a vision to someday launch a brand of his own. His brother, Colin, was an artist with an impeccable style. With his big vision and modest experience working at Coop, Chase and Colin approached Prichard and his team at a local festival called *Wildbrew*. The Healeys pitched the idea of creating a new line of high-end beers called Prairie Artisan Ales that would be developed and contract brewed at KBC.

"The name 'Prairie' came about as we were looking for something that generally described the Midwest and

Photo courtesy of Prairie Artisan Ales

A large percentage of beers produced by Prairie Artisan Ales are aged in barrels that previously kept a wide range of spirits and other beverages. This makes for an impressive barrel-aging space at "The Big House" built in McAlester, Oklahoma, a few years ago.

Oklahoma," said Prichard. "Chase grew up in Tulsa, which is about 90 miles away from Krebs."

Fueled with excitement on both sides, Prichard, Lalli, and the Healeys worked out the details, collaborated on recipes, and Krebs Brewing produced and shipped the first Prairie Artisan Ales beers in August 2012. It had taken just five short months from that initial meeting to the first release of Prairie Ale to hit store shelves.

"We made the first couple batches of the Prairie stuff and it was clear that we were onto something special," said Prichard. "The reaction from the beer-drinking community was amazing."

KBC had always planned to be a local-focused brewery with no intention to distribute outside of its region. It wasn't until the partnership with the Healeys that the plan changed. Chase Healey secured a distribution commitment from renowned beer distributor the Shelton Brothers, which called for distribution in nine states, making widespread distribution a necessity.

"As Krebs Brewing Company, we had no aspirations toward mass distribution," said Prichard. "That changed as we developed a strategy with the Healeys because of the Shelton Brothers agreement."

Working together designing Prairie Artisan beers, creativity began to skyrocket and the brewing team would try almost anything. Creating beers with flavors that would make Baskin-Robbins jealous, the brew team kept imagining new ways to put flavors of the day into the beer in the most non-traditional ways. One beer (Tiny Esses) is made with and designed to taste like Skittles — and it pulls it off perfectly.

Chase wanted to explore the "big beer" side of the business, especially brewing imperial stouts, and the team found ways to make those big beers work on their modest 15-bbl system. The imperial stouts commanded the attention of craft beer aficionados and began to raise the brewery's profile almost quicker than the production team could brew.

The brewery once founded to brew local Choc Beer was now brewing a line of beers that were catching fire. Prairie Artisan Ales began to medal in competitions and excitement about the brand escalated, especially after the release of a new imperial stout named Bomb! in May of 2013, a beer that quickly exploded in popularity.

Before long, the demand for the Prairie brand exceeded Krebs' own beers. Expansion was imminent. Lalli and his team did the best they could to keep up, but sheer volume necessitated a brewery upgrade, this time to a 50-bbl system. Purchased from Sweetwater Brewing Company, the new brewery went online in fall of 2014, coinciding with Bomb! becoming a year-round brand.

CHANGING OF THE GUARD

While the partnership was creative, successful, and sometimes even magical, the winds of change began to blow for Chase Healey. What was once unique and special became unfulfilling, trying to keep up with a demand that exceeded anyone's expectations. When the brand was launched, it was the uniqueness of creating small batch beers that appealed most to Healey, according to Lalli.

"We were brewing so much stuff, we couldn't do it all ourselves anymore," said Lalli. "We kept adding people and buying tanks. Before long, we had grown a bunch. Next thing you know, you're growing rapidly. The small family feel turned into a big commercial business. Chase savored the small batch concept. I don't think being involved with a large production brewery was where he wanted to be or what he wanted to be doing."

In February 2016, Prichard acquired the Prairie Artisan Ales brand (and all its assets including trade name and recipes) from the Healeys. With the Healeys out as owners, Krebs Brewing Company continued to brew the Prairie beers, and still do, as full owners of the brand.

Today, KBC still produces Choc Beer and does other contract brewing, but Prairie Artisan Ales make up the majority of the barrelage produced by the brewery. Growing a few thousand barrels each year since the original partnership, KBC is currently producing more than 20,000 barrels of beer annually. That makes Krebs the largest brewery in Oklahoma, but by comparison they produce about one-third the amount of the 50th largest craft brewery in the United States.

Photo courtesy of Prairie Artisan Ales

The immediate success of Bomb! after its release as a one-off in 2013 forced the brewery to upgrade to a 50-barrel brewery from its former 15-barrel system. The beer continues to be a fan favorite a decade later.

While no longer an owner, Colin Healey continues to create the unique artwork for the Prairie brand. Chase Healey has gone back to his roots of small, craft brewing.

"Because we bought the brand from Chase, it allowed him to start American Solera Brewing in Tulsa," said Lalli. "He's the only one, and he's doing it his way."

FEATURED BEERS

Prairie offerings have always been less about style guidelines and more about creating a "wow" factor. This concept is certainly on display with Prairie's flagship, year-round imperial stout known as Bomb!

Bomb!

Bomb! is the brewery's adjunct-driven, 12% ABV imperial stout made with

What is Choc Beer?

While the 21st Amendment allowed states the right to appeal Prohibition, Oklahoma originally chose to stand pat, and Prohibition remained in effect with the sole exception of beer no higher than 3.2% ABW until 1957. In the Choctaw Nation, the Native American territory in which Krebs is located, it remained dry long after that.

With no alcohol legally allowed on this relatively undeveloped frontier, those who wanted alcoholic beverages of any kind had to be resourceful in making or acquiring these concoctions. An area rich in coal, European immigrants (including a high concentration of Italian immigrants) came to Krebs to work in the coalmines, and they brought their thirst and brewing expertise with them.

A local brew evolved that became known as "Choc" beer, short for the "Choctaw" region of its founding. The beer had many variations, made with whatever ingredients could be found. As traditional brewing ingredients were difficult to source in this remote, dry area, people made due with what they had.

Michael Lalli says Choc beer may be best thought of as a beer/seltzer hybrid. Instead of mashing, Choc makers would steep barley, getting very little extract. Table sugar would be added to the wort to increase the alcohol of the resulting beverage. Bread yeast was the most common fermenter until dry brewer's yeast became popular in the 1970s, eventually becoming the norm. The resulting brew would typically be bottle conditioned, highly carbonated, and have very little body.

"Everybody's Choc beer is different, depending on fermentation temps.," said Lalli. "More modern versions often use Champagne bottles as the beer is often bottle conditioned. Carbonation can reach four volumes for a very effervescent brew. Even though it's now legal, a lot of people still brew it at home."

When it came to taking Choc beer commercial at KBC, Lalli had some new ideas.

"As a homebrewer, I didn't want to brew with that much cane sugar. I was a huge fan of German wheat beers and white beers," said Lalli. "When we created 10-gallon (38-L) trial batches for Krebs Brewing Company, I took the cane sugar out of Pete's recipe and replaced it with wheat. The laws stated that the beer had to be 3.2% alcohol by weight or less. That is how our variant of Choc Beer got started."

ancho chiles, cocoa nibs, vanilla, and coffee. It frequently appears near the top on beer rating sites' rankings. The base of the beer is big on its own, but the adjuncts take it to an all new level and create the beer's signature character. As the brewery's website says, if you're going to try just one Prairie Artisan Ale, it should be Bomb!

The beer is the result of three separate mashes due to the size of the grain bill. Each mash contains two unique specialty malts, for a total of six specialty malts in the finished batch. The flavors come together as the individual mashes are blended in the kettle. As the first mash goes to the kettle, it begins to boil and the second mash gets underway. By the time the third mash is complete, the original wort from the first mash has been boiling for hours, creating a rich, concentrated wort, filled with flavor from hours of Maillard reactions.

IBUs are high, but only meant to balance out the sweetness. Dark and specialty grains, as well as the coffee and cocoa nibs, add additional bitterness. The adjuncts are added post-fermentation, recirculated with an external tank. Bomb! is a nicely balanced beer despite the sweet base of ingredients. The brew team had an interesting goal when setting out to brew Bomb!

"Our goal was to make something more flavorful than a barrel-aged stout without barrel aging it," said Prichard. "People are surprised when they find out it's not barrel-aged."

The first batch of Bomb! was brewed as a one-off in May 2013. It was the ninth or tenth Prairie beer brewed by KBC, but the reaction to it was overwhelming compared to its predecessors. Though meant as a one-off, Bomb! was re-brewed shortly thereafter due to its popularity. Before long, everyone realized the beer needed to be a core beer offered year-round. Led by the popularity of Bomb!, the brewery upgraded to its 50-bbl brewing system in fall of 2014 to meet the demand.

Bomb! is best served in a snifter at about 60 °F (16 °C), paired with a funky cheese with bold flavors.

Slush *(strawberry & raspberry kettle sour)*

Slush is a year-round offering, a 6.1% ABV kettle-soured beer. All of Prairie's kettle sour beers are made with house-cultured *Lactobacillus*, propped up and pitched. Slush is made with dried sweet orange peel and dried lemon peel, which are added to the whirlpool once boiling is complete. After fermentation, concentrated strawberry and raspberry fruit purees are added. Some of the fruit ferments, pushing the beer's ABV north of 6%. The beer is centrifuged to produce a nice brightness along with its red hue. Fruit aromas and flavors are present but not overpowering. The goal is a refreshing and crisp experience.

Prairie Ale *(farmhouse ale)*

Prairie Ale was the first-ever Prairie beer brewed, a Belgian-style farmhouse saison that checks in between 8–9% ABV.

"This was a Chase Healey recipe," said Prichard. "It spoke to me in a lot of ways. My family's history in brewing is frontier, with a roughness to it. Prairie Ale harkened back to that. We do not control temperature in this fermentation. We add a lot of priming sugar in the bottle to get that huge effervescence to it. It's also special to me because I drank a bottle of this before I kissed my wife for the first time."

The now retired Prairie Ale undergoes a clean fermentation using Wyeast French Saison 3711 yeast. The beer ferments warm to finish very dry at just under 1.001. *Brett brux* is added at packaging where it sits for four weeks to achieve proper carbonation in heavy bottles that can handle the intense carbonation.

"The end-resulting beer is a little funky, a little chunky, highly carbonated, and crisp, leaving the palate clean," said Prichard. "Other beers we make use multiple *Brett* strains, but this one solely uses *Brett b.*"

Okie *(imperial brown ale, barrel aged)*

A huge imperial brown ale weighing in a 12% ABV and 60 IBUs, Okie lives somewhere in the space between a brown ale and barleywine. The focus is on the barrel aging, which drives some of the final alcohol content. Compared with Bomb!, Okie is more caramelly, with some residual sweetness, but not as much body, making the whiskey barrel character lead. Some hop bitterness balances the sweetness. A dark fruit character reminiscent of Belgian candi sugar comes from oxidation in the barrels that produce plum and raisin notes.

Served at 50 °F (10 °C) in a snifter and paired with a fine cigar is a recipe for success. Okie has been retired by Prairie, which makes brewing it yourself the only way to taste this unique brew.

Vinyl *(barrel-aged imperial stout)*

Vinyl was born as a small batch brewed exclusively for members of Prairie Artisan Ales' former membership club, called the Prairie Dawg Club, which included the perk of access to rare, limited releases. The name Vinyl signifies the beer is a throwback to when imperial stouts weren't laden with adjuncts. Vinyl records are both throwbacks and dark like the beer. Vinyl is a simple yet complex big, barrel-aged stout, checking in at 13.1% ABV.

The first Vinyl was brewed in 2019. Prairie had been brewing an imperial stout for years by then, but wanted a chewier, thicker version. Like Bomb!, Vinyl is created by combining three separate mashes, each with a different grain bill. The beginning and ending gravities are higher than Bomb!, helping it finish sweet with a hint of chewiness. Vinyl is aged in Four Roses Bourbon barrels that are filled immediately upon arrival.

Most Prairie barrel-aged beers are stored in barrels for 9–12 months, but Vinyl can be aged up to 18 months, depending on the strength of the liquor in the barrel.

"We taste it to determine when it comes out," said Prichard. "Once we get around the 12-month mark, the barrel's alcohol becomes more prominent. But because this one starts out thicker and chewier, it allows us to keep it in the barrels longer. The extra six months help to mellow out the beer and adds a pleasant oxidative character."

LOCAL INGREDIENTS

Any story about beer and brewing always comes back to the basics: Malt, hops, yeast, and water.

Malt

Lalli prefers to employ Pilsner malt as the brewery's main base malt and is partial to Canada Malting Superior Pilsen for its overall character.

"I've always been a fan of using Pilsner malt as a base instead of 2-row," said Lalli. "I feel like it's a cleaner base to build on without the graininess that you can sometimes get with other base malts."

For specialty malts, the majority are sourced from European maltsters.

"There's certainly nothing wrong with domestic malt," said Lalli. "But I do feel like there is a certain intensity to the European specialty malts that matters for what we're doing. For imperial stouts we solely use European specialty malts and prefer the products of maltsters Simpsons, Dingemans, and Weyermann."

Caramel/crystal malts do not play a big role in any of the brewery's beers. "I'm not a huge fan of beers with a high percentage of caramel malt," said Lalli. "To me that usually gives the beer an odd sweetness, especially as the beer ages. I do, however, love Special B malt. Regardless of the beer style, I prefer it as the only caramel malt to capture the character I'm looking to achieve. It's easy to overcomplicate the grain bill when designing recipes; avoiding that pitfall will always make the beer better."

Hops

When the brewery transitioned from the 15-bbl brewhouse to the 50-bbl brewhouse in 2014, the decision was made to start using CO_2 hop extract for 100% of the bittering additions. Some beers are brewed with only the brew kettle addition, so they only have hop extract, while other beers get hop extract in the kettle and pellets in the whirlpool.

"It really depends on what I'm

Brewery Cultured *Lactobacillus*

Krebs Brewing developed its sour beer program prior to the partnership with Prairie. Michael Lalli enlisted the help of longtime friend William Shawn Scott (or Scotty, as he's known around the brewery). With a highly advanced knowledge of all things brewing-related and having done quite a bit of research on growing *Lactobacillus*, media type, incubation temperatures, and more, Scotty was the perfect person to help Lalli create the sour beer program.

GOING TO LEIPZIG

The pair decided that Gose would be the base style of the brewery's sour program, and there was only one way to learn how to brew Gose properly — by going to Leipzig, Germany, and learning from the masters. Lalli, Scotty, and Pete's Place Owner Joe Prichard met with Brewmaster Matthias Richter at the Bayerischer Bahnhof in Leipzig, who shared with them Old World brewing techniques.

"Besides being an awesome guy and a great brewer, Richter has no equal when it comes to crafting the Gose style," said Lalli.

GROW YOUR OWN

KBC brewed the Gose in 2011; the brewery's first experience with kettle souring. After experimenting with commercial *Lactobacillus,* Lalli and his team wanted to try growing their own. Using brewery-grown *Lacto*, the resulting Gose exceeded expectations, medaling in competition. The process they discovered of producing their own *Lacto* is now the basis for all the sour beers Prairie produces. The current kettle sour base beer is a variant of the Gose first produced in 2011.

"As we got busy, we needed to turn the beers over faster," said Lalli. "I need to get the pH drop overnight. I was told 'no way can you do that.' But you never tell a redneck there's no way. We figured out we definitely can make that happen if you have the right *Lacto* and you pitch enough of it. Now it's the bulk of our production."

THE PROCESS

Harvesting *Lactobacillus* from their own grain, Lalli and his team grow the *Lacto* then prop the starters up for a full-sized pitch. A certain amount of grain is added to a starter, allowing the *Lacto* to rinse from the grain. Then, the grain is removed and the remaining liquid is placed in a second starter to prop it up. The method remains the same today as it was back when the process started, just on a much larger scale.

"We have always used an unhopped 8 °P (1.032) wort made using 80% light DME (dried malt extract) and 20% dextrose," said Lalli. "We've used/tried just about everything; different Pilsner malts, 2-row, specialty malts, red wheat, white wheat, you name it. Results will be different each time. Pilsner from vendor A will produce results different than Pilsner from vendor B. As a starting point, I would suggest making half of your grain starters with Pilsner malt and half with wheat malt. If growing your own is the path you choose you'll eventually settle on the grains that give you the results you're after."

Lalli prefers harvesting from wheat and Pilsner malt because of the type of *Lacto* that comes from these malts.

"I almost always get more gravity points with Pilsner malt," said Lalli. "Heterofermentative *Lactobacillus brevis* is super common on grain. I can tell without testing it how it acts on the first pitch. It has certain identifiable characteristics. While it can be a substitute for grain, I'm not crazy about using yogurt as it will produce homofermentative *Lactobacillus* yielding only lactic acid. Hetero will also produce acetic acid, which can be very good in small amounts."

Just having the playbook for how Prairie Artisan Ales grows their *Lacto* doesn't ensure success.

"It's a feel with *Lacto* growing," said Lalli. "The process is something that has taken years to perfect and scale to consistently produce the large amounts of *Lactobacillus* needed to support our kettle sour program. It is by no means the only way to get from point A to point B, but it's what works best for the flavors/aromas we're trying to achieve."

Rather than relying on cell counts, Lalli's team pitches on volume. The process starts over every week on Wednesday. Lalli puts the grain starters into a self-built incubator. On Fridays, the starters that make the cut are decanted off the grain. Pitches become available three days later on Monday. With sour beers being such a huge part of the lineup at Prairie, the team produces 14 grain starters that yield four liquid barrels of *Lacto* every week.

HOUSE CHARACTER

Lalli believes the difference between harvesting his own *Lacto* and buying *Lacto* from a supplier is absolutely worth the additional time and cost.

"I would say the main difference between the *Lacto* we grow and *Lacto* either from a lab or one of the dried types is complexity. The dry/lab *Lacto* does the job and certainly makes great beer but, to me, in the finished beer it just comes through as acidity. The *Lacto* we grow lends some carryover flavor/aroma to the finished beer. Some of that is because our house *Lacto* is producing other acids besides just lactic acid."

For the less adventurous, commercial sources for heterofermentative *Lactobacillus* abound, including: Lallemand

Photos courtesy of Prairie Artisan Ales

Growing their own Lactobacillus *is a huge part of Prairie's sour beer program.*

Wildbrew Sourpitch, Fermentis SafSour LB-1, Wyeast 5223-PC (Lactobacillus brevis), and White Labs WLP672 (Lactobacillus brevis).

SOURING WITH *LACTOBACILLUS*

Once the *Lactobacillus* is ready, brewing Prairie's base Gose looks like this: The brewer sparges into the kettle souring vessel, takes acidity readings, adds the *Lacto*, and lets it set overnight. Once the beer is soured to the proper pH at or near 3.5, it is then boiled, quickly chilled, and fermented with a clean yeast. Effectively, if the beer is mashed on a Monday, it is boiled on Tuesday.

Since a majority of the brewery's sour beers use the same base, two 150-bbl fermenters are used for kettle souring. The inoculated wort remains there until needed, brought back 50 barrels at a time. "We once produced seventeen 50-bbl batches in one week," said Lalli.

What started out as a glorified homebrew experiment has blossomed into the backbone of the majority of Prairie's production, showing that taking chances in homebrewing can lead to amazing results.

trying to do and, of course, there are always exceptions," said Lalli. "As for hop varieties, the extracts can either be generic or varietal specific, it doesn't seem to matter. Pellet hops are sourced by project, whatever is the best choice for that particular brew."

As you've likely noticed by now, Prairie has largely avoided the IPA and hop craze most breweries embrace, instead staying true to their model they have held since the beginning. "Most of our beers are hopped for bitterness but not hop character," said Prichard. "We don't want much hop aroma in our beers."

Yeast

Yeast strains are chosen based on the brew, but if Prairie has a house yeast, it's US-05, often known as the "Chico" strain, which it uses for most of its kettle sours and imperial stouts.

"For me this is a choice, much like using Pilsner as a base malt," said Lalli. "It provides a clean, reliable platform to build from."

Another house favorite tends to be the French Saison yeast (Wyeast 3711) used to ferment all of the farmhouse ales but also some of the kettle sour/mixed culture ales before they are dosed with *Brettanomyces* or other additions later in the process.

"The thing with 3711 is the fermentation temperature," said Lalli. "I like to knock out at 80 °F (27 °C) and let it free-rise from there, otherwise the character will be lacking. I've seen it get pretty hot, my personal best is around 104 °F (40 °C). Reaching temperatures that high takes time to get comfortable with, but once you wrap your head around it, you'll be rewarded with better results."

Bohemian Pilsner yeast is the clear cut choice for any of Prairie's lagers.

"The only lager yeast that's ever worked for me is Wyeast 2278," said Lalli. "It's almost like having a lager cheat code."

Of course, the house-cultured *Lac-*

Photo courtesy of Prairie Artisan Ales

Prairie OKC taproom opened in 2017 in Oklahoma City. A lot of Prairie's innovation happens here on a 3.5-barrel pilot system that churns out new releases every week, often on "New Beer Fridays." No beer styles, or crazy ideas, are off limits here.

tobacillus is integral to the entire line of sour beers produced by Prairie Artisan Ales, giving these beers the "Prairie character."

Water

Rural Oklahoma has fairly soft water and doesn't require any alterations to it, except when trying to replicate a certain water profile from another area for a specific beer.

"When we moved brewing operations from Krebs to McAlester, Oklahoma, a few years ago our in-house lab guy and our R&D brewer worked on the water for months before the first brew," said Lalli. "They discovered that unless it's a heavily hopped beer or unless we were trying to replicate a water source, there's really no reason to treat our water."

The brewery's hot liquor tank holds enough volume and is vented so that all the brewing water is hot enough for long enough to cook off the chlorine.

BIG HOUSE ON THE PRAIRIE

A few years ago, Prairie moved brewing operations to a new space affectionately known as "The Big House" in the neighboring town of McAlester, about 7 miles from the original Krebs location. The days of being overworked in cramped spaces trying to keep up with demand on a small system are now definitely in the rearview mirror. A new brewhouse was not the only growth the company undertook.

Prairie OKC is the brewery's taproom that opened in 2017 in Oklahoma City. The taproom contains a 3.5-barrel brewhouse that does innovation brewing, providing 2–4 new beers every single week, often debuted on "New Beer Fridays." This allows the brewery to experiment on a smaller level to see what becomes a hit with its fans before scaling up.

Today, Prairie Artisan Ales is distributed in 40 states, Europe, Asia, South America, and Australia. In less than a decade it has won numerous high-profile awards and has developed a devout following all over the world. And if you talk to fans of Prairie Artisan Ales, they might just say it's "The Bomb!"

Prairie Artisan Ales' Bomb! clone

(5 gallons/19 L, all-grain)
OG = 1.120 FG = 1.034
IBU = 24 SRM = 110 ABV = 12%

Bomb! is the brewery's adjunct-driven flagship, a 12% ABV imperial stout made with ancho chiles, cocoa nibs, vanilla, and coffee.

INGREDIENTS

16 lbs. (7.3 kg) Canadian Superior Pilsen malt
14 oz. (400 g) Simpsons black malt
14 oz. (400 g) Simpsons roasted barley
14 oz. (400 g) Simpsons Golden Naked Oats® malt
14 oz. (400 g) Dingemans chocolate malt
14 oz. (400 g) Dingemans Special B malt
14 oz. (400 g) Weyermann melanoidin malt
1.25 lbs. (567 g) D2 liquid candi sugar
4 oz. (113 g) medium brown sugar
4 oz. (113 g) maltodextrin
4 oz. (113 g) lactose sugar
7.7 AAU Magnum hops (60 min.) (0.55 oz./16 g at 14% alpha acids)
0.67 oz. (19 g) vanilla beans, split and chopped
1.3 oz. (37 g) ancho chiles, chopped
2.8 oz. (81 g) cacao nibs
4.4 oz. (124 g) coffee beans
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Be sure to use two sachets if using a dry yeast or make a large starter if using a liquid yeast strain. You may consider re-pitching yeast from a previous batch as well.

This is a single infusion mash with a ratio of 2 qts./lb. (4.2 L/kg) of grain to provide a thin mash with high enzymatic activity. Target a mash temperature of 149 °F (65 °C) and mash for 60 minutes or until conversion is complete. Recirculate wort (vorlauf), then sparge with enough water at 170 °F (76.7 °C) to collect 7.5 gallons (28.4 L) of runoff to your boil kettle. Boil for 120 minutes or until target gravity is achieved, adding sugars at beginning of boil and hops after the first hour.

At flameout, rapidly chill the wort to 68 °F (20 °C) and transfer the wort to your fermenter. Pitch yeast, oxygenate well if using a liquid yeast strain, and set the fermenter in a cool, dark place to ferment at about 68 °F (20 °C).

After fermentation has completed, rack the beer onto adjuncts. Leave beer on adjuncts until flavor/aroma target has been achieved. Crash cool, keg, and force carbonate to 2.5 volumes, or prime and bottle condition.

(5 gallons/19 L, partial mash)
OG = 1.120 FG = 1.034
IBU = 24 SRM = 110 ABV = 12%

INGREDIENTS

8.7 lbs. (4 kg) Briess Pilsen light dried malt extract
1 lb. (0.45 kg) Canadian Superior Pilsen
14 oz. (400 g) Simpsons black malt
14 oz. (400 g) Simpsons roasted barley
14 oz. (400 g) Simpsons Golden Naked Oats® malt
14 oz. (400 g) Dingemans chocolate malt
14 oz. (400 g) Dingemans Special B malt
14 oz. (400 g) Weyermann melanoidin malt
1.25 lbs. (567 g) D2 liquid candi sugar
4 oz. (113 g) medium brown sugar
4 oz. (113 g) maltodextrin
4 oz. (113 g) lactose sugar
7.7 AAU Magnum hops (60 min.) (0.55 oz./16 g at 14% alpha acids)
0.67 oz. (19 g) vanilla beans, split and chopped
1.3 oz. (37 g) ancho chiles, chopped
2.8 oz. (81 g) cacao nibs
4.4 oz. (124 g) coffee beans
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Be sure to use two sachets if using a dry yeast or make a large starter if using liquid yeast strain. You may consider re-pitching yeast from a previous batch as well.

Using about 2 gallons (7.6 L) of water, mash the Pilsner and melanoidin grains at 149 °F (65 °C) in a mesh bag for 60 minutes or until converted. Remove the grain bag, allowing the liquid to drain back into the kettle. Next, steep the rest of your grains for 10 minutes in a separate mesh bag. Repeat steps for removal of bag. It's best to mash first and steep second because the grist has so many dark grains that can lower pH levels too low as well as add unpleasant bitterness if soaked too long. Once the steeped bag is drained, add water to 3 gallons (11 L), then raise to near-boiling temperatures. Remove the pot from heat and slowly stir in half of the malt extract until thoroughly dissolved. Return to the heat and boil for 60 minutes.

Add hops and sugars at the beginning of the boil. With 10 minutes remaining, remove again from the boil and slowly stir in the rest of the DME.

Chill wort to 68 °F (20 °C) and transfer to your fermenter, topping up to a volume of 5.5 gallons (21 L). Follow the remainder of the all-grain recipe.

Prairie Artisan Ales' Slush clone

5 gallons/19 L, all-grain)
OG = 1.046 FG = 1.010
IBU = 11 SRM = 3 ABV = 6.1%

A bright red, kettle-soured ale made with strawberry and raspberry fruit puree complemented with dried sweet orange peel and dried lemon peel.

INGREDIENTS

7.8 lbs. (3.5 kg) Canadian Superior Pilsen malt
6 oz. (170 g) Weyermann acidulated malt
12 oz. (340 g) white wheat malt
1.5 lbs. (680 g) Briess Pilsen light dried malt extract (added post kettle sour)
9 oz. (255 g) sea salt
3 AAU Cascade hops (60 min.) (0.55 oz./16 g at 5.5% alpha acids)
2.5 lbs. (1.13 kg) Oregon Fruit strawberry puree
2.5 lbs. (1.13 kg) Oregon Fruit raspberry puree
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
Lactobacillus strain of your preference
¾ cup corn sugar (if priming)

STEP BY STEP

Single-infusion mash with a ratio of 2 qts./lb. (4.2 L/kg) to provide a thin mash with high enzymatic activity. Target a mash temperature of 147 °F (64 °C) and mash for 60 minutes or until conversion is complete. Recirculate wort (vorlauf), then sparge with 5 gallons (19 L) of water at 170 °F (77 °C) and collect 6.5 gallons (24.6 L) of runoff to your boil kettle.

Reduce temperature to 110–114 °F (43–45 °C), add *Lactobacillus,* and try to maintain this temperature during the souring process. Ideally, pitch enough *Lacto* to get the pH to drop in 12 hours. Once pH has dropped to 3.5–3.0, proceed to boil for 60 minutes, adding sea salt, hops, and dried malt extract at the start of the boil. After the boil is complete, whirlpool for 10 minutes.

Chill the wort to 68 °F (20 °C) and transfer the wort to your fermenter. Pitch yeast, and set the fermenter in a cool, dark place to ferment at about 68 °F (20 °C).

After fermentation has mostly completed, add fruit to the fermenter. Once fermentation of the fruit has ended, crash cool, rack beer into a keg and force carbonate to 2.5 volumes, or prime and bottle condition.

(5 gallons/19 L, extract only)
OG = 1.046 FG = 1.010
IBU = 11 SRM = 3 ABV = 6.1%

INGREDIENTS

5.75 lbs. (2.6 kg) Briess Pilsen light DME
8 oz. (227 g) Briess Bavarian wheat DME
2 tsp. lactic acid, 88%
9 oz. (255 g) sea salt
3 AAU Cascade hops (60 min.) (0.55 oz./16 g at 5.5% alpha acids)
2.5 lbs. (1.13 kg) Oregon Fruit strawberry puree
2.5 lbs. (1.13 kg) Oregon Fruit raspberry puree
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
Lactobacillus strain of your preference
¾ cup corn sugar (if priming)

STEP BY STEP

Before starting your brew, separately pre-boil and chill about 3.5 gallons (13.25 L) of water so you can add that to top up your fermenter later.

Heat about 2 gallons (7.6 L) of water to near boiling. The exact temperature doesn't matter since there is no mashing. You want it hot enough to dissolve the DME but not too hot that it boils over. Take pot off the heat source and stir in ¾ of the total volume of malt extract in any combination and the lactic acid. Raise to boil only briefly enough to sterilize your wort, then cool to 110–114 °F (43–45 °C), add *Lactobacillus,* and try to maintain this temperature during the souring process. Ideally, pitch enough *Lacto* to get the pH to drop in 12 hours. Once pH has dropped to 3.5–3.0, proceed to boil for 60 minutes, adding sea salt, hops, and remaining malt extract at the start of the boil. Knockout and whirlpool.

At flameout, chill wort to 68 °F (20 °C) and transfer the wort to your fermenter, topping up with pre-boiled and chilled water to a volume of 5.5 gallons (21 L). Pitch yeast and set the fermenter in a cool, dark place to ferment at about 68 °F (20 °C).

After fermentation has mostly completed, add fruit to the fermenter (or rack to secondary fermenter containing the fruit). The fruit will ferment somewhat. Once fermentation of the fruit has ended, crash cool, rack beer into a keg and force carbonate to 2.5 volumes, or prime and bottle condition.

TIPS FOR SUCCESS:

Because of the low pH, a higher-than-normal yeast pitch rate is advised. If target acidity is low, add malic, lactic, or phosphoric acid to adjust.

According to Head brewer Michael Lalli, "Don't worry about a 'CO_2 blanket' if the pH drop can happen in 12 hours."

If you do not have the means or ability to go through the *Lactobacillus* souring process, you can simply use lactic acid to achieve the desired pH. However, it will provide a much less authentic version of the beer than souring using *Lactobacillus* at the proper temperatures.

Prairie Artisan Ales' Prairie Ale clone

(5 gallons/19 L, all-grain)
OG = 1.068 FG = 1.001
IBU = 38 SRM = 3 ABV = 9%

The inaugural Prairie Artisan Ale, a dry, effervescent Belgian-style farmhouse saison that drinks smoothly for a beer of its size.

INGREDIENTS

8.5 lbs. (3.9 kg) Weyermann Pilsner malt
6 oz. (170 g) Weyermann acidulated malt
12 oz. (340 g) red wheat malt
12 oz. (340 g) white wheat malt
12 oz. (340 g) flaked wheat
1.5 lbs. (680 g) cane sugar (60 min.)
8 AAU German Perle hops (60 min.) (1 oz./28 g at 8% alpha acids)
3.1 oz. (88 g) Czech Saaz hops (0 min.)
Wyeast 3711 (French Saison), White Labs WLP590 (French Ale), or LalBrew Belle Saison yeast
Wyeast 5112 (Brettanomyces bruxellensis), White Labs WLP650 (Brettanomyces bruxellensis), or equivalent (for bottle conditioning)
Lalvin EC-1118 or equivalent (for bottle conditioning)
½ cup corn sugar (if priming)
½ cup cane sugar (if priming)

STEP BY STEP

This is a single infusion mash with a ratio of 2 qts./lb. (4.2 L/kg) to provide a thin mash with high enzymatic activity. Target a mash temperature of 148 °F (64 °C) and mash 60 minutes or until conversion is complete. Recirculate wort (vorlauf), then sparge with 5 gallons (19 L) of water at 170 °F (77 °C) and collect 7 gallons (26.5 L) of runoff to your boil kettle. Boil for 60 minutes or until target gravity is achieved, adding bittering hops and sugar at start of boil. At flameout, whirlpool and add the Saaz hop addition.

Rapidly chill the wort to 80 °F (27 °C) and transfer the wort to your fermenter. Pitch yeast, oxygenate (if using a liquid yeast strain), and let temperature free rise during fermentation. After fermentation has completed, crash cool, prime and with bottles rated for 3+ volumes of CO_2, use a 50/50 combination of dextrose/cane sugar. Add *Brettanomyces brux* and Champagne yeast with priming sugar.

(5 gallons/19 L, extract only)
OG = 1.068 FG = 1.001
IBU = 38 SRM = 3 ABV = 9%

INGREDIENTS

4.5 lbs. (2 kg) Briess Pilsen dried malt extract
1.5 lbs. (680 g) Briess Bavarian wheat dried malt extract
1 tsp. lactic acid, 88%
1.5 lbs. (680 g) cane sugar (60 min.)
8 AAU German Perle hops (60 min.) (1 oz./28 g at 8% alpha acids)
3.1 oz. (88 g) Czech Saaz hops (0 min.)
Wyeast 3711 (French Saison), White Labs WLP590 (French Ale), or LalBrew Belle Saison yeast
Wyeast 5112 (Brettanomyces bruxellensis), White Labs WLP650 (Brettanomyces bruxellensis), or equivalent (for bottle conditioning)
Lalvin EC-1118 or equivalent (for bottle conditioning)
½ cup corn sugar (if priming)
½ cup cane sugar (if priming)

STEP BY STEP

Before starting your brew, separately pre-boil and chill about 3.5 gallons (13.3 L) of water so you can add that to top up your fermenter later.

Heat about 2 gallons (7.6 L) of water to near boiling. The exact temperature doesn't matter since there is no mashing. You want it hot enough to dissolve the malt extract but not too hot that it boils over. Take pot off the heat source and stir in half of the malt extract and lactic acid. Raise to boil, add the bittering hop addition and sugar then boil for 60 minutes, adding the remainder of the malt extract with about 10 minutes remaining. At flameout, whirlpool and add the Saaz hop addition.

Rapidly chill the wort to 80 °F (27 °C) and transfer the wort to your fermenter, topping up with pre-boiled and chilled water to a volume of 5.5 gallons (21 L). Pitch yeast, oxygenate (if using a liquid yeast strain), and let temperature free rise during fermentation. After fermentation has completed, crash cool, prime and with bottles rated for 3+ volumes of CO_2, use a 50/50 combination of dextrose/cane sugar. Add *Brettanomyces brux* and Champagne yeast with priming sugar.

TIPS FOR SUCCESS:

Don't worry about the beer getting too hot during fermentation. Michael Lalli's personal best is 104 °F (40 °C). Experimenting with slightly underpitching the yeast will likely produce more interesting flavors and aromas.

Prairie Artisan Ales' Okie clone

(5 gallons/19 L, all-grain)
OG = 1.107 FG = 1.016
IBU = 52 SRM = 26 ABV = 12%

In a space between a brown ale and a barleywine, Okie packs a punch delivering flavors of sweet caramel and dark toast led by the nuanced character used in the barrel-aging process.

INGREDIENTS

16 lbs. (7.3 kg) Canadian Superior Pilsen malt
1.3 lbs. (0.6 kg) Dingemans Cara 45 malt
5 oz. (142 g) Dingemans aromatic malt
2.5 oz. (71 g) Dingemans chocolate malt
10 oz. (284 g) Weyermann acidulated malt
5 oz. (142 g) Weyermann Carafa® II malt
1.25 lbs. (0.57 kg) white wheat malt
12 oz. (340 g) medium brown sugar
20 AAU Centennial hops (60 min.) (2 oz./56 g at 10% alpha acids)
1.2 oz. (34 g) Cascade hops (0 min.)
2 oz. (56 g) French oak cubes
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

If you do not have a used Bourbon barrel for aging, then soak the oak cubes in the Bourbon of your choice at least two weeks before brew day to recreate the barrel aging essence of the beer. Also, use two sachets if using a dry yeast or make a large starter if using liquid yeast strain. You may consider re-pitching yeast from a previous batch as well.

This is a single infusion mash with a ratio of 2 qts./lb. (4.2 L/kg) of grain to provide a thin mash with high enzymatic activity. Target a mash temperature of 149 °F (65 °C) and mash for 60 minutes or until conversion is complete. Recirculate wort (vorlauf), then sparge with enough water at 170 °F (77 °C) to collect 7.5 gallons (28.4 L) of runoff to your boil kettle. Boil for 120 minutes or until target gravity is achieved, adding sugar at the beginning of the boil and bittering hops after the first hour.

At flameout, add the Cascade hops and whirlpool for 10 minutes. Then rapidly chill the wort to 68 °F (20 °C) and transfer the wort to your fermenter. Oxygenate the wort if using a liquid yeast strain or re-using yeast, then pitch the yeast. Set the fermenter in a cool, dark place to ferment at about 68 °F (20 °C). After fermentation is complete, add your soaked oak cubes, or rack to a secondary vessel containing the cubes. After achieving the desired flavor profile, crash cool, keg and force carbonate to 2.5 volumes, or prime and bottle condition.

(5 gallons/19 L, extract with grains)
OG = 1.107 FG = 1.016
IBU = 52 SRM = 26 ABV = 12%

INGREDIENTS

9 lbs. (4.1 kg) Briess Pilsen dried malt extract
1 lb. (0.45 kg) Briess wheat dried malt extract
1.3 lbs. (0.6 kg) Dingemans Cara 45 malt
5 oz. (142 g) Dingemans aromatic malt
2.5 oz. (71 g) Dingemans chocolate malt
5 oz. (142 g) Weyermann Carafa® II malt
12 oz. (340 g) medium brown sugar
2 tsp. lactic acid, 88%
20 AAU Centennial hops (60 min.) (2 oz./56 g at 10% alpha acids)
1.2 oz. (34 g) Cascade hops (0 min.)
2 oz. (56 g) French oak cubes
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

If you do not have a used Bourbon barrel for aging, then soak the oak cubes in the Bourbon or whiskey of your choice at least two weeks before brew day to recreate the barrel aging essence of the beer. Also, be sure to use two sachets if using a dry yeast or make a large starter if using liquid yeast strain. You may consider re-pitching yeast from a previous batch as well.

Before starting your brew, separately pre-boil and chill about 3.5 gallons (13.25 L) of water so you can add that to top up the wort later.

Heat about 2 gallons (7.6 L) of water to somewhere in the ballpark of 149 °F (65 °C). The exact temperature doesn't matter since there is no mashing, just steeping. When at temperature, put all your character grains (everything except the malt extract) in a mesh bag and steep for 10 minutes. Remove bag, letting the liquid drip back into the kettle without squeezing the bag. When complete, dispose of your used grains and stir in half of the total volume of malt extract and lactic acid. Raise to a boil, add the bittering hop addition and sugar then boil for 60 minutes, adding the remainder of the DME with about 10 minutes remaining. At flameout, add the Cascade hops.

Rapidly chill the wort to 68 °F (20 °C) and transfer the wort to your fermenter, topping up with pre-boiled and chilled water to a volume of 5.5 gallons (21 L).

Follow the remainder of the all-grain recipe.

TIPS FOR SUCCESS:

The better the source of the Bourbon or whiskey, the better the barrel-aged character will be in the finished product. Also, be sure to keep extra malt extract on hand to add in case the starting gravity comes in low.

Prairie Artisan Ales' Vinyl clone

(5 gallons/19 L, all-grain)
OG = 1.120 FG = 1.034
IBU = 56 SRM = 92 ABV = 13%

A thick and chewy barrel-aged imperial stout with a high OG and FG, and tons of flavor.

INGREDIENTS

16 lbs. (7.3 kg) Canadian Superior Pilsen malt
13 oz. (366 g) Simpsons DRC® malt
5.4 oz. (153 g) Simpsons roasted barley
13 oz. (366 g) Dingemans Special B malt
8 oz. (227 g) Dingemans chocolate malt
13 oz. (366 g) Weyermann Carafa® III malt
8 oz. (227 g) Weyermann chocolate rye malt
5.4 oz. (153 g) Weyermann melanoidin malt
113 oz. (366 g) Crisp pale chocolate malt
2 lbs. (910 g) flaked oats
1.2 lbs. (540 g) D2 liquid candi sugar
4 oz. (113 g) dark brown sugar
4 oz. (113 g) turbinado sugar
4 oz. (113 g) maltodextrin
21 AAU Magnum hops (60 min.) (1.5 oz./43 g at 14% alpha acids)
2 oz. (56 g) French oak cubes
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

If you do not have a used Bourbon barrel for aging, then soak the oak cubes in the Bourbon of your choice at least two weeks before brew day to recreate the barrel aging essence of the beer. Also, use two sachets if using a dry yeast or make a large starter if using liquid yeast strain. You may consider re-pitching yeast from a previous batch as well.

This is a single infusion mash with a ratio of 2 qts./lb. (4.2 L/kg) of grain to provide a thin mash with high enzymatic activity. Target a mash temperature of 149 °F (65 °C) and mash for 60 minutes or until conversion is complete. Recirculate to set the grain bed, then sparge with enough of water at 170 °F (76.7 °C) to collect 7.5 gallons (28.4 L) of runoff to your boil kettle. Boil for 120 minutes or until target gravity is achieved, adding sugars at start of boil and hops with 60 minutes remaining.

At flameout, whirlpool, then rapidly chill the wort to 68 °F (20 °C) and transfer the wort to your fermenter. Oxygenate the wort if using a liquid yeast strain or re-using yeast, then pitch the yeast. Set the fermenter in a cool, dark place to ferment at about 68 °F (20 °C).

After fermentation is complete, add your soaked oak cubes, or rack to a secondary vessel containing the cubes. After achieving the desired flavor profile, crash cool, keg and force carbonate to 2.5 volumes, or prime and bottle condition.

(5 gallons/19 L, partial mash)
OG = 1.120 FG = 1.034
IBU = 56 SRM = 92 ABV = 13%

INGREDIENTS

7.7 lbs. (3.5 kg) Briess Pilsen dried malt extract
2 lbs. (910 kg) Canadian Superior Pilsen malt
13 oz. (366 g) Dingemans Special B malt
8 oz. (227 g) Dingemans chocolate malt
13 oz. (366 g) Weyermann Carafa® III malt
8 oz. (227 g) Weyermann chocolate rye malt
5.4 oz. (153 g) Weyermann melanoidin malt
113 oz. (366 g) Crisp pale chocolate malt
2 lbs. (910 g) flaked oats
1.2 lbs. (540 g) D2 liquid candi sugar
4 oz. (113 g) dark brown sugar
4 oz. (113 g) turbinado sugar
4 oz. (113 g) maltodextrin
21 AAU Magnum hops (60 min.) (1.5 oz./43 g at 14% alpha acids)
2 oz. (56 g) French oak cubes
Servomyces (yeast nutrient)
SafAle US-05, LalBrew BRY-97 (American West Coast Ale), Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

If you do not have a used Bourbon barrel for aging, then soak the oak cubes in the Bourbon of your choice at least two weeks before brew day to recreate the barrel aging essence. Also, use two sachets if using a dry yeast or make a large starter if using liquid yeast. You may consider re-pitching yeast from a previous batch as well.

In a mesh bag, mash Pilsen and melanoidin malts and flaked oats in 2 gallons (7.6 L) of water at 149 °F (65 °C) for 60 minutes. Steep the rest of your grains for 10 minutes in a separate mesh bag. Drain bags and add water to make 3 gallons (11 L) of wort. Raise to near boiling, then remove pot from heat and slowly stir in half of your malt extract until dissolved. Return to the heat source and boil for 60 minutes.

Add bittering hops and sugars at the beginning of boil. With 10 minutes remaining, remove again from boil and stir in the rest of the malt extract.

Follow the remainder of the all-grain recipe, topping up to 5.5 gallons (21 L) in the fermenter. BYO

Cooking with Spent Grains

Making use of a brewing byproduct

story and photos
by Dan Jablow

For as long as I've been homebrewing, I have exclusively brewed beer using all-grain recipes. Like others that use milled grain when brewing, at the end of my brew day I'm left with a decent amount of spent grain. Depending on how much beer you brew at a time and how frequently you brew, you may find yourself generating lots of this brewing byproduct. When it comes time to clean up after the brew day is done, we must decide what to do with all this spent grain. Discard it in the trash? Add it to the compost heap? How about turning it into flour and reusing it in the kitchen?

WHAT IS SPENT GRAIN?

Before we get any further here, let's first go over some basics. When you brew beer you need a base malt to serve as the main source of fermentable sugar in the wort. The primary ingredient in your base malt is usually barley. Sometimes, in addition to the barley base malt, the grain bill for a given beer can contain other non-barley ingredients like wheat, oats, or even corn. Spent grain is what you call your malt after you have used it to make wort and it typically can't be reused for brewing purposes because all of its sugars have been extracted during mashing.

Options for handling spent grain typically fall into a few categories: Disposal, composting, feeding to livestock, and re-using. I'd wager that many of you simply throw your spent grain away. That's what I did when I first started brewing. While I favor brewing ultra-compact, single-gallon (4-L) sized batches, I brew often enough that I am generating a few pounds (1–2 kg) of spent grain every week and it didn't feel right to throw so much spent grain away. Brewing can be a resource-intensive activity. Think about all the water that is used on brew day — there's the strike water, sparge water, water used for sanitizing solution if you use something like Star San, water for cleaning, water for rinsing, and water for chilling wort. On the rare occasions when I brew a larger batch on my 5-gallon (19-L) electric brew-in-a-bag (BIAB) system, I make every effort to collect the waste water from my immersion chiller to use for cleaning and rinsing as well as for watering my garden. When I brew small batches in my kitchen it's harder to collect waste water for reuse so I started thinking about other ways to reduce the amount of waste I was generating.

In talking with professional brewers, I learned that they often find clever ways to reuse instead of discard one of their single biggest waste items. Many breweries work with local farmers who collect the spent grain for use as composting material and/or as feed for their livestock. I've also seen some breweries use spent grain to make dog treats. While I don't compost at home nor am I allowed to have livestock in my neighborhood, this got me thinking that perhaps I could leverage my culinary school and formal restaurant training to incorporate spent grain into some of my favorite recipes.

PREPARING SPENT GRAINS FOR COOKING

I prefer to dry out my spent grains prior to using them. This will preserve them and will also make storage easier. You don't need much in terms of equipment to do this — an oven, a spatula, and, ideally, a metal sheet tray that has edges or a lip. You could also use a baking dish or a cookie pan, just make sure it has sides so your spent grains don't go sliding off it. My preferred pan is what's known as a half-sheet tray in restaurant lingo, which typically measures 13 x 18 inches (33 x 46 cm) and has a 1-inch (2.5-cm) lip around the edges. I find that a typical single-gallon (4-L) brew will yield enough spent grain for two half-sheet trays, both of which fit comfortably in my oven. Obviously if you are brewing 5+ gallons (19+ L) at a time, you will yield a lot more spent grain than that. Though you certainly can, I'm not suggesting that you'll want to dry and reuse all of that grain — the point here is to suggest that you don't have to throw all of it away.

To begin the drying process, simply take your spent grains and lay them out directly onto your sheet tray in a relatively thin, even layer. It's best not to pile the spent grains more than an inch (2.5 cm) or so high or else this will prolong the drying-out time. Place your sheet tray into a 200 °F (93 °C) oven and let the grain dry out over the course of the next 6–8 hours. Every hour or so I take the trays out of the oven and stir up the spent grain on the tray with a spatula to ensure it dries evenly. I also rotate my pans in the oven every time I stir the spent grains. Once the grain is bone-dry, remove the trays from the oven and let cool. Once cool to the touch, package the dried spent grain in an airtight container or Ziploc bag until you're ready to use them.

For some recipes, like the granola recipe shared later in this article, you can leave your dried spent grain whole, but for most recipes you want to mill them into a fine, flour-like consistency. This will make it easy to swap some the flour in any given recipe for your homemade spent grain flour. To accomplish this, I use a coffee grinder. Because coffee flavor can be difficult to remove over time and so I don't have to clean it out every time I use it, I have a dedicated grinder just for coffee beans and another for spent grains and spices.

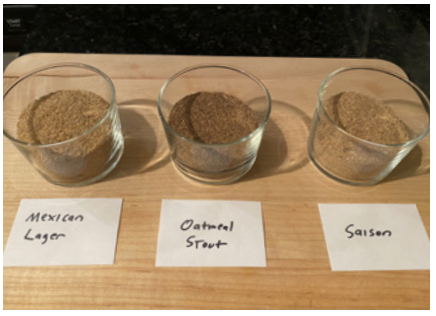
The milling process is easy. Add the spent grains to the grinder, pop the lid on and grind until the grains achieve an almost powder-like texture. This shouldn't be too difficult for most grinders to achieve and takes just 10–15 seconds of grinding to turn the grains into a fine texture. To preserve freshness, I mill just before I'm about to use it in a recipe.

Step 1: *Collect and drain spent grains after transferring your wort to the kettle.*

Step 2: *Spread spent grain out on a tray or pan at a thickness up to one inch (2.5 cm).*

Step 3: *Dry grains in an oven set to 200 °F (93 °C) for 6–8 hours, stirring each hour.*

Step 4: *Once cooled, grind your dried spent grains into a flour-like consistency.*



Step 5: *Store your spent grain flour in a dry place until you are ready to use it.*

HOW TO APPROACH CULINARY USAGE OF SPENT GRAIN

When I cook at home it's not unusual for me to use some of the same adjuncts from brewing in my favorite recipes. For example, my cornbread recipe contains a mix of flour and cornmeal — my Mexican lager and Kentucky common recipes both contain at least 10% flaked maize in their grain bills. I can't make oatmeal raisin cookies without oats — and oats feature prominently in both my New England IPA recipe as well as an oatmeal stout I brew. Furthermore, some beers — hefeweizens and witbiers for example — contain high proportions of wheat in their grain bills. Seeing that there were common ingredients in some of my spent grain mixes and favorite recipes led me to conclude that it should be possible to replace some of the all-purpose flour in my recipes with spent grain flour.

I have previous experience with flour substitutions as I've already replaced some of the all-purpose flour in my favorite recipes with whole wheat flour. Swapping out all-purpose flour for spent grain flour is similar with one major caveat. In many recipes like traditional breads and pizza dough, flour serves a very important role by providing structure. It's the combination of flour, water, and mechanical action (kneading or mixing) that creates gluten in your baked goods. This gluten forms the structure and texture. If you were to replace all of the flour in a recipe with spent grain, especially spent grain derived exclusively from barley, you remove a lot of the gluten in the recipe. Barley contains gluten, but not as much as is found in all-purpose flour. If you remove too much flour from some recipes, the final product could lack the gluten needed to provide the necessary structure. My general substitution rules of thumb are:

- For traditional yeast-leavened breads and pizza dough, I begin by swapping out 25% of the flour in a recipe with spent grain flour.
- For everything else, including cookies, brownies, cakes, quick breads (bread leavened with baking powder and/or baking soda), muffins, pancakes, and waffles, I generally swap out 50% of the flour called for with spent grain flour.

I arrived at these substitution rates through trial-and-error, which I encourage home cooks to do as well. There are no rules here — cooking is an objective process as much as it is also a subjective process. In other words, cooking is deeply rooted in fundamental techniques but everyone experiences and tastes food differently — what I like might not be what you like. Experiment and determine what you like.

It's also worth noting that, in my experience, spent grain flour seems to be more absorbent than regular all-purpose flour. When developing or altering your own recipes to include spent grain, you may need to slightly increase the proportion of wet ingredients in your recipe.

BENEFITS OF USING SPENT GRAIN IN YOUR KITCHEN

Why go through all this effort of drying out and milling spent grain when it's so much easier to throw it away? Beyond the benefit of keeping waste out of landfills, I see other reasons to reuse spent grain in the kitchen. The biggest may be an improvement in flavor and texture. All-purpose flour is highly refined and designed to not have any real discernable flavor. It's in your baked goods to provide structure and that's about it. Barley, along with whatever else is in your spent grain mix, will undoubtedly lend more depth of flavor to whatever items you prepare with it. An immediate flavor characteristic that I notice with most spent grain is a very subtle nuttiness. Depending on the beer brewed, its spent grain will impart other flavors as well. For example, when I brew a stout, some percentage of my grain bill will consist of darker roasted barley that can lend roasty, almost chocolate-like notes not only to beer but also to foods like brownies or a molasses-based quick bread.

Another benefit, if you want to call it that, is that it is a fun conversation when sharing these foods with friends and family, especially if paired with the beer that was also made using the same grains.

Spent Grain Recipes

I brew many different styles of beer at home and each style has its own unique grain bill. Every unique grain bill will consist of a different combination of spent grain that will impart its own flavor characteristics to the recipe product. The recipe examples I present here demonstrate applications of different spent grain mixes. An important note for the recipes that follow: The amount of spent grain flour required is post-milling.

Spent Grain Granola

This was the very first recipe I made using spent grain. I make this one frequently and because this recipe is quite flexible, I sometimes vary the ingredients based on what I have on hand in my pantry. The variety of nuts and dried fruit can change from batch-to-batch. You can also add in a ½ cup of whatever seeds (pumpkin or sunflower work well) you have on hand but this is totally optional. I like my granola loose as opposed to packed-tightly into bars or clusters but you could certainly apply some pressure to the granola mix while it's on the sheet tray before baking to promote the formation of clusters. The spent grain used for this recipe doesn't even need to be milled, you can use it whole.

INGREDIENTS

1½ cups spent grain, dried and un-milled (I recommend using spent grain from a lighter beer that doesn't contain roasted malt)
1½ cups rolled oats
1 cup roughly chopped unroasted nuts (I use almonds, pecans, and walnuts)
1 cup coconut flakes, preferably unsweetened
½ cup roughly chopped dried fruit (I use dried cranberries)
½ cup olive oil
⅔ cup maple syrup
⅓ cup brown sugar
½ tsp. Kosher salt
½ tsp. cinnamon
¼ tsp. ground cloves
¼ tsp. garam masala (optional)
Pinch of ground nutmeg

STEP-BY-STEP

Preheat oven to 300 °F (150 °C). In a large bowl, using a large spoon, spatula, or your hands, thoroughly combine all of the above ingredients.

Spread the mixture evenly on a half-sheet tray or similar sized sheet. I recommend using something with a lip or edge.

Bake for roughly 50 minutes until the nuts and coconut turn golden-brown in color. Be sure to stir the mixture every 5–10 minutes. Let cool and package in an airtight container or plastic food-storage bag.

Spent Grain Pancakes

Homemade pancakes are so easy to make you'll never buy another pre-packaged mix again. This is another recipe, like Spent Grain Granola, where I find that a lighter spent grain mix works best. With a third of its grain bill being flaked maize, I like using the spent grain from my Mexican lager for pancakes. You can even replace the flour entirely in this recipe, swapping it out with 1 cup of cornmeal to make Johnny cakes. The great thing with this recipe is that it offers lots of flexibility to suit your taste. You can use 1 cup of all-purpose flour and add in a ½ cup of mini chocolate chips. Use 1 cup of whole wheat flour and add in a ½ cup chopped walnuts and a ½ cup mashed bananas to make super-flavorful banana nut pancakes. Fruit additions also work nicely here as well.

INGREDIENTS

1 cup spent grain, dried and milled finely (I recommend using spent grain from a lighter beer that doesn't contain roasted malt)
1 cup all-purpose flour, or 1 cup of whole wheat flour, or a 50/50 mix of each
1 Tbsp. granulated sugar
2 tsp. baking powder
1 tsp. salt
2 eggs
2 cups milk (you may need up to an additional ½ cup depending on how thick your batter is)
2 Tbsp. melted butter plus additional butter for cooking
2 Tbsp. honey

Optional add-ins:

½ cup of chopped walnuts, or
½ cup mini chocolate chips, or
½ cup fruit (blueberries, strawberries or mashed bananas)

STEP-BY-STEP

Heat a large non-stick skillet over medium heat.

In a large bowl, mix together the dry ingredients (spent grain, all-purpose flour, sugar, baking powder, and salt).

In a separate bowl, mix together the wet ingredients (eggs, milk, melted butter, and honey).

Pour the wet ingredients over the dry ingredients and mix to combine. It's fine if there are some lumps in the batter. If the batter seems to be too thick, add a little more milk and stir it in. You want the batter to have the consistency of marinara or tomato sauce — not too runny so that the pancakes spread too thin when the batter hits the pan but not too thick that the batter is hard to pour.

Add 2 tsp. of butter to the pre-heated skillet and let it melt, swirling the pan to cover it with the butter. I like to make small sized pancakes that require about 3 tablespoons of batter. I find I need about 2–3 minutes per side to get them nice and brown but not too dark. Keep an eye on your pan too and turn down the heat if the pancakes are cooking too quickly. Everyone's stovetop heats differently so you might need to cook a few test pancakes before you determine your timing.

Serve immediately or hold in a 200 °F (95 °C) oven for up to 10–15 minutes. Cooked and cooled pancakes freeze well and can easily be thawed in a microwave.

Spent Grain Banana Bread

Banana bread is a classic example of a quick bread — a bread that uses baking soda and/or baking powder as leavening agents instead of yeast. Quick breads are generally easy to prepare in that they don't require kneading or resting. Sometimes you can even prepare all of your ingredients in one bowl. I think they make good candidates for swapping out flour with spent grain because the finished product doesn't have the same type of structure and elasticity that you'd find in a more traditional yeast-leavened bread, like a baguette or French bread. The quick bread just needs enough structure so that it can hold itself together and not collapse and it won't matter if you replace some of the flour with something containing less gluten. For this recipe, I think you can get away with using spent grain from just about any type of beer you brew, with the darker the beer grains used, the more flavor that the spent grain will lend to your finished banana bread.

INGREDIENTS

2 very ripe bananas, mashed
½ cup unsalted butter, melted
¾ cup packed dark brown sugar
1 egg
1 tsp. vanilla
1 tsp. baking soda
1 tsp. ground cinnamon
Pinch of ground cloves
Pinch of ground allspice
Pinch of ground nutmeg
¼ teaspoon Kosher salt
¾ cup all-purpose or whole wheat flour
¾ cup spent grain, dried and milled finely (almost any variety of spent grain will work here)

STEP-BY-STEP

Preheat your oven to 350 °F (175 °C). Using butter or non-stick cooking spray, grease a 9- by 5-inch (23- x 13-cm) loaf pan and set aside.

In a large bowl, mash the bananas until they start to form a smooth paste. Add in all the other ingredients except the flour and spent grain and mix to combine. Add the flour and milled spent grains and combine until you see no unmixed flour. Pour this batter into your greased loaf pan and put in the oven.

Bake for 40–50 minutes until a cake tester or toothpick inserted into the center of the banana bread comes out clean. Cool on a rack and remove from the pan prior to slicing.

Spent Grain Chocolate Chip Cookies

This is my go-to recipe for chocolate chip cookies. It produces cookies that are loaded with chocolate chips and are more chewy and chunky rather than flat and crispy, especially when you let the cookie dough chill in the refrigerator before baking. The spent grain addition here works well, adding some texture and nuttiness to the finished cookies. Using spent grain from a darker brew, for example a stout or porter, will really amp up the roastiness in the cookies and would even work well for a chocolate chocolate chip variation.

INGREDIENTS

1 cup all-purpose flour
1 cup spent grain, dried and milled finely (almost any variety of spent grain will work here)
½ tsp. baking soda
½ tsp. Kosher salt
1 cup (8 oz.) unsalted butter, melted
1 cup dark brown sugar, packed
½ cup granulated sugar
2 tsp. vanilla
2 large eggs
12 oz. chocolate chips (I prefer semi-sweet but any variety will work)

STEP-BY-STEP

If you plan to bake the cookies immediately, preheat your oven to 325 °F (163 °C). I prefer to let the cookie dough chill for 2–3 hours before baking as this helps prevent the cookies from spreading out too much when they bake. (See my note later on dough-chilling.)

Line a cookie sheet or sheet tray with parchment paper or grease with butter or non-stick cooking spray.

In a large bowl, whisk to combine the all-purpose flour, spent grain flour, baking soda, and salt and set aside

In another large bowl, add the melted butter, brown sugar, and granulated sugar and beat/mix until smooth (about three minutes if using a stand mixer set to medium speed). Beat/mix in the eggs, one at a time, and the vanilla for another 2–3 minutes until the mixture is a light sand color and is very smooth and creamy. Add the dry mixture to the wet mixture and mix until everything is just combined. Stir in the chocolate chips.

If baking immediately, you can place the cookie dough right onto the prepared sheet trays for baking. Size is up to you — use about 2 Tbsp. of dough for smaller cookies, or up to ⅓ of a cup for larger cookies.

Baking time will also depend on cookie size. Smaller cookies will take roughly 10 minutes to cook while larger cookies will take 12–14 minutes to cook. Halfway through cooking, rotate your cookie tray in the oven.

You'll see the edges of the cookies start to turn brown — that's a good indication of cookie doneness. When the cookies are done, pull the sheet tray out of the oven and let the cookies rest on it before transferring to a wire rack or a cool sheet tray to cool.

Optional: Dough chilling is not mandatory but I find that when I skip this step, the cookies spread out too much for my taste during baking. To prevent that, this newly formed cookie dough should chill in the refrigerator for at least two hours prior to baking. After adding in the chocolate chips, I take the dough out of the bowl and form it into logs roughly a foot (32 cm) long and about the diameter of a beer bottle. Wrap the cookie dough logs in plastic wrap and refrigerate until you're ready to use. When it comes time to bake the cookies, I cut off sections of cookie dough roughly 1–1½ inches (2.5–4 cm) thick.

Spent Grain Soda Bread

Like the Spent Grain Banana Bread, this is another type of quick bread however this one is a bit more reminiscent of a traditional bread. Like the banana bread recipe, it doesn't rely on yeast for leavening, rather, the acid in the buttermilk reacts with the baking soda, which enables the bread to rise while it bakes. This recipe can mostly be prepared in a single bowl up to a certain point, then you'll need to get your hands a bit dirty as you knead the dough to help it come together. Make sure that you've got a clean surface to work on before that step. You can bake the formed dough on a baking pan or sheet tray that's been lined with parchment paper, or directly in a cast-iron skillet in the oven, which is my method of choice. The finished bread will develop a nice sturdy crust while baking and will be quite dense but the inside will be soft like other quick breads.

INGREDIENTS

2¼ cups all-purpose flour, plus a little extra for your countertop
2¼ cups spent grain, dried and milled finely (almost any variety of spent grain will work here but I like to use something from a darker brew, like an oatmeal stout)
2 Tbsp. granulated sugar
1 tsp. Kosher salt
1 tsp. baking soda
6 Tbsp. cold butter, cut into ½-inch (1-cm) cubes
1¾ cups buttermilk*
1 egg

** If you don't have buttermilk, you can quickly make your own using any kind of dairy milk and white vinegar. Simply add 1 tablespoon of white vinegar for every 1 cup of milk. Mix together and let stand at room temperature for 5 minutes. Stir again and it's ready to be used in place of buttermilk.*

STEP-BY-STEP

Preheat oven to 400 °F (205 °C). Place a sheet of parchment paper onto a baking pan or tray (if using that). If using a cast iron skillet, make sure it's well-seasoned/lightly oiled.

In a large bowl, thoroughly combine the all-purpose and spent grain flours, sugar, salt, and baking soda.

Add the butter to the dry ingredients and using your hands, work the butter into the flour mix until it is the size of very tiny pebbles. Think of a green pea, but half that size.

In a separate small bowl, mix together the buttermilk and egg, then add to the dry ingredients.

Combine the wet and dry ingredients as best as you can — I find it best to use a wooden spoon here — until the mixture becomes too hard to stir. The dough will be very sticky and tacky and will appear to not be fully mixed. Pour it out onto a floured countertop and knead with your hands until you can form it into the rough shape of a ball. You might need to add a little more flour while kneading to get the dough to come together without it being too tacky to the touch.

Transfer the dough ball to the prepared baking pan or cast-iron skillet. Using a sharp knife, score the top with a "X" shape about a ½-inch (1-cm) deep. Bake for about 45 minutes until the surface becomes very crusty. The best way to determine doneness is to use an insta-read thermometer – insert it right into the center of the "X" and when it reads 185 °F (85 °C), the bread is done baking.

Remove the bread from the pan/skillet and let it cool on a wire rack for at least 15 minutes before slicing into it.

BY DREW BEECHUM & DENNY CONN

CLEANING ACTION

An ounce (28 g) of prevention

When people find out that you're a beer lover/obsessive – you inevitably get the question — "What's your favorite beer?" From the plethora of pithy answers, we usually respond — "the one in front of me!" Some questions just don't have serious answers.

But when you get known as a "brewer," then the curious will inevitably inquire (after the rounds of, "is that legal?" and, "What do you make?") — "What's the most important thing when making beer?"

For us, there is no wittiness that can encompass the deadly seriousness of this matter — and there's truly only one answer: Cleaning and sanitation. Swimming through the swirling morass of brewing bugaboos, it would be easy to get lost. Style, ingredients, process, mash temperatures, water chemistry, fermentation temperatures, yeast vitality — these are all essential elements of a great beer, but the utterly mundane and boring step of cleaning and sanitation towers above all the "fun" pieces of brewing.

Put simply: If you don't execute your cleaning and sanitation; nothing else matters. Not your process controls, your super charged yeast, your finest malts and hops . . . nothing.

What do we need to achieve to win the brewing sanitation game? We need to eliminate shelters for beer spoilage organisms (a.k.a., cleaning) and then we need to "eliminate" the organisms themselves sufficiently to give our favored critters — brewer's yeast — time to establish and dominate the worty landscape (a.k.a., sanitation). This issue, we'll start with cleaning as it is the bedrock on which we build our good habits.

Put simply: If you don't execute your cleaning and sanitation; nothing else matters.

Photo by Charles A. Parker/Images Plus

CLEANING

Brewing generates a fair amount of mess and sludge. Proteins glom onto the kettle walls, yeast settles everywhere, beerstone latches onto every surface available. We have to get rid of it because every little bit provides a potential hiding hole for some nasty critters just waiting to spoil your beer.

A word about where to put your effort — we tend to think of brewing "hot-side" and "cold-side" operations. The typical rule of thumb teaches us that while cleanliness is lovely on the hot side, it's imperative on the cold side. In other words, up until the point you're done boiling the wort, a little sloppiness is OK. But the second the wort is chilled — your A-game is required. Practically, this means anything touching cold wort needs to be clean and sanitary — starting with any kettle valve or tubing that you use to transfer from the boil pot to the fermenter all the way to the bottle or tap line you pour the beer with. To our minds, it just makes sense to keep it all nice and spiffy. OK, reasonably spiffy . . . don't go overboard about it.

CLEANING CHEMICALS

In the professional brewing world, the choice of cleaning compounds tends to rotate around various preparations of caustic soda. Lye and other professional cleaning chemicals are powerful and aggressive dissolvers of most beer soil. But they are dangerous — caustic burns are no joke.

In a work environment compounds that require care, experience, and protective equipment make perfect sense. For the casual hobbyist, we cannot stress enough — don't do it. Our needs allow us to build in a margin for safer cleaners that are less likely to cause issues.

We're both fans of the Alkaline Brewery Wash from Craft Meister. It's safer than straight caustic soda, but has more power than most brewery cleaners. The other major type of homebrew cleaners are sodium percarbonate-based solutions like Five Star Chemicals' PBW or Craft Meister Oxygen Brewery Wash. Homebrewers, being notoriously thrifty,

have made a number of "clone" cleaners using mixtures of TSP (trisodium phosphate) and OxiClean, etc. But, in general, we recommend sticking with a professionally made product for surety and consistency . . . and this applies to all brewing solutions.

If you must use something like OxiClean, then make sure you buy the version that is free of additional scents. (e.g., OxiClean Free) And don't use regular dish soap! Not just because of the smell, but the soap isn't as efficient at cleaning and, unlike OxiClean, requires a ton of rinsing to ensure your brew gear is free of residue.

THE MAGICAL CLEANING TRIO

Cleaning is, at heart, a chemical and physical action. Cleaning solutions attack the various bonds in brewing residues to remove them from the surface and we flush them away. Thinking back to your basic chemistry classes — the rate of chemical reactions are impacted by time, temperature, concentration, and agitation. The longer you let something soak, the more bonds get attacked. The higher the temperature, the faster the bonds get attacked. More cleaning compound, more agents to attack the grime. And with agitation and physical scrubbing, the bonds get broken more easily.

As always, there are caveats. Don't let a cleaner soak for too long less it also attacks your vessel surface. (See the number of hoses Drew's had to replace because cleaner attacked the vinyl.) Many cleaners work better at higher temperatures but may also break down if heated to boiling (or melt your plastics/shatter your glass). Too much cleaning compound is wasteful (it doesn't dissolve) or potentially messy like extra OxiClean "gluing" itself to your carboy surface. And if you scrub too hard, you can scratch your vessel surfaces — even stainless steel will fall victim to enough physical enthusiasm!

Mix the proper amount of chemical into hot water (120–140 °F/50–60 °C, for instance). Give it 10–20 minutes to soak in and then scrub with a stiff bristled plastic brush or plastic scrubby. Nothing beats a little elbow grease in these matters and wearing brewing gloves are definitely recommended. Word of caution — when dealing with plastic, like buckets, don't scrub so hard that you create scratches. If piles of gunk provide shelter to bacteria, scratches are impregnable safehouses for beer spoilers. Scrape a bucket and you'll need to scrap it.

Denny cleans with a sponge after soaking. After a good soak, there's almost never a need for heavy scrubbing and using a sponge ensures that you won't scratch anything. And if you do need something "extra," mechanically speaking, Drew swears by plastic scrapers made, nominally, for cast iron cookware. The plastic is rigid enough to give you some force without being strong enough to mar glass and steel surfaces.

After all the gunk is detached from the vessel, hose, gadget, or widget, you need to rinse and rinse well. You want the surfaces to be free of all chemical residue. If you run your fingers along the surface and feel them getting slippery, you need to rinse some more. The rule of thumb Drew follows is to rinse with as much water as you used cleaner.

This is particularly important with acid-based sanitizers to avoid throwing off the pH of the sanitizing solution. Plus, who wants cleaner in their beer?

WATER MARKS AND BEER STONE

Not every piece of brewing residue should be attacked with an alkaline cleaning agent. You'll be fighting chemistry if you do and busting out the extra tanks of elbow grease to scrub them away.

The two classic examples that occur often are water mineral deposits and beer stone. After a boil you'll often be left with a whitish residue of various mineral salts that have fallen out of solution (calcium carbonate, for example) and at the same time in your boil kettle or kegs, you might notice a buildup of brown patches that don't respond to scrubbing — that's beer stone (calcium oxalate, amongst other things).

Both of these are better attacked via an acidic solution. Even a simple bath of citric acid in hot water, or a long soak with an acid-based sanitizer like Saniclean, will allow you to simply wipe away the buildup with a sponge.

ACID RINSES/PASSIVATION

Because of things like beer stone and residual caustic solutions, an acid rinse is almost always used in the professional brewing world. It's also important in a stainless steel, quick turnaround world due to its passivation action. Passivation is a chemical process meant to remove from the steel any free iron and restore a protective oxide layer that prevents rusting and interaction between the metal and acidic wort.

The oxide coating will occur naturally over time, but a quick rinse of a hot citric acid solution can speed up the process of protecting the metal. The general consensus is that in the homebrewing world passivation is rarely needed. The only time Denny passivated anything was when he had the top of a (legally obtained) keg cut out and the opening began to rust. A quick scrub with Barkeeper's Friend (BKF) took care of passivating the stainless steel due the oxalic acid in BKF. Unless you're brewing frequently with little downtime, you'll be fine!

A WORD ABOUT SMALL PARTS

In the midst of all this cleaning, scrubbing, and soaking talk — our primary focus has been on the big things: The fermenter surface, the keg interior, etc. If you skip over the small parts, you might as well have not done anything at all. Take the extra time to break those valves and gaskets down and make sure they're clean. You'd be surprised at the stuff that can grow in a kettle ball valve or hide behind an o-ring on a keg post.

AN OUNCE (28 g) OF PREVENTION

Cleaning doesn't have to be hard — in fact, if you're smart about your cleaning regimen, you should be starting as early as possible. The biggest sin you can commit is waiting to clean. Time allows residues to dry and harden, stains to penetrate surfaces, etc. In other words, rinse the big stuff out the second you can.

Beer bottles, for instance, are notorious for stubborn baked in yeast residue that is difficult to remove and scrub. After pouring a beer, take 10–15 seconds and rinse the bottle out. Advantage is you'll give your beer a chance to fully form a head and settle. Five minutes now will keep you from 30 minutes of work later. (That should be tattooed on Drew's eyelids as a reminder.)

BY WILLIAM JABLONSKI

LONG-DRAW DRAFT SYSTEMS

Pushing your home draft system to new levels

Homebrewers tend to have a habit of making things more complicated than needed. Why buy a wort chiller when you can spend a weekend wandering Home Depot looking for the right combination of copper compression fittings? If you have a kegerator, I am guessing that many of you have contemplated installing a more ambitious beer delivery device. The kind of system that gets your cold draft to a corner of the house or home bar, far away from where your kegs reside. Don't walk all the way to the kegerator. Have the beer come to you.

It can be done and it's not particularly hard, but these systems can be cost-prohibitive. Long-draw systems are most commonly found in bars where refrigeration storage for the kegs may be a long way from the faucets. And there are a few rules that must be adhered to and more than a few opportunities to mess it up along the way. This article will guide you through the design and installation process.

We will discuss a hypothetical system installed within a single-family house with a basement. Your particular system may not require every aspect of this design, but with a little knowledge and an idea of what to look out for, you should be well prepared to take a deep dive. Previous draft system articles in *BYO* offer useful information about tubing, faucets, hardware, and home bar designs. Some of this stuff is going to be buried behind drywall or under a slab and a realistic evaluation of your builder expertise is warranted. I can assure you that nobody at the hardware store will have any useful expertise. Don't make the mistake of designing and installing your system similar to household plumbing. We are going to assume you have a solid understanding of draft system balance. If not, spend some time learning about how the relationship of pressure, resistance, and temperature work in a draft system. A long-draw system is complex. I'm not here to tell you not to go for it, only to be the sober friend. You really don't want to use substandard equipment anywhere, but with a long-draw the stakes are much higher.

Loosely, there are three types of draft systems. A direct-draw system is one in which the kegs are stored in a cooler and the shank and faucet assembly penetrates the cooler wall. This is the simplest of the three. It eliminates several hardware and cooling problems, making life cheaper and easier. A converted refrigerator or chest freezer (a.k.a., keezer) are examples of a direct-draw system. A slightly more complex design is a short-draw system, in which the kegs reside in a refrigeration unit and the faucets are a few inches or feet away. A fan is typically used to move cold air from the cooler into the unrefrigerated space and then back to the cold space. If you are familiar with a typical kegerator with a tower, that's a short-draw system. Both are fairly simple to design and install. The third design is a long-draw system, requiring an order of magnitude more planning, hardware, expense, and time. You're looking at around $2,500 (USD) minimum and the costs can go up from there. That's not including minor or major home renovations that may be involved. But the reward is impressive.

The complexity of a long-draw system is mostly wrapped up in the refrigeration requirements, along with a decent amount of resistance headaches. Unlike typical plumbing, our beer always needs to be at the correct temperature from keg to faucet, which is

The complexity of a long-draw system is mostly wrapped up in the refrigeration requirements, along with a decent amount of resistance headaches

Photos courtesy of Canadian Beverage Supply

The design and function of trunk lines is to allow for remote serving of ice-cold draft beer.

never more than 38 °F (3 °C). This is one of those hard rules. You like your beer at 44 °F (7 °C)? Tough. Let it warm up or pour yourself a glass of foam. Keeping it cold is the prime design initiative and it is unfortunately not something we can neglect. Even a few degrees variation will cause foaming. You will be reminded, and annoyed, each time you pull a pint. Homebrewed beer comes with not insignificant amounts of pride. Commercial kegs come with a healthy price tag. We want this system to pour great beer, whether homebrewed or commercial, day in and day out.

First, we are going to need a cold space to store our kegs. You don't need a walk-in cooler (though if you convince your significant other . . . well, great). A fridge or chest freezer will work just fine. An external thermostat is required because, again, maintaining temperature is our dilemma. As for resistance, the farther the keg from the faucet the more line resistance we have to account for. Add lift or drop (a.k.a., gravity) to the equation and things get more difficult, but should not be a deal breaker. We will calculate resistance later. So number one, keep it cold; number two, correctly calculate restriction; and number three, apply gas pressure to get beer from keg to faucet. This last part is where long-draw systems can get nutty. We are going to discuss blended gas in a future article, so if your particular long-draw system cannot be balanced with 100% CO_2, stay tuned. Soon you'll be able to get your beer virtually anywhere in your home.

In our hypothetical long-draw, Joe Homebrewer wants to install a faucet in his shower. Because why not? Joe has a basement and the shower is on the second floor, with a total distance of 25 feet (7.6 meters) from the Corny keg to the faucets. Joe brews a lot and wants four faucets available. He has a chest freezer for keeping his kegs cold and knows how to patch drywall as well as cut tile. Joe's system does not need a drip tray (he is in a shower after all) but if you are going to your kitchen counter, plan for a drip tray and drain.

Joe plans to re-use his keezer for this long-draw system. Once the beer exits the refrigerated space it will warm and CO_2 gas will escape resulting in a foamy mess each time a beer is poured. The foam will continue until the cold keezer beer reaches the faucet and then the warming process will start all over. Let's not do that. We will use a dedicated trunk line with a glycol loop to keep our beer at the correct temperature from keg to glass.

All of the *BYO* draft articles I have written discuss the importance of using quality hardware and this goes double for a long-draw system. Some of this stuff is going to be buried behind drywall or under a slab so you really don't want to use sub-standard equipment anywhere. With a long-draw the stakes are much higher. Use brewery-approved materials throughout, sourced from name-brand manufacturers. All metal components are going to be stainless steel and your vendor should have a reputation for integrity along with a generous return policy.

KEEPING IT FROSTY

A glycol chiller used in combination with the trunk line should be employed to maintain temperature. The chiller circulates glycol within an insulated assembly of beer line, tape, and moisture barrier. The glycol continually removes heat that would otherwise allow the beer to warm up. A pump runs the glycol 24/7 in an endless loop and the compressor assembly switches on and off to maintain glycol temperature (usually cut out at 28 °F/-2.2 °C, then cut in at 34 °F/1.1 °C or thereabouts). With four lines to chill for a distance of less than 25 feet (7.6 m), Joe can use a chiller with a capacity of around 1,000 BTUs. A useful formula for calculating BTU requirements is to multiply the number of faucets by 100, then multiply the foot length of the trunk line by 7 (up to 6 lines). Add both to determine BTU requirements. The chiller should be a bit oversized though. Multiply the BTU requirements by 1.4 to determine the appropriately sized chiller. Round up to the nearest size. If your line goes through a hot attic you'll want even more BTU. The chiller will also be used to keep the draft tower cold. Quality towers have an insulated shank assembly with chilling blocks built in, and that helps quite a bit.

Here are some things to consider with the chilling part of the system:

- Account for a receptacle near the chiller. Get some "glycol jumper line," a premade insulated length of line to get from your chiller to the trunk line, or make your own. Use ⅜-in. ID poly line. All of this refrigeration equipment makes some noise and generates heat too; choose your installation location carefully. But wait, there is more!
- The chiller will not bring down the beer temperature, but it will maintain the temperature from the cooler. The glycol chiller's thermostat should be set to maintain a bath temperature roughly between 27 and 33 °F (-3 and 0.5 °C). The chiller will hopefully be factory set. If not, you get to experience the joys of programming a commercial digital thermostat.
- Mix your 100% USP-grade propylene glycol to around 24 °Brix. That is roughly 2 parts water to 1 part glycol. Most chillers do not require distilled water, but check to be certain. 24 °Brix glycol will bring the freezing point well below the bath temperature. A refractometer is required for this measurement as hydrometers do not work so well with glycol (if you don't have a refractometer, now you have a reason to purchase one). The copper chilling coils operate at around 0 °F (-17.7 °C). If your mix is too lean you'll get a block of ice, but don't overdo it or you can jam up the pump. Glycol absorbs moisture and it needs to be checked every few months and replaced when the Brix starts to creep. Only use 100% USP-grade propylene glycol.
- Pure glycol has a shelf life of about one year. UV light (sunlight, for example) will quickly degrade the fluid. Buy only enough of this increasingly expensive fluid to get going.

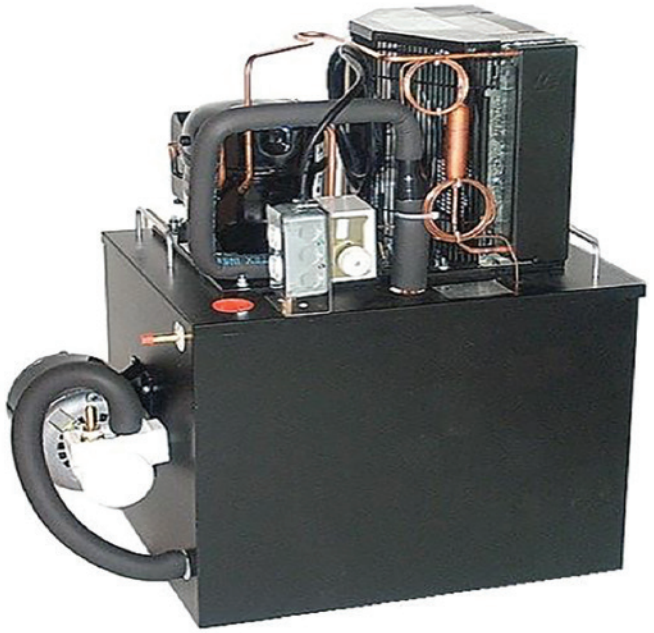
Right about now you may be thinking "I can design and build a homemade glycol chiller and keep it in the refrigerator." That's an idea, but a fridge will not get cold enough. Freezer? Unfortunately, residential freezers do not have the heat removal capacity. The air will get below freezing of course, but the constant heat loading in the freezer is too much for the

> **If the trunk line goes from the keg and into an attic before going back down to the shank, only measure the actual lift from keg to shank.**

unit to keep up with. In addition, air is a relatively poor conductor. A dedicated, purpose-built glycol chiller uses cold copper coils in direct contact with the glycol solution. If you're still not convinced, we can provide a few examples of clients who asked us to get their glycol systems sorted.

RESISTANCE

System resistance refers to the friction and gravity inherent to the system. It is a one-time design consideration we need to get right. First, determine how much trunk line you need. This is the length from the coupler to the shank. Trunk line is available in ¼-in., 5/16-in., and ⅜-in. ID sizes. ¼-in. barrier tubing provides 0.4 psi of resistance per foot (30 cm), 5/16-in. is 0.15 psi per foot (30 cm), while the larger ⅜-in. ID is only 0.06 psi per foot (30 cm). These are generalities because every manufacturer is ever so slightly different, but the differences are not so important within our limited trunk line distance. Ignore ⅜-in. discrepancies since they are really only useful in bigger systems like those found in stadiums. The other two sizes are similar. If your resistance calculation allows for it, ¼-in. is preferred as it contains less beer and is therefore easier to chill. It's also a bit less expensive. The glycol line in the trunk is universally ⅜-in., however, and you are going to need ⅜-in. splicers no matter what the ID of your beer line. Almost all beverage line in the trunk is made with barrier tubing. Remember that the trunk is permanent and there is a lot of beer in that line. Barrier tubing is a requirement. The glycol line will be less expensive poly tubing.



A glycol chiller is required if you want to set up a long-draw draft system.

Next determine the rise (lift) or fall of the beer. This is the vertical distance from the middle of the keg to the shank. We need to be accurate to within a foot or so. If the trunk line goes from the keg and into an attic before going back down to the shank, only measure the actual lift from keg to shank. Every foot of rise that has a corresponding foot of fall is cancelled (and vice versa). Our beer needs 0.45 psi pressure to overcome each foot (30 cm) of lift (or simply ½ psi per foot/30 cm). With the magic of blended gas we can overcome quite a bit of resistance and lift. What is much harder is dealing with gravity. Beer falling from a keg on the third floor to the basement bar is a complex design constraint because it is hard to compensate for the *lack* of gravity induced resistance. Our applied pressure is carbonating the beer but it is also pushing the beer. If we have a target 2.5 volumes of CO_2 we will need to apply about 11 psi to the keg. If our system incorporates a 25-ft. (7.6-m) drop, that's 11.25 psi of gravity removed restriction. 25 ft. (7.6 m) of ¼-in. tubing provides 10 psi of restriction. So we are already unbalanced. We will need to compensate with a lot of choker. It is usually much better to push kegs on the same level as the faucets or up a modest amount than it is to deal with beer drop. That and hauling kegs up and down stairs is not fun. If we flip the design and decide to push the beer up 25 ft. (7.6 m) we would be looking at 10 psi or 3.75 psi of resistance with ¼-in. and 5/16-in. respectively. With an applied 11 psi of pressure we can balance our system with a few feet of choker. Line diameter should progress from larger ID to smaller ID from keg to faucet. This is a hard rule. Introducing a smaller diameter tube along the circuit will cause foaming.

Your Sanke couplers should use ⅜-in. tubing. Cornelius keg quick disconnects (QDs) need a line ID that is at least as large as the trunk line. This line should be flexible too, not rigid barrier tubing. "PVC Jumper" is available in premade lengths for Sanke couplers.

Poly barrier tubing is difficult to work with in a cooler, from the coupler or QD to the trunk line. Use flexible tubing (https://BYO.com/article/choosing-tubes-and-hoses/). Tubing from the trunk line to the shank will be 3/16-in. choker. Flexible TPE is best used for choker because it is 3 psi per foot (30 cm) and it is barrier, but quality PVC is not a beer crime. You can inspect the PVC and replace it whenever you feel it is required.

After you peel off the insulation and install splicers, you need to rebuild the trunk. You need foam tubing, silver tape, foam tape, and refrigeration tape for all that. You'll need it to insulate the choker as well.

THE INSTALL

After you have determined the design restriction, bought your glycol chiller and glycol, trunk line with an extra few feet just in case, glycol jumper line, 3/16-in. choker along with all of the associated splicers and clamps, you are ready to

get a tower installed. There are literally dozens of design options. You do get what you pay for with draft towers. Economy towers tend to be flimsy affairs with mediocre insulation and questionable hardware. My advice is to find a reputable provider that will allow you to buy the tower without faucets so you can use your preferred faucet. Just be careful about compatibility issues; this equipment is supposed to be universal domestic thread, but it doesn't always happen. Specify the proper width drip tray as well.

We typically install the draft tower first, then work from the kegs up to the tower. The tower will likely come with 15 psi of restriction out of the box and you will trim that back as needed. If your design needs more than 15 psi of restriction you should take a second look. More than around 15 psi is difficult to get right when using 100% CO_2. Try going from ¼-in. to 5/16-in. line and recalculate. Ask your supplier how much restriction they have built into the tower and how much restriction each foot of choker provides. This is usually anywhere from 2.0 or 2.2 psi per foot (30 cm) of PVC to 3 psi per foot (30 cm) with TPE line. It is very important to know this accurately so you can complete your install precisely.

You have options when choosing your draft tower (sometimes called a font). Namely, look at purchasing a glycol insert. This is the guts of the tower and you can use it behind a wall, for example. You'll save a bit of money as well.

What to consider with a draft tower? Faucets are a lever and that tower will get pulled on . . . hard. Secure it on a suitable substrate such as ¾-in. (19 mm) plywood or something equally robust. Drywall or tile backer board are definitely not going to work. Plan to sufficiently reinforce the wall or countertop. Promise draft beer after the installation is complete and employ a buddy for assistance.

Tall faucet handles can lean back into the wall before being fully closed. There is a thing called a faucet straightener for this and they are cumbersome, but they do work. Or just use stubby handles.

European towers may be metric and therefore do not accept domestic faucets. Check first.

Ready to install this dream system? If the previous sections have not scared you off, and it shouldn't have, dive in. A long-draw system is quite a bit more complex than any draft system you may have experienced and the results are accordingly very satisfying. Take your time, read up (including links below), and check all the boxes. Draft beer in the shower is really a possibility. And if your significant other has different ideas . . . we have never met. BYO

ADDITIONAL RESOURCES:

https://byo.com/article/faucet-design-from-functional-to-fancy/
https://byo.com/article/design-a-homebrew-bar/
https://byo.com/article/choosing-tubes-and-hoses/
https://byo.com/project/diy-draft-trunk-lines-when-you-want-to-run-long-draft-lines/
https://byo.com/project/homemade-glycol-chiller/

BY RD HARLES

SIDE-BY-SIDE FERMENTATION UNIT

Converting an old fridge

DISCLAIMER: WE ARE WORKING WITH 115V. IF YOU ARE NOT COMFORTABLE WITH YOUR ABILITIES, CONSULT AN ELECTRICIAN.

Dialing in the temperature of the fermentation based on the chosen yeast can elevate your beer. Brewers may also want to raise temperature for a diacetyl rest or cold crash a particular style of beer and a fermentation chamber along with a temperature controller works great for this.

I decided to make the move from a brew bucket to a conical and needed a larger fermentation chamber to fit it. I looked at a ton of different refrigerators and freezers and the only style that would fit my conical was a side-by-side fridge. I needed an inside height of 44.5 in. (1.13 m) based on the tallest attachment on the conical's lid and a depth of about 20 in. (51 cm) for the attachments on the front.

I found a side-by-side refrigerator for only $100 (USD). The inside dimensions were 54-in. high x 32-in. wide x 26 in. deep (1.38-m x 0.81-m x 0.66-m) so this would give me plenty of room. I gutted just about everything out of it including the glass shelves, wire baskets, ice maker, water and ice dispenser on the door, and the interior dividing wall (so I could make it into one large chamber). The only things left intact were the wiring harness on the ceiling and the cooling unit in the back.

The refrigerator side of the unit alone was large enough to fit the conical, so I did consider leaving the freezer alone, but I decided I didn't need the extra freezer space. Also, keeping the interior wall would have forced me to make a venting system to push the cold freezer air over to the fridge side when there was a need for cooling. In addition, the extra room without the interior wall gives me plenty of room for a blow off vessel, the heater/fan unit, and the option to add another fermenter if I ever choose to do so.

There are many temperature controllers on the market to control your fermentation chamber, but I chose to go with the BrewPi controller. The BrewPi unit basically controls your fermentation chamber by using one temperature probe measuring the inside of the chamber and the other temperature probe inside a thermowell on your fermenter to measure the wort temperature.

Based on the temperature of the wort and the temperature you need your wort to be, the controller will either turn on the compressor to cool the wort or turn on your heater to warm the wort. For example, my yeast may have an optimal range of 68–72 °F (20–22 °C). I will set a 10-day profile on my controller to start the wort at 68 °F (20 °C) and then raise the temperature of the wort over a 10-day period to 72 °F (22 °C). When fermentation is complete, I'll soft-crash the beer to 50 °F (10 °C) for dry hopping, then finally lower the wort to 38 °F (3 °C) to help drop the hops and yeast out of suspension and prepare for a closed transfer from the conical to a keg.

I decided to make the move from a brew bucket to a conical and needed a larger fermentation chamber to fit it.

Photos by RD Harles

Tools and Materials

- Side-by-side refrigerator (cooling)
- Porcelain light socket (heating)
- 150-W reptile bulb (heating)
- Computer fan (heating)
- BrewPi temperature controller
- 2x4 board (floor)
- Composite decking (floor)
- 2x2 board (viewing window)
- (2) 5-in. x 7-in. (13-cm x 18-cm) glass (viewing window)
- (2) Solid state relays
- Oscillating multi-tool
- Duct tape
- Silicone caulk

STEP BY STEP

1. EVERYTHING MUST GO

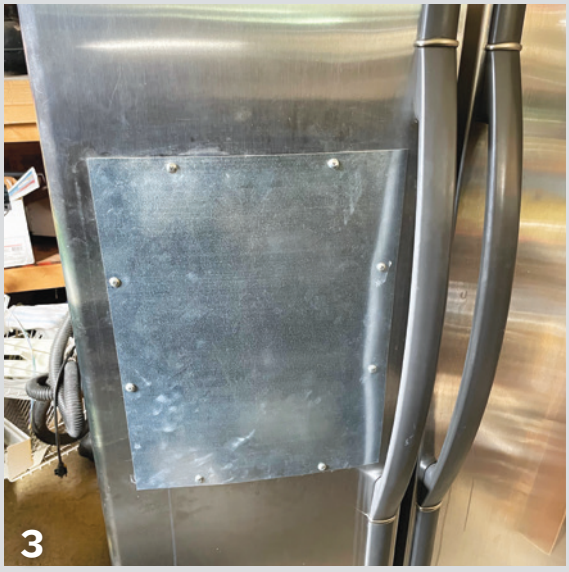
I removed just about everything from the interior of the side-by-side refrigerator including the glass shelves, wire baskets, ice maker, and all parts involving the water/ice dispenser on the freezer door. I then gave all the surfaces a good cleaning with bleach.

2. REMOVE THE INTERIOR WALL

I removed the interior wall separating the freezer from the fridge. I use an oscillating multi-tool to initially cut the plastic wall on both sides and then removed the plastic. Then I used the blade from a hacksaw to cut the insulation out that remained. I made sure to leave a couple inches in the front center so that the doors have something to close against. Finally, I used some duct tape to seal up the exposed insulation where the wall once was.

3. REMOVE THE WATER AND ICE DISPENSER FROM THE FREEZER DOOR

I probably didn't have to remove all of it but the whole area was dirty and unsightly so I ripped it all out. This was probably the most difficult part of the project. All the parts (plastic ice chute, water tubes, and wiring) inside the door were sealed in with foam insulation and had to be cut out. Once everything was removed, I sealed it up with a piece of sheet metal and used a can of foam spray seal in the hole to fill the void.



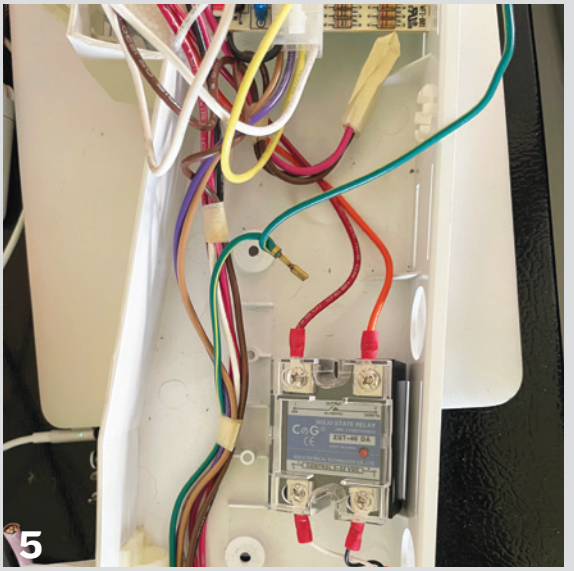
4. ADD A FLOOR

The refrigerator floor had a big hump in the back (which is where the compressor and other parts occupy) and the rest of the fridge floor was very uneven, so I built a new floor level with the top of the hump for everything to sit on. It's simply built using a 2x4 frame spray painted black and some old composite decking boards across the top that I had in the basement.


4

5. ELECTRICAL WIRING

To control the cooling side, I located and removed the fridge thermostat so the BrewPi controller can take over. I then cut and attached the two wires to a solid-state relay (SSR) that attaches to the BrewPi controller. In the picture on the right, you can see the red and orange wires that connected to the original thermostat. The white and black wires feed to the BrewPi controller, which will switch the power on when needed. The heating side works the same way — wires connect to the porcelain light socket, which is wired to an SSR, then back to the BrewPi controller.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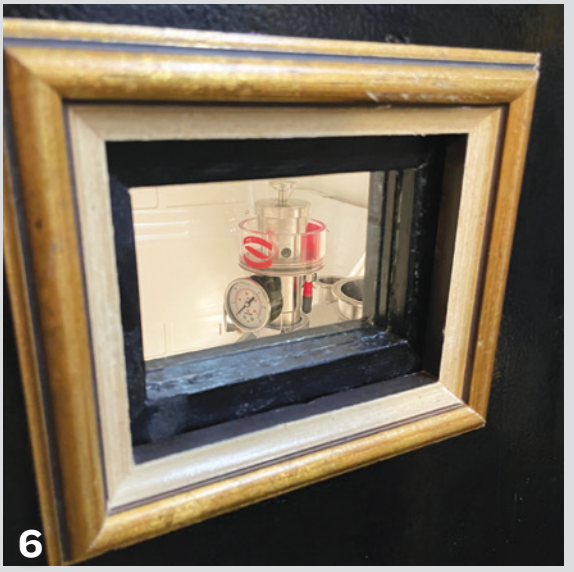
6. VIEWING WINDOW

Probably the least important yet my favorite feature is the double-pane viewing window. I didn't want to open the doors every time I wanted to see how the fermentation is progressing or to check the psi gauge, so I added a window to the side of the unit. I found two old 5-in. x 7-in. (13-cm x 18-cm) picture frames in the basement and took the glass from both of them. Then I made a frame from scrap 2x2 board and cut two ¼-in. (6-mm) grooves in each board and painted it. I slid the glass into the grooves, then glued and screwed them together, finally adding silicone caulk around all edges to create a seal. Next, I cut the hole in the side of the fridge and used silicone to seal the window in. I also tapped into the light wiring in the fridge door and added a light switch on the outside. BYO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BrewYour Own THE HOW-TO HOMEBREW BEER MAGAZINE 2022 STORY INDEX

Brew Your Own — 2022 Recipe Index

Photo by Charles A. Parker/Images Plus

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BY JAMIL ZAINASHEFF

YOU CAN GO HOMEBREW AGAIN

Leaving commercial brewing behind

Pretty much everyone who has brewed more than one batch of beer at home has thought about working as a professional brewer or opening their own brewery. I chose to do the latter, opening Heretic Brewing Company in Pittsburg, California with my wife in early 2011.

Over the past decade I have had many homebrewers tell me their dream of starting a brewery or ask me for advice on how to get a job in the brewing industry. They loved brewing at home so much they wanted to make it a lifetime career.

In the beginning, I was honest with them and told them they should reconsider. Owning a brewery, or any business for that matter, is a lot of hard work. It can be rewarding on some levels, but it can be brutally hard, challenging work. I've seen too many people fail and too few truly succeed.

What I don't like about the beer business is that it is a business. Those days when I could wake up and decide to brew something fun and new were gone. I didn't have any days off and I had to consider things like production schedules, distribution channels, and taproom sales. Sure, I still created new beers, but then I had to take care of federal and state label approvals, price posting and label production, and so much more. If there wasn't great branding to go with the beer, then it didn't matter how great it tasted; it wouldn't be commercially viable. One of my favorite styles of beer is British cask ale, but regardless of what us beer geeks claim, very few customers want lower ABV beers and we could rarely brew them.

Eventually, advancing age, health issues, and the stress of the pandemic made my wife and I come to the hard decision to sell the brewery we had worked at every day for the last decade. It was a tough decision. Many of the nearly 50 employees were like family to us. We loved seeing them and being around them. They helped us build a brewery from nothing to a substantial, internationally distributed brand. It hurt a lot not to be part of that anymore.

What selling the brewery did afford me was time to work on other things. Time to clean out the garage. Time to fix that sticky door. Time to have lunch with friends.

I was at lunch with my friend Chris Graham of MoreBeer!, when he asked if I had time to homebrew again. I had thought about it, but I didn't have any of my homebrew stuff left. Chris set me up on the spot with a Brewzilla system and some ingredients to brew a classic English bitter.

At first it seemed slightly foreign to me to be brewing 5 gallons (19 L) of beer again. The equipment was different from anything I used in the past, but once I got started, it was like riding a bike. I fell into a familiar rhythm. I instinctually knew the timing, the additions, the adjustments, etc. After a decade of running a commercial brewery, it was so incredibly easy to make a small batch of delicious beer. I put that batch in a cask and served it on a beer engine, much to the joy of my friends. It was by far the best English bitter I had ever brewed and I didn't need to worry about how much to sell it for or how to convince distributors that they should take some. It was clear that the homebrewer in me never left. It was just beat down a bit by the weight of owning a brewery.

While just about everyone that has brewed more than one batch of homebrew dreams of opening their own brewery, just about every brewery owner dreams of just being able to brew with the freedoms and joy of homebrewing. BYO

It was clear that the homebrewer in me never left. It was just beat down a bit by the weight of owning a brewery.

Photo courtesy of Jamil Zainasheff

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