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Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

NOVEMBER 2020, VOL.26, NO.7

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THE OBVIOUS CHOICE FOR BEVERAGE FERMENTATION

Fermentis by Lesaffre

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NOVEMBER 2020, VOL.26 NO.7

BYO 25 YEARS

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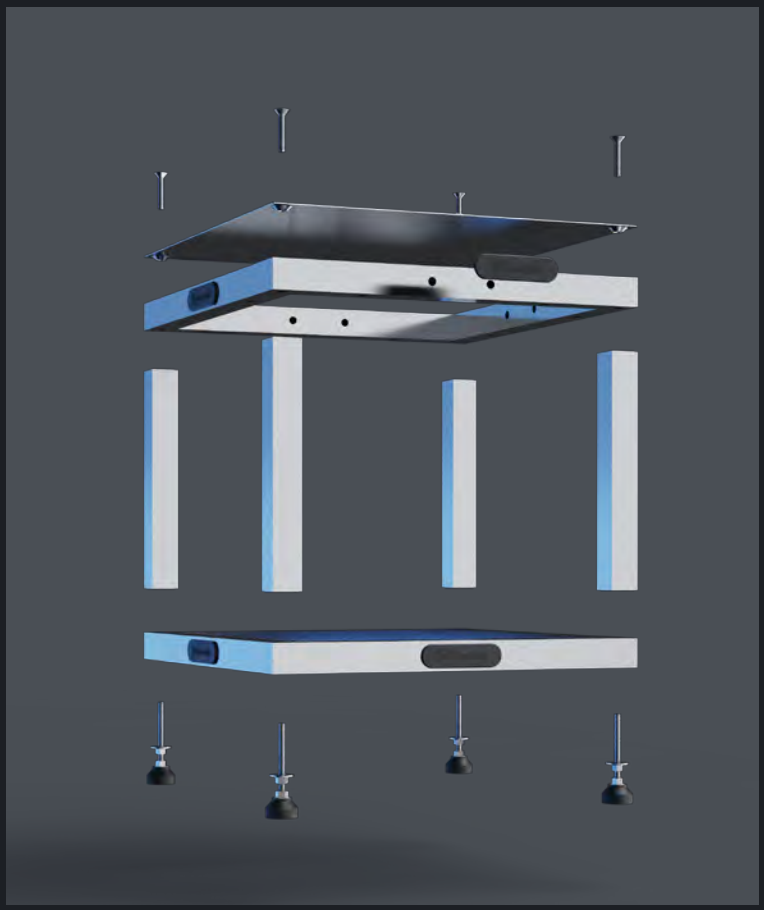

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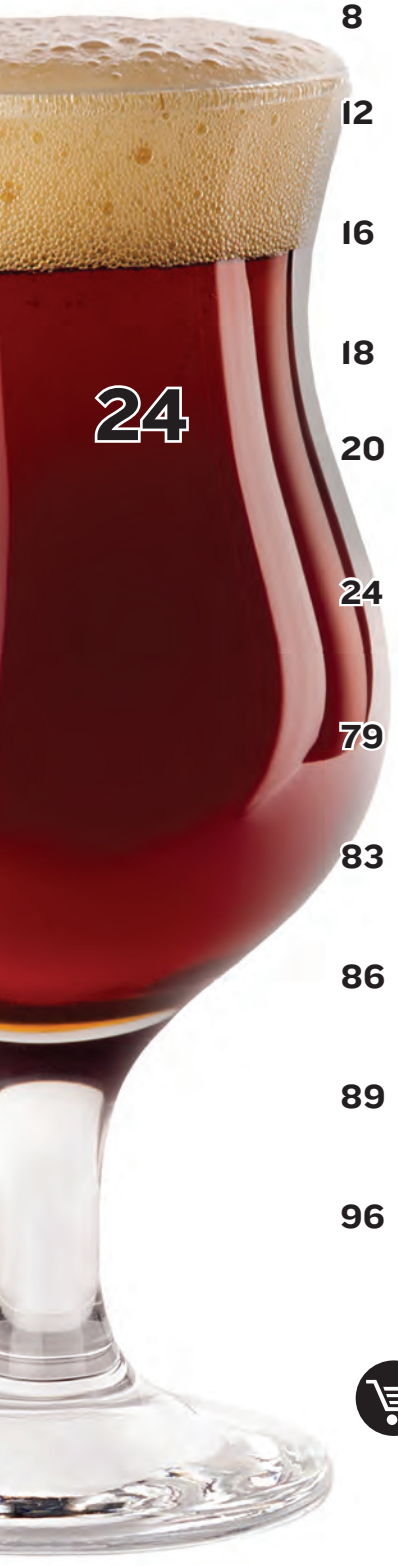

departments

where to find it

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

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

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

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

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Cover Photo Illustration:
Charles A. Parker/Images Plus

Q Are there any new hop varieties that you are really excited for?

I'm intrigued with the profile of Barbe Rouge. The red berry flavors/aromas would be excellent in a wide range of styles for summer thirst quenchers.

My brewing philosophy is to stick to the classics. Chinook is a newcomer in my world. There are so many great classics that I don't often feel the need to go in search of the latest release. But I appreciate the researchers and growers who put a tremendous effort into each new variety. I enjoy occasionally picking up anything I have not heard of at my local brew shop. I will sometimes make a single-malt, single-hop beer with US-05 just to see what the hop can do. Nine times out of ten I like my newly discovered beer. My hop schedule is going to be fairly pedestrian for these brews. Maybe an early and a late addition. Bittering is going to be alpha acid (AA)% dependent. So a high AA variety will be used for a high IBU beer or if the AA is on the low side I'll look to see what hidden talent the hop may have. I think many brewers eventually realize that more is less, and vice versa. If I brew it well, I'll have a fine beer to explore. And then I'll go back to conquering Tettnang or Fuggle or some other classic. Maybe I need to brew more often!

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Catharina Sour

Brazil is a paradise of tropical fruit, many of which aren't exported since they are too fragile. Catharina sour is a fruit-forward beer, and Brazilians stress that tropical fruit isn't required, but fresh fruit is. Gordon Strong breaks this style down. https://byo.com/article/catharina-sour-brazilian-kettle-soured-fruit-beer/

MEMBERS ONLY

Brewing With PID Controllers

PID controllers are a popular way to add automated control to RIMS or HERMS breweries, fermentation temperature control, or kegerators. Discover the art and science of controlling PID controllers. https://byo.com/article/brewing-on-autopilot-with-pid-controllers/

Tips For Brewing A Doppelbock

Doppel is German for double and, although these beers aren't double the strength of a normal bock, their specific gravity is usually above 1.070. Homebrewers who want to take a shot at this classic style need to start brewing now to enjoy this winter. https://byo.com/article/brewing-doppelbock-tips-from-the-pros/

MEMBERS ONLY

Mead Clone Recipes

If you are on the search for some recipes to inspire a mead fermentation we present three great clone recipes from Redstone, Rabbit's Foot, and Wild Blossom meaderies. https://byo.com/article/mead-clones/

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MAIL

FINE TUNING WATER CHEMISTRY

I found the article "Adjusting Flavor Using Brewing Salts" in the September 2020 issue to be very useful and timely. I added one small grain of granular of calcium chloride to a 320-mL snifter of my freshly brewed, force-carbonated Northwest IPA and it transformed the beer from good to excellent. I was so impressed that I added 26 grains (about 0.5 grams) to my keg to dose my remaining beer. According to my calculations, story author Stephen Stanley was dosing his experimental beers with about three times more salt. I mention this because he doesn't advise adding salt to carbonated beer for fear of a gusher. However, there is no reason not to try this technique on finished beer because the amount that can be added to transform the beer is insignificant in terms of the volume of CO_2 coming out of solution. I don't think anyone needs to wait to brew their next batch to employ this technique, and you can get good results with just ⅓ of the salt that he used as a baseline dose.

Also, there's just a little error I found in this story. It states, "One part per million (ppm) is roughly equivalent to one mL per liter." That should be one ppm is equivalent to one milligram per liter.

Dan Hewett • *via email*

Story author Stephen Stanley responds: "First, thanks for correcting my typo. You are correct, it should be milligrams (mg) per liter and I apologize for the error. As to the amount of salt required to generate a perceivable effect, I'd point out that how much to add depends on individual taste, as well as the chloride level already in the beer. When presented with the argument against adding salts directly to beer, I went downstairs, poured a sample of saison and added some calcium chloride grains. The result was not a gusher but there was some foaming. Still, given the problem of ensuring that all of the salt addition gets dissolved into the beer, particularly the less soluble ones such as gypsum and baking soda, using solutions means less stirring and carbonation loss. And thanks, Dan, for helping me learn something.

P.S. The chloride addition did not perceptibly improve the saison, at least not under my admittedly unscientific test conditions."

contributors

Since 2017, **Ben Martin** has been the Head Brewer at Mad Cat Brewery in Faversham, England, located amongst the famous hop farms of East Kent. In his professional life, Ben specializes in British cask ales, whilst also drawing inspiration from Belgian and international beer styles, and has won awards for both his cask-conditioned dark saison "Catro" and wet-hopped pale ale "Oatrageous." Ben remains a passionate homebrewer, choosing to create eclectic and unconventional beers in his own time, often incorporating foraged and home-grown ingredients. He has also mentored other homebrewers in his local area and run homebrewing classes at Mad Cat Brewery. His first professionally brewed beer — a ruby rye ale — was named "Emotional Blackmail" after his cat, who is called Moe for short.

Ben makes his *BYO* debut beginning on page 42 discussing ingredients often found in the kitchen pantry that can be substituted for more traditional brewing ingredients in a pinch.

Gordon Strong is the President and highest ranking judge of the Beer Judge Certification Program (BJCP), the organization that certifies beer judges for homebrew competitions and also registers qualifying homebrew competitions. In addition to his Grand Master Level V judge status, Gordon is a three-time winner of the National Homebrew Competition Ninkasi Award and the author of homebrewing books *Brewing Better Beer* and *Modern Homebrew Recipes*. He has been *BYO's* "Style Profile" columnist since 2015 and is a frequent feature story author.

One of the locations Gordon often travels to judge competition beers is Brazil, and through those visits he's grown very fond of the country's beer culture, which he explores in this issue starting on page 50.

Jason Phelps started homebrewing more than 15 years ago, and like many hobbies it became a life-changing experience. After first learning to make beer, Jason branched out into cider, wine, and ultimately mead. Along the journey Jason has received more than 120 competition medals for a wide range of fermentations. As an author of articles in both *Brew Your Own* and *Wine-Maker* magazines, Jason loves to share his experiences and knowledge with other beverage makers. After retiring from a 25-year career in IT, Jason and his wife, Margot, opened Ancient Fire Mead & Cider in Manchester, New Hampshire, in 2017.

Beginning on page 66, Jason shares tips, techniques, and recipes for making fruit meads.

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MAIL

THE *BIG BOOK OF CLONES*

Hi *Brew Your Own* team. I hope you're keeping safe and well. I purchased the *Brew Your Own Big Book of Clone Recipes* a few months back (great book, by the way) and I have a query about the Brooklyn Lager recipe on page 200.

The Hallertau Mittelfrüh and Saphir hops are added for the last two minutes of the boil, but unlike the other hops added to the boil, there isn't any mention of AAU or alpha acid percents. I've checked your recipes on byo.com and noticed the online recipe doesn't mention or recommend it either.

Are you able to provide a suggestion or a recommendation? I'm new to all-grain brewing. I appreciate any help or guidance you can provide.

Rich Ward • *Lichfield, Staffordshire, England*

Thanks for the positive feedback on our Big Book of Clone Recipes! *There are a lot of tremendous clone recipes in there, and you picked a classic! To address your question, the reason that the alpha acid units are not listed in this particular instance is similar to the reason we do not list them for dry hops. Hops added near the end of the boil (when a whirlpool stage is not employed) have negligible bittering effect from alpha acids on the final beer. These late additions are mainly to extract the hop's essential oils and their associated flavor and aroma contributions. So having Saphir at 2.5% vs. 4% alpha acids won't change the recipe. Best of luck brewing Brooklyn Lager!*

PRESSURE RELIEF VALVE QUESTION

I have a question regarding the Hop Dropper "Reader Project" on page 13 of the September 2020 issue (online at https://byo.com/article/the-hop-dropper/). The project allows you to flush your dry hops with CO_2 before they drop into the unitank to help avoid oxidizing the beer). It says: "Now slightly open the PRV (pressure relief valve) so that the air in the airlock can escape upwards. Flush for about 1 minute like this."

I have an Ss Brewtech Unitank myself and I am not really sure how to slightly open up the PRV. Can you please detail the process?

Phillipe Birster • *Montreal, Quebec*

Paul Schüssler, who created the Hop Dropper, responds: "You can easily turn the PRV up a little at the top (the upper part can be turned). As soon as you hear it hiss, the air escapes from the dropper."

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.

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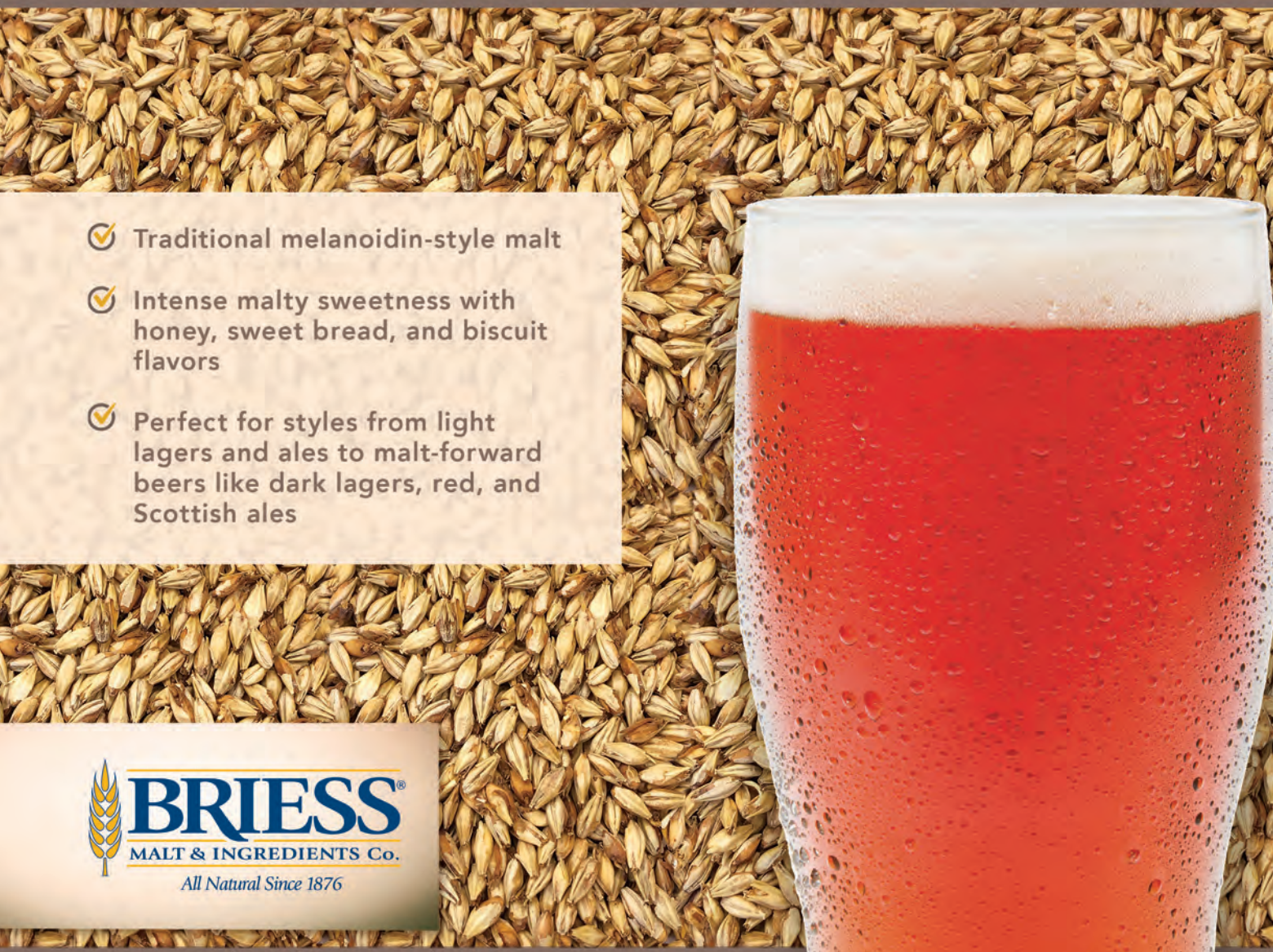

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BEGINNER'S BLOCK

BY DAVE GREEN

BIG BEERS, DONE RIGHT

It's not too late to brew that big beer for winter; the barleywine, imperial stout, doppelbock, or Belgian quad you've dreamed of. If you play your cards right, you should have plenty of time to get one or more out for the season. Many brewers consider these some of the harder styles to brew, but they don't need to be. So let's run through some basics of brewing big beers to get a beer you're proud to sip all winter long.

YEAST MANAGEMENT

I'll just jump right into the heart of the matter of making imperial-style or high-ABV beers: Happy yeast make good beer. Stressed yeast often throw off-flavors and/or have difficulty finishing fermenting. A recommendation I have for all brewers that don't have a lot of experience in brewing big beers is to use dry yeast strains. They are easy to use, easy to pitch a proper amount, and you don't need to aerate the wort (but you should still use a yeast nutrient). SafAle's US-05, S-04, and BE-256 from Fermentis, LalBrew's Nottingham, New England, and Abbaye from Lallemand, and Mangrove Jack's M42, M44, and M41 are all good candidates due to their strong attenuation and alcohol tolerance. Pitching 2–3 sachets per 5 gallons (19 L) should be more than enough to finish a beer to the upper end of the strain's alcohol tolerance level, oftentimes even higher.

If a liquid strain is preferred, there are several techniques you can employ to build enough yeast to properly ferment high-gravity wort. In my experience, the path of least resistance is to brew a smaller beer (lower-alcohol beer) a week or so prior to your big-beer brew day and repitching the yeast cake (tan sediment at the bottom of the fermenter) into the high-gravity wort. Then you don't need to deal with oversized starters and the hassles they can entail. There are a lot of calculations that can go into repitching yeast from a yeast cake, but to keep things simple, pitch roughly a pint (500 mL) of the solid material found at the bottom of the fermenter per 5 gallons (19 L) of high-gravity wort. This should provide plenty of healthy, vigorous yeast that are ready for action. But make sure to add some yeast nutrients to the high-gravity wort near the end of the boil and you'll need to aerate the wort in some fashion. A shot of pure oxygen or a period of filtered air through a carbonation stone is highly recommended to give the yeast a leg up in this stressful, high-sugar environment.

ALL-GRAINERS SHOULD CONSIDER MALT EXTRACT

All-grain brewers can be a stubborn bunch. Malt extract is too often viewed as an inferior product or one that they feel below their skill level. That's all well and good if you want to be a purist in your brewing ways, but when it comes to brewing really big beers, malt extract and simple sugars should be your best friend. My general rule of thumb is to create wort from malt up to about 1.080 (and even then I'm sometimes disappointed by low efficiency), then it's supplement time. I've talked to several elite brewers in the craft beer world about their big imperial stout and have been surprised how many use dried malt extract to gain those extra points above your typical mid-ABV beer and they (and their customers) are 100% happy with the results.

There is another technique known as parti-gyle brewing, which is one I will employ to produce high-gravity wort as well, but that is a rabbit hole I can't jump down in this article. Digital members can learn more about this historic brewing technique at: https://byo.com/article/introduction-to-parti-gyle-brewing/

FERMENTATION THOUGHTS

Some temperature control during fermentation is highly recommended. These fermentations can get vigorous if left unchecked, with the potential for temperatures to get dangerously high during a critical period in the beer's fermentation cycle. Your goal is to try to maintain the fermenter temperature within the yeast strain's suggested range. More specifically though, a cooler start to fermentation and warmer end of fermentation is the best way to ensure that the yeast don't throw unwanted flavors at the beginning of this critical phase or fall out of solution too soon to finish the fermentation.

AGING AND PACKAGING CONSIDERATIONS

Once fermentation is complete there may be several more considerations for your big beer. Many imperial stouts these days feature additions like vanilla beans, cocoa nibs, coffee, or Bourbon-soaked oak that may require extending aging times. Even without those added ingredients, some extra conditioning time is recommended for these big beers. Make sure to rack the beer to a secondary vessel for conditioning if your beer was fermented in a plastic pail, or to get the beer off the yeast, or if you need to free up your primary fermenter. Fermenters with a yeast dump port won't necessarily need a racking. While there may be some benefits to age a beer like this for long periods of time, you may find that you're happy with the results not too long after fermentation is complete if you've treated the yeast with care. If you do decide to age for a longer period of time or if the beer is a very high-alcohol beer, I definitely recommend pitching a bottle-conditioning strain of yeast (a high-alcohol tolerant strain) if you are not force carbonating.

HOMEBREW DROOL SETUP

DOUG PATTERSON • PATASKALA, OHIO

This is the third homebrewery I have constructed. Like many, I started out with 5-gallon (19-L) plastic buckets and have progressed from there. As a union pipefitter by trade, I was able to design, fabricate, and install all of the piping, support steel, electrical, lighting, controls, and specialties myself.

My 385 sq. ft. (36 m^2) brewery consists of a completely gravity-fed system that yields ½ BBL per batch. My brew day starts with filling the 30-gallon (114-L) hot liquor tank with water produced from the Durastill distiller. Once dosed with water additions to match the desired profile, it is heated using a Blichmann 220V BoilCoil™ and controller. Strike water is underlet into the mash tun, a 30-gallon (114-L) insulated hot water jacketed RenoTech vessel with false bottom and agitation paddle. A wall-hung 5,500 BTU Navien hot water boiler recirculates heating water. Most any step mashing profile is easily accomplished. Wort is drained into the Blodgett gas-fired steam kettle.

Post-boil wort is drained to a transfer kettle, which is hoisted vertically to encapsulate the twin immersion coils. The wort is first cooled using our 52 °F (11 °C) ground water in the outer coil. Tempered exchange water is reused for initial equipment cleaning. When wort temperature falls to 100 °F (38 °C), chilled glycol is recirculated through the inner coil bringing the wort to final pitching temperature. The cooled wort is transferred into a 17-gallon (64-L) conical fermenter where the prepared yeast starter is pitched followed by pure O_2 via diffusion stone.

The filled conical is wheeled into the 1st stage walk-in cooler. After primary fermentation the 1st stage is either reduced in temperature via modulating dampers or the conical is wheeled into the 2nd stage lager box for a second fermentation, lagering, or aging. Finished carbonated kegs are stored in the 2nd stage lager box, which is a constant 32 °F (0 °C).

My wife jokes, "If we sell this house, we're listing it in *BYO*."

Digital members can see more at: http://www.byo.com/articles/drool-page

Photos by Doug Patterson

WHAT'S NEW

TALUS™ HOP

The Hop Breeding Company (HBC), a joint venture between Yakima Chief Ranches LLC and John I. Haas Inc., announced the release of the new proprietary hop Talus™, formerly HBC 692. With aromas of pink grapefruit, citrus rinds, dried roses, pine resin, tropical fruits, and sage, it lends itself to many beer styles, particularly hop-forward beers. It's the daughter of Sabro® and a local Pacific Northwest open pollination with the goal of deriving new flavors and aromas not traditionally available in hops. To learn more about this new varietal, check out https://www.johnihaas.com/talus/

THE BLICHMANN GRAIN MILL

Designed for nanobrewers, the Blichmann Grain Mill is compact and built for durability. The grain hopper can hold up to 60 lbs. (27 kg) of grain and the mill's throughput can crush 12 lbs./minute (5.4 kg/minute), faster than any grain mill in its class. The gear-driven hardened steel rollers with micro flutes eliminate grain shear, which reduces shredding of the hulls helping to reduce polyphenolic extraction from the husk. The rollers are 3 in. x 6 in. (7.6 cm x 15 cm) and the mill's gap can be adjusted without the need for tools. The Blichmann Grain Mill starts at $995. To learn more, visit https://www.blichmannengineering.com/pro-brewing

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Just like with meadmaking, yeast nutrients are a must if you plan to ferment your own hard seltzer. Enter Omega Yeast's newly developed Propper Seltzer™ nutrients, nourishing your favorite beer yeast through a healthy sugar-based fermentation in as little as seven days. This is an all-in-one addition of yeast supplements. Want seltzer even faster? Ferment in four days with Omega Yeast's Lutra™ kveik. To learn more about this new product being released this fall, visit www.propperseltzer.com

YEAST PROPAGATION DYNAMICS

Two quality control scientists from Sierra Nevada Brewing Co. put out a paper this past summer that addressed the environment brewers grow their yeast for propagation purposes. What they did was look at the ratio of carbon to nitrogen (C:N) to find out if brewer's yeasts (Crabtree-positive organisms — yeast will ferment in the presence of oxygen) prefer a lower or higher ratio. They did grow the yeast in very low-sugar environments (2 °P/1.008 starting gravity) and mixed from low C:N ratio (100) up to high C:N (850). What they found was an increase of 46% in cell production and 27% reduction in fermentation efficiency (more respiration) in the yeast grown in the low C:N environment. This may change the way we look at growing yeast for our starters or for storage. You can purchase the study here: https://doi.org/10.1002/jib.621

Upcoming Events

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Learn from craft brewing industry experts with live online sessions covering Sales & Marketing, Brewery Operations, Business Operations, and Start-Ups. Join Nano breweries (and Nanos in-planning) online for two days packed with over 30 seminars, workshops, and Q&A panels geared just for you – the small-scale commercial brewery, or brewery in-planning, working on smaller systems. Get your questions answered live by speakers, meet and learn from fellow attendees, and talk with vendors specializing in the small-scale Nano brewing niche. NanoCon Online will be a wonderful and safe opportunity that will benefit your small-scale brewing and business knowledge during very challenging times. http://nanocon.beer

22ND ANNUAL LEARN TO HOMEBREW DAY NOV. 7. 2020

LEARN TO HOMEBREW DAY

November 7

On the first Saturday in November, thousands of people will gather at Learn to Homebrew Day sites worldwide to brew beer and learn about the hobby of homebrewing. In 1999, Learn To Homebrew Day was established by the American Homebrewers Association (AHA) to promote the most rewarding and delicious activity of all time — homebrewing. Grab some friends, pull together a recipe, and show them the beauty of homebrewing . . . and you can remain socially distanced. https://www.homebrewersassociation.org/aha-events/learn-to-homebrew-day/

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REPLICATOR

BY MICHAEL BURY

DEAR REPLICATOR,

Is there any chance you can get a clone recipe from Brown's Brewing in New York? I especially love their Cherry Razz ale and miss it since I have moved away. The other aspect was the setting of their brewery . . . having a pint or two at their Walloomsac taproom was one of the most peaceful places I've been to. Thank you in advance.

Jeff Damico
Milford, New Hampshire

Thanks, Jeff, for this request. I hope that this article and the accompanying recipe will illuminate your quest for brewing something close to the real deal. The beer itself has morphed over the course of time so I hope that this article's recipe is more reminiscent of your experiences. Just a side note, true to the community-like character of Brown's, my interactions with them were of a friendly conversation and more akin to a fun back-and-forth between friends just chatting about beer and the development of their brewery. I mainly spoke with Sarah Hoffman, Brown's Brewing Company's Brand and Marketing Manager who graciously helped fill in several of the details surrounding the brewery's history and their taprooms.

Brown's Brewing Company has been independent and "fiercely defending happier hours since 1993" when Garry and Kelly Brown spent three years renovating a forgotten warehouse on a then-blighted River Street in Troy, New York. Their goal was simply to create an aesthetically pleasing place for employees to brew and customers to enjoy a beer. This commitment to hard work with an eye towards their patron's experience helped build a highly regarded brewery and taproom that subsequently helped spur a resurgence in the city of Troy, an old industrial town that had fallen on hard times. It is a city that is home to Rensselaer Polytechnic Institute (RPI), the first college in the U.S. dedicated to engineering and the first to offer a degree in civil engineering for college students.

Several decades of sustainable growth eventually meant Brown's needed more space. They were able to acquire a 175-year-old factory space located in North Hoosick, New York, another old industrial town located close to the Vermont border. After an incredible amount of renovation, while staying true to the industrial history of the factory, the Walloomsac Brewery and Taproom opened in 2013 providing the opportunity for Brown's beer to be brewed and packaged along with a beautiful space located on a scenic spot on the Walloomsac River. With two separate brew houses, a state-of-the-art canning facility, and two award-winning restaurants, Brown's Brewing Company has created a loyal following throughout the region.

The Walloomsac brewery is currently Brown's production site. It's outfitted with five open fermenters, which are typically favored for producing a more colorful, ester-forward fermentation, in particular English beers as well as weissbier. Each fermenter isn't your run-of-mill size though, but rather an impressive 100-BBL capacity. In addition, the brewery features two 70-BBL cylindroconical fermenters, two dish bottom 70-BBL fermenters that pull double duty as conditioners, and another five horizontal 70-BBL conditioning tanks. With two 120-BBL brite tanks, the facilities combined boast an impressive total capacity of 870 BBLs of beer with an annual production of 4,000 BBLs.

With such a brewing capacity, Brown's is uniquely positioned to be both a destination brewery as well as a local watering hole. Both locations are situated on the banks of rivers and are a draw for not only craft beer enthusiasts but also folks in search for a beautiful setting for a beer or a spot to dine. Additionally, both taprooms feature modern amenities while still showcasing much of the original industrial infrastructure of each building.

As for Brown's commitment to their local community, one doesn't have to look far to see what organizations they help support. Annually, the Troy location hosts the Firehouse Chili Cook-Off with all proceeds benefiting The Burn Center and the New York State Firemen's Home. They regularly support Dinners with Love (a program through which they donate meals to hospice patients and their families), Troy Boys & Girls Clubs, and Habitat for Humanity, just to name a few community fundraisers.

One brewing aspect that they're proud of is their barrel-aged sour series. Sarah says, "It pulls from a diverse stock, conditioned largely in French oak, for up to two years. Each beer is a unique blend, and a snapshot in time of barrels that happen to be both at their peak at that time, as well as working symbiotically. From there we choose additions (fruit, spices, etc.) to complement or augment the flavors already inherent in that particular blend. Once packaged, blends are refermented in the bottle to allow for better shelf stability. Many of these can develop in the bottle for months or even years, while others are best consumed fresh."

For brewing Cherry Razz, Brewer Duncan MacCrea has several suggestions that can be found in "Tips for Success" on the opposite recipe page. I'd pay close attention to them. One consideration is that a British ale yeast was recommended to increase ester production, hence the recommended strains. If you have a favorite British ale strain, feel free to substitute it here. You could also experiment with an open fermentation (keep the lid loose) to see if that aids in creating additional esters. Best of luck in recreating this, Jeff!

BROWN'S BREWING CO.'S CHERRY RAZZ CLONE

(5 gallons/19 L, all-grain)
OG = 1.064 FG = 1.014
IBU = 15 SRM = 12 ABV = 6.6%

INGREDIENTS

9 lbs. (4.08 kg) Pilsner malt
1.75 lbs. (0.79 kg) wheat malt
1.5 lbs. (0.68 kg) crystal malt (20 °L)
12 oz. (0.34 kg) crystal malt (60 °L)
4 oz. (113 g) crystal malt (80 °L)
1 lb. (0.45 kg) frozen raspberries
0.6 lb. (0.27 kg) frozen tart cherries
4 AAU Summit™ hops (60 min.)
(0.25 oz./7 g at 16% alpha acids)
Wyeast 1318 (London Ale III), or
White Labs WLP066 (London Fog),
or LalBrew Verdant IPA
¾ cup corn sugar (if priming)

STEP BY STEP

Mill the grains, then mix with 4.2 gallons (15.7 L) of 169 °F (76 °C) strike water to achieve a single infusion rest temperature of 154 °F (68 °C). Hold at this temperature for 60 minutes. Vorlauf until your runnings are clear before directing them to your boil kettle. Batch or fly sparge the mash to obtain 6.5 gallons (24.6 L) of wort.

Boil for 60 minutes, adding the Summit™ hops at the beginning of the boil. At 10 minutes left in boil, add a kettle fining agent such as Irish moss or a Whirlfloc tablet and a yeast nutrient of your choice.

After the boil, rapidly chill the wort to slightly below fermentation temperature, which is 66 °F (19 °C) for this beer. Aerate the wort (if using a liquid strain) then pitch the yeast.

Maintain a steady temperature for the duration of active fermentation. Once primary fermentation is done, rack into a secondary fermenter containing the raspberries and cherries. If you have access to carbonation, try to purge the receiving vessel. Allow for complete fermentation of the fruit, which can take up to two weeks.

Bottle or keg the beer and carbonate to approximately 2.5 volumes.

BROWN'S BREWING CO.'S CHERRY RAZZ CLONE

(5 gallons/19 L, extract with grains)
OG = 1.064 FG = 1.014
IBU = 15 SRM = 12 ABV = 6.6%

INGREDIENTS

5 lbs. (2.27 kg) Pilsen dried malt extract
1 lb. (0.45 kg) wheat dried malt extract
1.25 lbs. (0.68 kg) crystal malt (20 °L)
12 oz. (0.34 kg) crystal malt (60 °L)
4 oz. (113 g) crystal malt (80 °L)
1 lb. (0.45 kg) frozen raspberries
0.6 lb. (0.27 kg) frozen tart cherries
4 AAU Summit™ hops (60 min.)
(0.25 oz./7 g at 16% alpha acids)
Wyeast 1318 (London Ale III), or
White Labs WLP066 (London Fog),
or LalBrew Verdant IPA
¾ cup corn sugar (if priming)

STEP BY STEP

Bring 6.5 gallons (25 L) of water to roughly 150 °F (66 °C). Steep the crystal malts for 15–30 minutes before removing. Add both malt extracts, with stirring, until fully dissolved. Turn on heat and bring wort to a boil. Boil for 60 minutes, adding the Summit™ hops at the beginning of the boil. At 10 minutes left in boil, add a kettle fining agent such as Irish moss or a Whirlfloc tablet and a yeast nutrient.

After the boil, rapidly chill the wort to slightly below fermentation temperature, which is 66 °F (19 °C) for this beer. Aerate the wort (if using a liquid strain) then pitch the yeast.

Maintain fermentation temperature. Once primary fermentation is done, rack into a secondary fermenter containing the raspberries and cherries. Allow for complete fermentation of the fruit, which can take up to two weeks.

Bottle or keg the beer and carbonate to approximately 2.5 volumes.

TIPS FOR SUCCESS:

This month's tips all come straight from the brewer, Duncan MacCrea's pen. First off, "We do a single infusion mash at 154 °F (68 °C), which may seem high for the target final gravity but we do not raise the temperature at the end of the mash to denature the enzymes, we simply allow conversion to continue through lautering and found the higher temperature necessary to not overshoot target final gravity. If you intend to raise the temperature at the end of mashing to denature the enzymes, you will likely find you need a lower target mash temperature to achieve the desired final gravity."

Secondly, "We once used raspberries and tart cherries in equal proportion but found that reducing the cherries kept the cough syrup flavor from coming through. Be sure to use tart cherries, not sweet cherries. Any amount of sweet cherries tastes like cough syrup after the sugar has fermented out. The fruit is added after the beer has been racked off the yeast into a conditioning tank. This allows time for the sugars of the fruit to ferment without the delicate aromas to be driven off by the vigor of primary fermentation. We centrifuge this beer for clarity but if a centrifuge is not found in your homebrewery, pectic enzyme can aid with clarification."

Finally, "Any fruit beer, short of some Belgian sour styles, are not intended to be aged and should be consumed fresh. This is no exception. We generally brew, ferment, condition, centrifuge, package, and send this beer out the door within three weeks. Ideally, it spends as little time as possible on the shelf and is consumed fresh." BYO

BY DAWSON RASPUZZI

BEYOND OAK

Incorporating exotic woods in your brews

There are many woods beyond oak that can add complexity to beer. Two pros who know their way around these exotic flavors share their top tips.

Amburana, which is one of my favorite non-oak alternatives, has a distinct gingerbread spice aroma/flavor with lofty vanilla.

Wayne Wambles is the Brewmaster for Cigar City Brewing in Tampa, Florida. He began as a homebrewer in the early 1990s and made the transition to commercial brewing by 1996. He assisted in building Cigar City from the ground up, beginning in 2008. Annual production has gone from about 1,000 barrels to 140,000 over that time.

We've used many exotic woods at Cigar City Brewing over the years. The first one we used back in the pilot days was Spanish cedar. We initially infused it into an early prototype for Marshal Zhukov's Imperial Stout. We were pleasantly surprised by the resinous character that it provided to the already existing forward roasted barley expression. They seemed to pair well. As we continued to experiment with it, we began trialing it in IPAs. This allowed us to understand the true nature of the wood because the wood was no longer competing with the assertive roasted grain character. We noticed that it displayed a forward white grapefruit character, along with white pepper and sandalwood. This ended up being a better idea in the end and led to the development of Humidor IPA, which is called Spanish Cedar Jai Alai today.

Over the years we've also used:

- Cypress (which has a yellow cake expression and exhibits some vanilla notes as well) in a helles lager infused with strawberries as well as an imperial milk stout.
- African Padauk (displays delicate chocolate and cinnamon notes but can become very tannic if left in contact with the beer too long) in a brown ale.
- Tamamuri (which has a pear or pear brandy expression) in a Maibock with aji amarillo peppers.
- Amburana, which is one of my favorite non-oak alternatives, has a distinct gingerbread spice aroma/flavor with lofty vanilla. I've used this in several beers, all of them bigger, maltier beers, with great results. Imperial brown ale, imperial stout, and Baltic porter are examples that have worked well in the past, but this wood could work very well in lower ABV, maltier beers too, like English brown ale. It's a very forward wood and can easily dominate the flavor profile if not infused carefully.

I'll leave the pairing of woods with adjuncts up to the imagination. They can create added depth, but I prefer to spotlight the uniqueness of the wood versus overshadowing it.

Toasting is a good measure to take prior to use. We usually have them processed into spirals and then toasted. If this is being attempted at home with local wood, results may vary. Holding at 175 °F (79 °C) for 30 minutes would likely eradicate many bacteria and offer a slight degree of caramelization of the wood sugars.

When testing new woods you haven't used before, I would suggest using smaller growlers and making sure they are purged well to avoid any oxidation that might result in paper to cardboard character that might be confused with tannins from the wood sample. Fill the growler with a neutral or less assertive beer and allow at least 14 days of static contact time. Keep it stored in the refrigerator to reduce staling of the beer. Then decant into a glass that allows for proper, focused delivery of aromatics to the nose and drink the sample. Decide whether it's something that could positively contribute to the beer. Smelling and tasting beers or new raw materials usually gives me ideas about how to use them with other raw materials or base styles of beer.

Negative samples usually express high levels of phenol notes such as clove and smoke.

Positive samples can have a massive array of possibilities that can express as fruit, phenols (baking spices . . . not one note clove/smoky/medicinal . . . vanilla is a singular positive example and it is common in oak), woodiness, and tannins to name a few. If you feel that it is pleasing, give it a shot.

Jamey Adams was a homebrewer from 2005-2015 before founding Arches Brewing in 2015 in Hapeville, Georgia. Jamey is the Brewmaster and has degrees in chemistry and biology with a passion for reproducing classic styles especially focusing on lagers.

Southern Bel' is a Belgian ale with Peruvian Palo Santo wood. Palo Santo is a protected wild tree that grows from southern Mexico down to Peru. It has been used for centuries for its mystical properties when burned as incense or by extracting the essential oils. It comes bundled as short, thin pieces of wood called smudging sticks. Due to its protected nature, only the fallen limbs can be harvested. We add these smudging sticks to finished beer and the alcohol acts as a solvent. The flavor profile that gets extracted by the alcohol in the beer is identical to the distinct smell of the essential oils. Since most people have never tasted this wood, their brains work overtime trying to place the flavors into categories that they have experienced before. The most common flavors associated with Southern Bel' are coconut, vanilla, cinnamon, and nutmeg.

The recipe works so well because the slight phenolic character of the esters in our Belgian blonde really complement the flavor of the essential oils in the Palo Santo to create the truly unique Southern Bel'. The blonde recipe also uses a number of specialty grains including biscuit, aromatic, special B, and honey malts.

When experimenting with different woods, it's always best to try it with a more neutral flavor. We are lucky in that sense as we make a really light lager that when paired with different woods allows us to differentiate the flavors that are coming from each wood species and also helps to determine dosing rates and contact times. All of these factors need to be accounted for when adding wood to beer. I think it's important to experiment with different ways to get the flavor of the wood into the beer, but keep in mind that these woods do not come sanitized and there are a number of living creatures that call the wood their home.

Find even more advice from Wayne Wambles and Jamey Adams in the online edition of this story at: https://byo.com/article/beyond-oak/ BYO

HELP ME, MR. WIZARD

BY ASHTON LEWIS

DECOCTING WHILE RECIRCULATING?

Also: Iodine starch testing and defining mash conversion

Q I'M ABOUT TO DELVE INTO BREWING DARK LAGERS AND I'M WONDERING IF THERE HAVE BEEN ANY ARTICLES WRITTEN ON DECOCTION MASHES WHEN YOU ARE USING A HEAT EXCHANGE RECIRCULATING MASH SYSTEM (HERMS) OR RECIRCULATING INFUSION MASH SYSTEM (RIMS)? I'VE GOT A THREE-PUMP, ALL-ELECTRIC HEAT, HERMS SETUP USING A MODIFIED KEG WITH A FALSE BOTTOM AS THE MASH/LAUTER TUN AND AM TYPICALLY RECIRCULATING MY MASH CONTINUOUSLY. I'VE NEVER DONE A DECOCTION MASH AND AM NOT SURE WHAT THE BEST WAY WOULD BE TO PULL A THICK OR THIN DECOCTION WHEN I'VE BEEN HEATING AND RECIRCULATING THE MASH TO GET IT TO MY FIRST REST TEMPERATURE. IS IT FEASIBLE TO PUMP THE DECOCTION TO MY BOIL POT AND THEN BACK INTO MY MASH TUN SO I'M NOT HANDLING HOT LIQUIDS? COULD I JUST PUMP LIQUID FROM THE MASH TUN TO THE BOIL POT AND ADD GRAINS FROM THE MASH TUN AND THEN PUMP THE MIXTURE BACK INTO THE MASH TUN AFTER THE DECOCTION?

RANDY HALSETH
VICKSBURG, MICHIGAN

The good news is that decoction mashing is doable and is actually pretty easy to perform.

Photo by Charles A. Parker/Images Plus

Decoction mashing isn't all that complicated a technique, but does add time to your brew day as well as color and flavor impacts on the beer.

A Randy, this is an interesting question that I will address with a few different perspectives. The first is a short answer to your basic question; I don't know of any articles that address using a RIMS or HERMS brewing setup for decoction mashing. There are a few key reasons why doing this is not practical, and the leader of this list is that RIMS and HERMS designs are based on pumping wort, not mash. This simple fact really has two implications for even the most die-hard MacGyver brewers.

Challenge number one is the pump suction connection point; these systems pull wort from the non-mash side of a screen and pump the wort through a heater. In a RIMS design, an in-line heating element, usually electric, is used to heat wort that flows back to the mash tun. The HERMS design is similar, except the heat exchanger is usually a copper (or stainless) coil that is submerged in hot water. Without worrying too much about the ease of changing the location of the pump suction from the wort side of the mash tun to the mash side, let's look at the pump, the suction diameter, and the line size.

When liquid piping systems are designed, flow rate, viscosity, and pressure drop across the system are the key variables that really define the pipe/hose diameter selected for the duty. In most brewing applications, the maximum wort/beer velocity is set to about five feet per second (1.5 m/s). Let's say that a RIMS/HERMS brewhouse is designed to turn the entire wort volume every 10 minutes. For discussion purposes, let's assume a liquid volume of 5 gallons (19 L). In this case, the design flow rate is 5 gallons (19 L) ÷ 10 minutes, or 0.5 gallons per minute or gpm (1.9 L/min.). The pressure drop across the piping system is negligible because the flow path is very short and there is no real change in elevation (liquid head), so I am not going to touch on these topics that are very important in larger pumping systems. The 0.5 gpm

(1.9 L/min.) flow rate through a ¼-in. (6-mm) ID (inside diameter) hose translates to a velocity of 3.27 feet per second (1 m/sec). In practice, no one wants to build anything using ¼-in. (6-mm) stainless or copper fittings and tubing because they are too delicate, so larger fittings and lines are used. That's why ⅜-in. (9.5-mm) hose is a common diameter for this type of design.

Now let's look at this system from a mash-pumping perspective. Even though mash is not particularly viscous, the particle sizes of the grain bits in the mash are the size and shape to cause clogs in pipes that are less than about 1.5 in. (38 mm) in diameter. On a homebrewing scale, 1.5-in. (38-mm) piping is huge! Yes, smaller line sizes are sometimes used, but they are prone to clogging. And forget about pumping mash through a skinny HERMS coil. Carrying this what-if scenario to completion, even if mash could easily be pumped through a smaller line, say ¾ in. (19 mm) in diameter, a pump with that size connection is required to make this work and now you are also looking at an expensive pump upgrade. The bottom line is that mash pumping on small systems is not practical. In my opinion, this challenge is the real deal breaker for the proposition. Not to mention that piping modifications, including the location of your pump suction on the mash tun, are also required.

The good news is that decoction mashing is doable and is actually pretty easy to perform. My suggestion is to go rogue and use some tools that are not part of your normal brewing setup. Going rogue is the technical term for cobbling together a solution using any number of approaches to solve a problem. My rogue solution to decoction mashing uses a kitchen scale, an 8-in. (20-cm) handheld, stainless steel strainer, a pot or two, a heating source that is not tied to a hard-piped RIMS or HERMS rig, and some good pot holders. Without diving down the rabbit hole of decoction mash heat calculations, let's simply assume that a typical decoction is equal to about a third of the total mash. A very convenient way of measuring this third is by weight, which is super easy for metric brewers. Those calculations that I am avoiding are based on weight, so there is a second reason for using weight instead of volume. Let's look at a recipe with 3.5 kg (7.7 lbs.) malt and a water-to-malt ratio of 3:1 as an example; this translates to 10.5 kg water and 3.5 kg of malt for a total mash weight of 14 kg, and a third of this total is 4.7 kg (10.4 lbs.). One or two stockpots can be used if you don't have something handy in your homebrewing equipment arsenal.

Traditional decoction mashing draws the thickest portion of the mash to be boiled. This is easy to do at home with the assistance of a strainer. Simply use this device as a ladle of sorts and pull out 4.7 kg (10.4 lbs.) of mash. Because mash is like a sponge, you can let most of the free-draining wort drain into the mash tun before transferring the scoop of mash to the pot and have plenty of retained wort for the boiling that is soon to commence. Once you have removed the required amount of mash, place your pot(s) of thick mash on your secondary heating device (a kitchen range or outdoor cooker works great for this), and gently heat to the boil while mixing. I say gently heat because you do not want to burn your decoction. You will notice that as the mash heats that it will become thinner and less viscous as alpha amylase acts upon starch up to about 162 °F (72 °C), and due to the rise in temperature. At some point you will find that stirring is not required to prevent scorching. The length of the decoction boil varies, so boil for whatever duration, and then return the boiled mash to the mash tun. Longer boils contribute more color and flavor than shorter boils.

This is the step you wanted to avoid, but without major design changes to your equipment this is what I am suggesting. The reason that multiple pots be used is to address your safety concern and also to allow for the use of kitchen pots versus more brewing equipment. If a big pot of pasta can be boiled and moved to the sink for draining, transferring a similarly sized pot of boiled mash should be manageable.

Decoction mashing is a very cool method in terms of mashing biochemistry, brewing history, and flavor. It also solves some very practical problems for homebrewers who have unheated mash tuns and want to conduct multi-temperature mashes from time-to-time. Your question was specific to the mechanics of the process, so that's what I covered. Decoction mashing for your dark lager may indeed be worth the extra work. Google "Heart of Darkness Dunkel, Springfield Brewing Company" and read the Q&A about this beer for some anecdotes. Cheers!

Q I'VE BEEN BREWING FOR A FEW YEARS NOW AND HAVE VERY RECENTLY JOINED UP WITH *BYO*. IN THE LAST FEW DAYS I'VE REVIEWED THE DOUBLE IPA RECIPE LISTINGS, WHICH LOOK REALLY GOOD AND I'M GEARING UP TO START MY FIRST CLONE ATTEMPT. IN THE INSTRUCTIONS IS THE PHRASE "UNTIL THE ENZYMATIC CONVERSION IS COMPLETE." PROBLEM IS I'VE NEVER HEARD THAT PHRASE BEFORE SO COULD YOU HELP BY EXPLAINING WHAT IT MEANS AND ADVISING HOW I CAN TELL WHEN IT'S COMPLETE.

ANDREW ROBB
SYDNEY, AUSTRALIA

A Welcome to *BYO* where we are committed to providing current, helpful, and technically sound brewing advice to our readers! It's always nice seeing great homebrewing questions from all parts of the world and we thank you for the query from down under. Now, onto the question at hand: Mash conversion.

Brewing is an ancient practice and the terms used by brewers are a hodgepodge of words, phrases, and units used by brewers who came before us. Some of these terms, like conversion, are commonly used by brewers but not always very helpful when it comes to really trying to make meaningful changes to beer flavor. Conversion simply refers to how

starch, specifically amylose, reacts with iodine. Take a sample of wort early in the mash, place it on a white plate, hit it with a drop of iodine solution, and a deep purple/inky black color immediately forms. As the mash rest is extended and starches are transformed by malt enzymes, especially alpha amylase, the color-forming reaction between wort and iodine ceases and the mash is said to be converted. Although this may sound like some religious experience for the mash, conversion is a bit nebulous. Let's dig a bit deeper into malt starch, malt enzymes, and what happens during mashing.

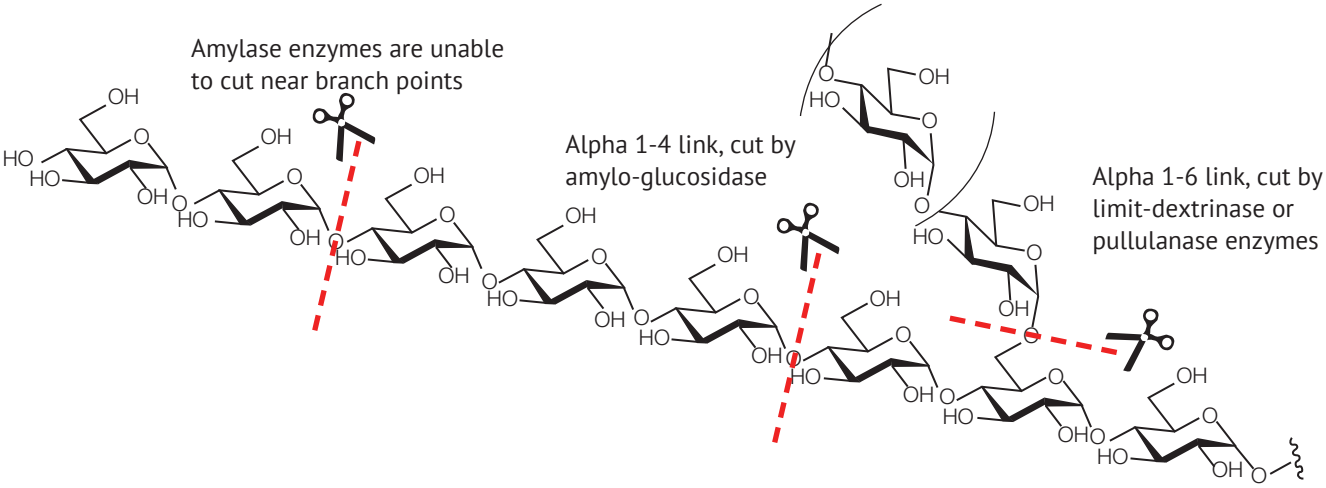
There are two types of starch found in cereal grains ranging from Amaranth to Zizania: Amylose and amylopectin. Starch is a glucose-based polymer, where each glucose sugar molecule is a monomer. And these glucose monomers in starch are either linked by a bond referred to as alpha 1-4 or alpha 1-6. Amylopectin is a branched molecule including alpha 1-4 and alpha 1-6 bonds, but amylopectin doesn't react with iodine and is not part of this discussion. However, all of the glucose monomers in amylose are linked by alpha 1-4 bonds and amylose polymers react with iodine to form colors ranging from colorless to deep purple/inky black. Although the color is related to the size of amylose polymer, the iodine test used by brewers is declared in absolute terms of positive and negative. Iodine-positive wort appears purple/black in the presence of iodine and iodine-negative wort has no real color change. Pretty subjective for sure. So, what does this test reveal?

Although beta-amylase is the enzyme in malt that produces fermentable sugars, mainly maltose, from amylose and amylopectin, it does not have a drastic effect on the reaction between amylose and iodine. Alpha amylase, on the other hand, produces little fermentable sugar from amylose and amylopectin, but it handily chops large starch molecules into smaller chunks that beta amylase can digest. Brewers need both enzymes to produce wort that has a high percentage of fermentable sugars. The iodine test is really telling us something about the action of alpha amylase on amylose. Iodine-positive wort is low in fermentable sugars and the iodine test is a handy way of signaling brewers that the enzymes need more time to do their thing. That's an anti-climatic conclusion, but that's really all the iodine test tells us. Wort could be very low in fermentability and be iodine negative, but in most cases, conversion signals that things have generally gone as planned. In that regard, an iodine-negative test result is a pretty good indicator of a successful mash.

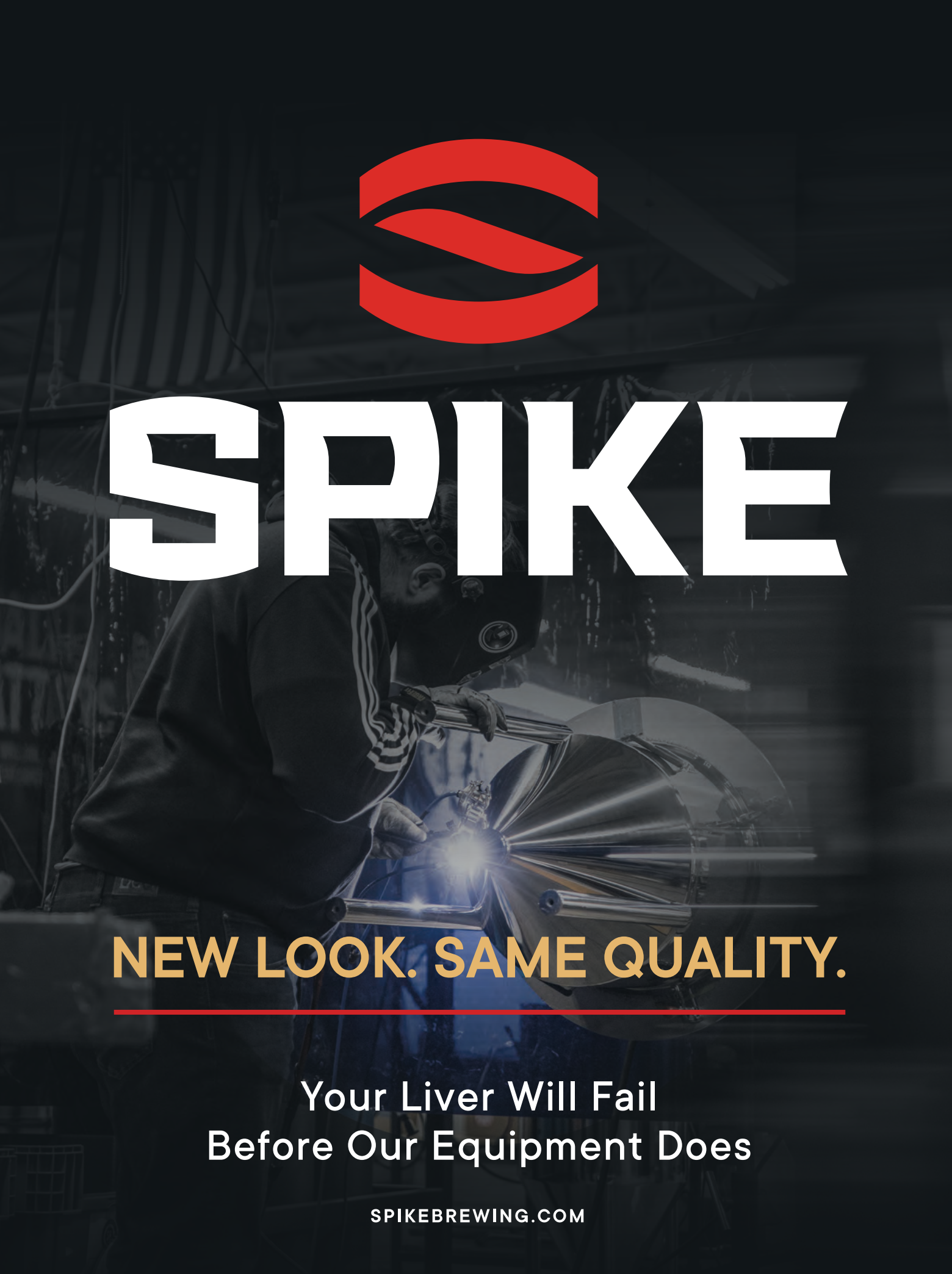
Time for a Mr. Wizard digression about this test. There was a time when I followed the rules of brewing and always checked for mash conversion before mashing out because good brewers follow rules and enzyme denaturation is irreversible. After umpteen negative iodine tests after the 70 °C rest (158 °F for brewers who are not yet hooked on metric) I said to myself "Ashton, this is silly. Modern malts are super consistent compared to malts from the past when this test was made popular. It's time to stop pulling samples that don't tell me anything new." And that was when I stopped performing the iodine test. That was about 25 years ago. I thought this was maybe my lazy little secret and kept it to myself.

A few weeks ago, I was having a phone meeting with a great brewer at a brewery that will remain nameless and two of my work colleagues who are both brewing scientists. We were discussing the use of exogenous enzymes, amylo-glucosidase and pullulanase, to produce highly fermentable wort (you can learn more on this topic in the October 2020 issue's "Advanced Brewing" column). One of my colleagues asks the brewmaster we were meeting with "was the wort iodine negative?" And the brewmaster said "I am embarrassed to admit that we did not perform an iodine test because they are always negative and we eliminated that step in our process years ago." Oh boy, I was smiling a toothy smile after that confession because I knew that I was not alone! Indeed, many modern brewers declare starch conversion complete when the mash cycle, defined by ratio of malt and water, mash pH, mash temperature, and mash time has ended. Some always use the iodine test just to be certain and others get on with the day. One counter argument to this though is that your thermometer is not reading correctly and you have missed your target mash temperature. You can see one such example in the May-June 2020 issue of Mr. Wizard, available at https://byo.com/mr-wizard/always-question-your-instruments-iii/

And that, Andrew, is what brewing recipes really mean with the phrase "when conversion is complete." Now, it's time to vorlauf; ciao! BYO



While amylopectin, pictured here, doesn't react with iodine, it's sister starch amylose does. Alpha amylase and beta amylase will chop both molecules down but amylopectin cannot be fully broken down into simple sugars unless exogenous enzymes are added to either the mash or the fermenter.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BY GORDON STRONG

FLANDERS RED

The Burgundy of Belgium

The red and brown beers of Flanders differ from lambics in that they are not spontaneously fermented and they don't traditionally contain wheat.

FLANDERS RED
BY THE NUMBERS

OG:	1.048–1.057
FG:	1.002–1.012
SRM:	10–16
IBU:	10–25
ABV:	4.6–6.5%

Photo by Charles A. Parker/Images Plus

A regional specialty ale in Belgium, the red and brown sour beers of Flanders have an almost cult-like following among beer enthusiasts and have helped inspire the modern craft beer obsession with creating soured barrel-aged beers. Borrowing 19th century English techniques, the modern Flanders red ale is somewhat of a throwback style. It has had challenges in finding a wider market without losing its traditional character, a problem shared with many historical styles.

Flanders red and the related oud bruin (old brown) are characterized as different styles by the Beer Judge Certification Program (BJCP), styles 23B and 23C respectively, but Belgians consider them as part of the same family of beer. The BJCP differentiates them because there are sensory differences between the two styles, enough to be detected by judges. I find it ironic that people argue about them being considered the same style by Belgians. Wait. Aren't these the same people who don't believe in styles at all? Pick a position. In my opinion they are different, but related; cousins within the same family. Michael Jackson was probably the first to talk about Flanders red as distinct from oud bruin.

The red and brown beers share mixed fermentation, as well as an extended aging period. Reds are traditionally oak-aged in large barrels while browns are not. The finished product represents a blending of old and young versions in varying percentages to give a different drinking experience. Versions with a higher percentage of aged beer have a more assertive acidity. Some versions may be sweetened, although this isn't traditional. Blending with a younger version is the traditional method of balancing sweetness.

The red and brown beers of Flanders differ from lambics in that they are not spontaneously fermented and they don't traditionally contain wheat. Fruited versions have been produced — and they are wonderful. These beers don't have a heavy yeast character from the primary *Saccharomyces* strain, contrasting with many other famous beers of Belgium, but rely on the mixed fermentation and aging process to develop complexity.

HISTORY

It's hard to talk about this style without focusing on Rodenbach Brewery, due to their size and influence. They basically have set the standard for the style even though others make something similar. Rodenbach was established in 1821 in the West Flanders town of Roeselare, but the current Rodenbach product doesn't really trace to that age. A visit to England in the 1870s introduced the concept of aging and maturing beer in giant wood vats, which was then copied at the brewery. So in some ways, this Belgian beer is carrying on an English tradition. The blending of old and young beers was also part of this foreign heritage.

Wild or mixed fermentations are common in Belgium, but the wild ales of Flanders don't rely on spontaneous fermentation through open-air coolships as do the lambic breweries of the Senne Valley. Rodenbach developed their mixed fermentation slurry over time, and often provided it to local breweries (famously, to the "Mad Brewers," De Dolle). However, they no longer provide this service after the company was sold to a larger brewery group, Palm.

The sour ales of Flanders developed over time, but modern examples are influenced by the red ale of Rodenbach and the brown ale of Liefmans. Jeff Sparrow wrote in *Wild Brews* that reds are from West Flanders and are matured in wood, while browns are from East Flanders and matured in stainless steel. I don't know if this was traditionally true but I know of browns that are aged in wood, such as Ichtegem and Petrus.

As the Belgians don't really differentiate between the styles, it's probably better to think of the beers as being from Flanders with a variety of production techniques utilized to produce them.

SENSORY PROFILE

I think this style confuses a lot of people because of how it is described as "wine-like" — I think that point needs some clarification. Michael Jackson wrote that the beer style is the "most refreshing in the world" and called them the "Burgundies of Belgium." But it's pretty clear he was talking about the oldest examples of Rodenbach. Tasting some sweetened examples made me wonder what kind of hooch people were used to if they were calling it "wine-like." But the best examples can inspire that image, even if it is echoing Rodenbach marketing — "*C'est vin*!"

What makes this style wine-like is its color (a beautiful deep red), its acidity (although light acetic acid would be a serious fault in wine), its fruity flavors, and its dry, tannic finish. It isn't as strong as wine, and the acidity can be stronger, but the red fruity flavors are appropriate. Malt is serving the same purpose as the grape, providing some body and the oak aging gives it some structure.

Yet no one should literally believe that the beer is mistakable for wine. Certainly not when it has been sweetened, or when some acetic acid is pres-

Rodenbach's extended aging period in foeders help develop some key flavors found in the beer.

FLANDERS RED

(5 gallons/19 L, all-grain)
OG = 1.050 FG = 1.010
IBU = 16 SRM = 17
ABV = 5.3%

INGREDIENTS

7 lbs. (3.2 kg) Vienna malt
2 lbs. (0.91 kg) flaked maize
12 oz. (340 g) dark Munich malt (9 °L)
12 oz. (340 g) Caramunich® III malt
6 oz. (170 g) Special B malt
2 oz. (57 g) chocolate wheat malt
3.4 AAU Styrian Goldings hops (first wort hop) (0.75 oz./21 g at 4.5% alpha acids)
0.5 oz. (14 g) Saaz hops (5 min.)
Wyeast 3763 (Roeselare Ale Blend), or White Labs WLP665 (Flemish Ale Blend), or White Labs WLP655 (Belgian Sour Mix 1), or Yeast Bay WLP4633 (Melange Blend Yeast)
French oak spiral, medium-plus toast
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 0.5 tsp. of calcium chloride and 0.5 tsp. of calcium sulfate to the mash.

This recipe uses a single infusion mash. Use enough water to have a moderately thick mash (1.5 qts./lb. or 3.1 L/kg). Mash the Vienna, Munich, and maize at 153 °F (67 °C) for 60 minutes. Add the remaining specialty malts, raise the temperature to 168 °F (76 °C) and recirculate for 15 minutes.

Sparge slowly and collect 6.5 gallons (24.5 L) of wort. First wort hops go into the kettle early in the sparging phase. Boil the wort for 75 minutes, adding hops at the times indicated in the recipe.

Chill the wort to 66 °F (19 °C), pitch the yeast, and ferment for 12–18 months. Put the oak spiral into the fermenter at the start of fermentation; before using, lightly boil the spiral for 15 minutes, discarding the water and using the spiral.

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

FLANDERS RED

(5 gallons/19 L, partial mash)
OG = 1.050 FG = 1.010
IBU = 16 SRM = 17
ABV = 5.3%

INGREDIENTS

3 lbs. (1.4 kg) pale ale dried malt extract
1 lb. (0.45 kg) Vienna malt
2 lbs. (0.91 kg) flaked maize
12 oz. (340 g) dark Munich malt (9 °L)
12 oz. (340 g) Caramunich® III malt
6 oz. (170 g) Special B malt
2 oz. (57 g) chocolate wheat malt
3.4 AAU Styrian Goldings hops (first wort hop) (0.75 oz./21 g at 4.5% alpha acid)
0.5 oz. (14 g) Saaz hops (5 min.)
Wyeast 3763 (Roeselare Ale Blend), or White Labs WLP665 (Flemish Ale Blend), or White Labs WLP655 (Belgian Sour Mix 1), or Yeast Bay WLP4633 (Melange Blend Yeast)
French oak spiral, medium-plus toast
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 0.5 tsp. of calcium chloride and 0.5 tsp. of gypsum to the mash.

This recipe uses a single infusion mash. Heat 7.5 qts. (7.1 L) of water to about 165 °F (74 °C). Place the crushed Vienna and Munich malts and maize in a large muslin bag and submerge the bag. Stir to make sure no dough balls exist. Rest at 153 °F (67 °C) for 60 minutes. Add the remaining specialty malts in separate bag, raise the temperature to 168 °F (76 °C) if you can without scorching the bags. Remove both bags and place in a large colander. Wash the grains with 2 gallons (7.6 L) of hot water. Add the malt extract and stir thoroughly to dissolve completely. Top off kettle to 6.5 gallons (24.6 L), add the first wort hop, then turn the heat on and bring to a boil.

Boil the wort for 60 minutes, adding hops at the times indicated. Follow the all-grain instruction for fermentation temperature, aging timeframe, and packaging.

ent. The sweetened versions remind me more of balsamic vinegar, in fact. So please don't repeat the "wine-like" characterization as literal – think of it more as an artistic impression or interpretation rather than a direct copy. If you do want to compare it to wine, a high-acid Burgundy would be closest, showing off Pinot Noir grapes.

A Flanders red ale should have a deep red color and be clear. It can have a low white head, but otherwise should look like a red wine. It should have an aroma of fruit such as black cherries, plums, red currants, or oranges; the fruitiness can be fairly strong, but there is also the impression of sourness and spice. The acidity can have a light acetic (vinegar) note, but this should never be strong. The spices can be light vanilla, if the beer was wood-aged. Sometimes there is a light chocolate note, although a stronger chocolate character is more characteristic of an Oud Bruin instead. There can be a moderate toasty-rich maltiness present, which may have a lightly sweet note.

The flavor is similar to the aroma in its fruitiness and spice. The sourness tends to have a complexity, not just be a simple lactic sourness. It should not be funky, however, and the sourness shouldn't be overly vinegar-like. The hop bitterness is restrained but enough to keep the maltiness in check, and the finish is usually dry. If the beer was aged in wood, some tannic notes help the impression of dryness and balance the malt. It shouldn't seem overly oaky, however. Like a fine red wine, the oak should be providing structure and balance, not be prominent. Toasty malt flavors round out the beer, but some versions are sweetened.

> **If the beer was aged in wood, some tannic notes help the impression of dryness and balance the malt.**

The body tends to be medium, not heavy, although the tannins can provide some additional body in younger examples. Carbonation is moderate or less, and the beer remains light on the palate due to the acidity. Sweetened versions will seem heavier.

BREWING INGREDIENTS AND METHODS

The grist of these beers is based on knowledge of the Rodenbach recipe. Vienna malt as the base, with some additional Munich malt for richness. Corn is used to lighten the body and flavor. Specialty malts provide some flavor and color, with moderate color crystal-type malts being common, as well as some darker crystal malts like Special B providing additional color and raisin-like flavors. The color may be adjusted further with some darker malts, as a touch of black malts helps give a true red shade to the beer. Rodenbach says that the darker malts and corn help control the unwanted acetic acid bacteria by providing anti-oxidants and lowering the protein content of the wort.

The mash program typically uses an infusion mash, with either a single step or multiple steps. As the mixed fermentation involves a complex mix of yeast and bacteria, worrying too much about mashing for attenuation isn't a problem – the microbiota will consume most everything. Unlike many other Belgian beer styles, sugar is not typically part of the recipe. The boil is often long so as to encourage the Maillard reaction, which also helps provide anti-oxidants, color, and flavor.

This isn't a hoppy beer, so using typical Belgian or German hops will be fine. Lower alpha acid varieties with a floral or spicy character are typical for many Belgian breweries. Some people caution against adding too many hops as this can inhibit some bacteria, but I haven't noticed this problem in this style. Hops should be restrained but this isn't a kettle-soured beer, so don't look for a quick lactic acidity. You want to develop complexity that only time can bring.

Flanders red and brown beers aren't spontaneously fermented like lambics are, but they do share many of the same yeast and bacteria. *Saccharomyces*, *Brettanomyces*, *Lactobacillus*, *Pediococcus*, and others are common. *Brettanomyces* tends to give more of a fruity character than a leathery or horse blanket flavor in this style. *Pediococcus* shouldn't give the beer a buttery diacetyl character, either. But you are looking for a complex acidity. *Acetobacter* can come into play in this style, but you have to be careful about it since it can rapidly overpower a beer. I wouldn't introduce this bacteria intentionally; Belgians don't.

One of the distinguishing factors between Flanders red and brown ales is that the reds tend to be oak-aged. In Belgium (Rodenbach, at least), they use enormous oak foudres (foeders), which are like vertical casks. Reminiscent of vatted porter, these are used for maturing the beer and developing the acidity. When replicating this character on the homebrew level, just keep in mind the surface area of beer in contact with the wood. If you use a smaller barrel, you will be getting much more wood than in these beers. Rodenbach ages their beer for about two years at ambient temperatures of 59 °F to 77 °F (15 °C to 25 °C). This maturation process helps develop the acidity and also to produce many of the fruity notes as organic acids esterify.

Another interesting production method is similar to gueuze in that the beers are often blended. Rodenbach has several beers that display a varying quantity of the "good stuff" or the most-aged beer. Blending an older and a younger version can temper the acidity and smooth the flavor. Some versions are sweetened, or fruit is added.

I was fortunate to visit Rodenbach one week after touring New Belgium in 2006. The beer served at Rodenbach directly from the foudres was very similar to what New Belgium was packaging as their La Folie at the time. However, the foudre beer at Rodenbach was more aggressively sour than what was packaged as Rodenbach Grand Cru; that beer had been blended. The ordinary Rodenbach had even more of the younger beer in the blend. So understand that there

is a range to the style, and even among the classic providers, there is a varying degree of acidity and intensity. Other providers sweeten the beer, although (as with lambics) I feel this is getting further away from the classic style while chasing inexperienced palates.

HOMEBREW EXAMPLE

This one is going to take some time, so please prepare yourself for it. I'm going to focus my comments on the special notes. The recipe itself is straightforward, and follows the types of ingredients typical of a Rodenbach-style ale. I like the wort for other uses too, so you can also use it for an amber lager with a clean German lager yeast. You can probably also make a clean ale from it too. If you make a larger batch, you can enjoy the other versions while you're waiting for this one to finish.

I'm using first wort hopping in this recipe but you can convert it to a 60-minute boil addition if you like. I like a little hop flavor in my beer, although it isn't traditional. It tends to fade anyway during aging, and I think it adds a little background complexity. I have chocolate wheat in this recipe, but any huskless dark malt will do since it is just for color adjustment.

This recipe uses an oak spiral. Please boil it first to help remove some of the fresh-cut wood flavor and tannins. The usage rate isn't high, but it will be in contact for a long time. If you can't get medium-plus toast, medium toast is also good. Hungarian oak can be used instead, but I wouldn't use American oak due to the stronger flavors it instills including vanilla and dill. French oak should be fairly easy to find, though. If you can't find spirals, you can use cubes but I'd avoid chips, powder, or other smaller formats. Small barrels typically add too much oak, so I wouldn't use those either unless it is well-used and neutral in profile.

The yeast is a special blend of a variety of yeast and bacteria. It takes a long time to work, so don't rush this one. Don't make a starter (manufacturer's recommendation) since there is a balance of yeast here. The sourness may take some time to develop, so don't expect a rapidly soured beer. I think the complexity gained over time actually tastes better, so again, be patient. There may or may not be a pellicle formed, so don't be stressed if it doesn't. Don't try to intentionally oxidize the beer or introduce oxygen later to encourage *Acetobacter* growth.

The final gravity may be lower than I suggest, depending on what the yeast and bacteria do. If the beer is too sour for your liking, you can blend it with a version of this recipe made fresh and fermented with a clean yeast. When you're dealing with these kinds of wild fermentations it's hard to get perfectly repeatable results so don't despair. If after a year the beer isn't sour enough, you can pitch some dregs from commercial sour beers with a profile you like. I don't like this practice early since it doesn't give your fermentation a chance and doesn't really show you what the selected yeast blend can do. BYO

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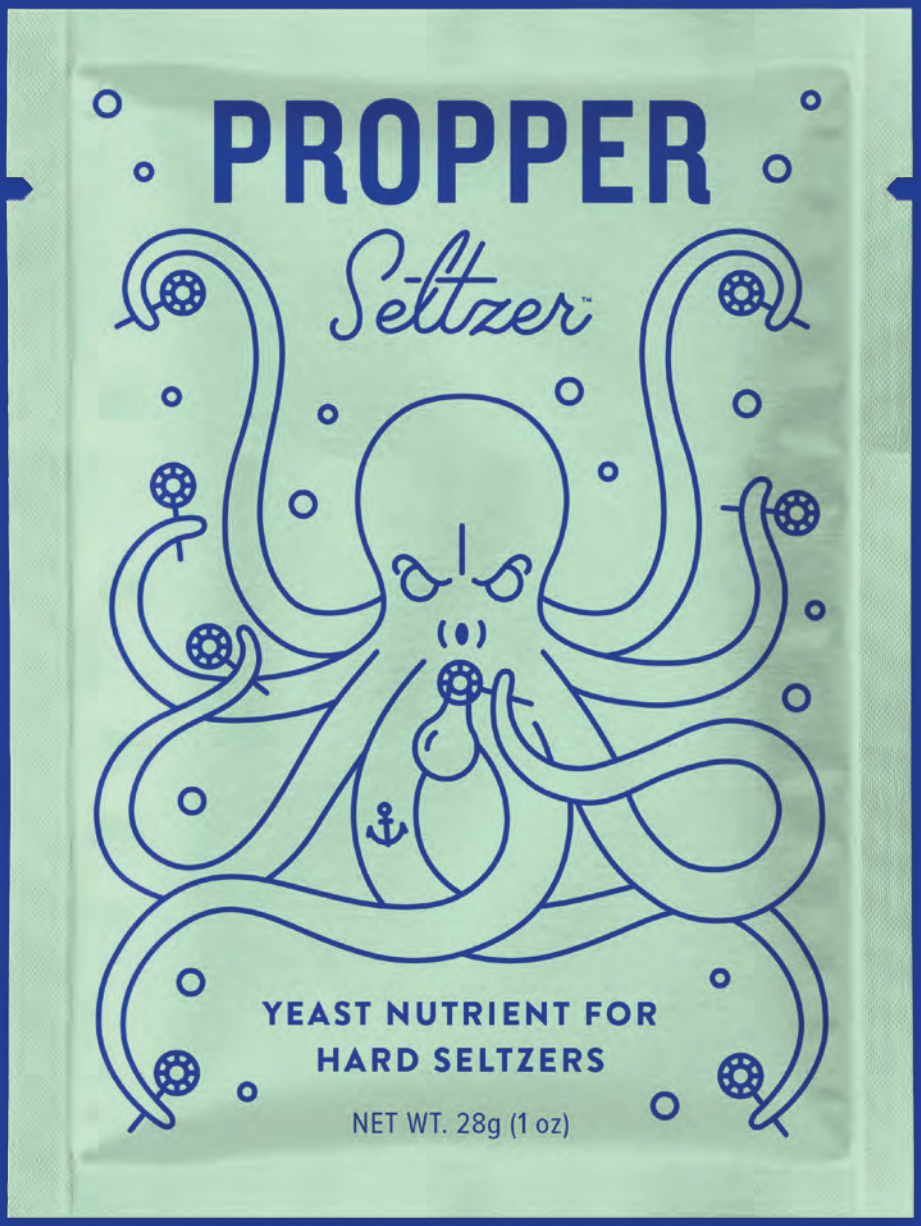

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12:00 – 12:30 PM	Q&A WITH NANO VENDORS			
12:30 – 1:30 PM	Contract Brewing & Alternating Proprietorships	Create A Month's Worth Of Brewery Social Media Posts In 1 Work Day	5 Ways To Reduce Brewery Risk	Small-Scale Sour Beer Brewing
1:30 – 2:00 PM	NANO TRENDS PANEL			
2:00 – 3:00 PM	Keys To Successful Brewery Branding	Balancing Being Owner & Head Brewer	Keys To Better Brewery Financial Forecasting	Brewing Water Treatments
3:00 – 3:30 PM	Q&A WITH NANO VENDORS			
3:30 – 4:00 PM	NANO TOPIC ROUNDTABLE #1			
4:00 – 5:00 PM	What Every Brewery Needs To Know About Trademarks	Setting Up Commercial Accounts For Ingredients, Equipment & More	Reusing Yeast Best Practices	Keys to Training Taproom Staff
5:00 – 5:30 PM	Q&A WITH NANO VENDORS			

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11:00 AM – 12:00 PM	Legal Checklist For Your Brewery Launch	Equipment TLC: Regular Maintenance & Upkeep	Maximize Virtual Experiences To Create New Revenue Streams	Brewery Insurance Claims Case Studies: Lessons Learned
12:00 – 12:30 PM	NANO VENDOR Q&A			
12:30 – 1:30 PM	NANO TOPIC ROUNDTABLE #2			
1:30 – 2:00 PM	COVID-19 BREWERY STRATEGY PANEL			
2:00 – 3:00 PM	Understanding & Using Biotransformation	The Financials Behind Packaging Decisions	Develop A Better Brewery Marketing Plan	Create A "Go To Market" Strategy For Your Brewery
3:00 – 3:30 PM	NANO VENDOR Q&A			
3:30 – 4:00 PM	NANO TOPIC ROUNDTABLE #3			
4:00 – 5:00 PM	Customer Expectations In The Covid-Era Taproom	Brewing Techniques For Hot Styles	Equipment Solutions For Small-Space Footprints	Top 5 Legal Mistakes To Avoid As A Brewery

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Kimc

Expand your home fermentations

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Story and Photos
by Ashton Lewis

The year 2020 has surely been the most unusual year for nearly everyone. That basic statement needs no further elaboration as we all have had our fair share of strife in 2020. But with bad comes good, and the silver lining of the dark cloud that has lingered over this year has been a renewed interest in great homemade foods, especially fermented foods. And within the niche of fermented food, wild fermentations have popped up in homes across the country. Two umbrellas capturing much of the buzz about this topic are sourdough breads and kimchi. The sourdough bug bit me and I have been pretty impressed with the quality of bread that has come out of my oven, as well as the terrific amount of information that is available to home bakers. Therefore, Mr. Wizard's first food article is going to be about kimchi!

WHAT IS KIMCHI?

Kimchi is a term used in Korea to describe a wide array of fermented vegetables and fruits, and is the national dish of South Korea. Over the past several years, Korean food in the U.S. has experienced a rise in popularity and more Americans are familiar with some of the dishes and condiments popular in Korean restaurants. Bibimbap, bulgogi, japchae, gochujang, and gochugaru are examples of popular Korean foods and condiments. And this list would be totally incomplete without kimchi. The most common kimchi is made from cabbage, with cucumber kimchi being a solid number 2 in the U.S.

Although all kimchi is not spicy, the most popular types are easy to spot because of their red color highlights coming from the generous use of gochugaru or dried, ground, red pepper flakes. In basic food science terms, kimchi is a food preserved with a combination of acid and salt and flavored with pungent spices that may have originally been used to cover up unpleasant tastes and aromas. This latter postulate has been used to explain why so many traditional foods, especially those from hotter climates, are hot and spicy.

A quick search about kimchi written by westerners often equates kimchi to spicy sauerkraut. This description is far from useful and does not do justice to kimchi or sauerkraut! The two kimchi types mentioned in this article, tongbaechu (whole cabbage) kimchi and mak kimchi (cut kimchi), traditionally include fish sauce, salted shrimp, sometimes oysters or fish, and lots of gochugaru. All of these ingredients, including the napa cabbage (nappa in Japanese refers to vegetable leaves, so "napa cabbage" loosely translates to leaf cabbage and has nothing to do with the Napa Valley), contain above average levels of free glutamic acid, along with other amines and so-called 5' (five prime) ribonucleotides that collectively contribute umami to food. The fact that tongbaechu and mak kimchi have a big depth of flavor from these umami ingredients helps explain why these kimchis work so well as ingredients in other dishes.

KIMCHI FERMENTERS

Kimchi is traditionally fermented and stored in earthenware crocks called *onggi*. Still popular today, fermentation crocks allow for easy access from a large mouth at the top and are sometimes equipped with heavy half-moons to keep the contents submerged under liquid, although this style of weight seems to be a feature of German crocks used for sauerkraut, as is the airlock/water seal that the latter have designed into the top of the crock. Korean kimchi *onggi* were traditionally buried in the ground to provide for steady temperatures.

My plastic E-Jen fermenter.

Onggi permit slow diffusion of gas across the wall and likely result in a different fermentation profile compared to glass containers that block gas diffusion. Plastics do permit gas transfer and may have some benefits to fermentation in comparison to glass containers. The E-Jen fermenter that I use markets gas-permeability as a feature that improves performance; the moveable inner lid also reportedly minimizes the growth of aerobes on the surface. My normal batch size uses 8.8 lbs. (4 kg) of cabbage, and I also end up with a small amount of kimchi that I ferment in glass, which does result in a different flavor. My wife and I both prefer the kimchi fermented in our plastic fermenter with floating lid.

UNITS

I unapologetically use the metric system in my own brewing and cooking ingredient lists because it's easier to use, especially when ingredient additions fall between 5 and 100 grams because this range of weights expressed in ounces requires the use of decimals and I like whole numbers. End of explanation. But, for those who prefer it, I did still include U.S. measurement equivalents for this article.

I view units as units and also refer to quarts and gallons when describing the size of pots and buckets because those units are used by the manufacturers; if you head to the hardware store looking for 8-liter buckets you will not find what you are looking to buy, so I have to refer to 2-gallon buckets and 2-quart saucepans.

GETTING INTO KIMCHI

In today's world of food journalism, picking a popular topic and running into the assignment with teen vigor is not all that uncommon, but the truth is my love of kimchi has nothing to do with 2020 or tinkering in the kitchen because of the COVID-19 blues. I love kimchi because I love Korean food, especially the spectacular dishes deftly crafted by my late mother-in-law, Sun. I had eaten some Korean foods before I met the young lady who would later become my wife, but had not been exposed to much variety. That all changed in 1989. And one of my favorite types of Korean food quickly became the amazing range of fermented vegetables that fall under the large umbrella of kimchi. It just so happened that Sun's kimchis were truly exceptional. I became spoiled, and unfortunately never learned the art of kimchi making from a real master. My wife was also spoiled by her mom's cooking and did not receive the secrets to Korean cooking. Such is life!

Over the past 25 years, I dabbled with kimchi making and would give up in frustration before forgetting about the frustration and trying again. This cycle waxed and waned for too long until I found a Korean cooking website called Maangchi and was finally able to produce several good batches of kimchi. This gave me the positivity previously denied, and I started applying an analytical approach to kimchi in an effort to make something that both my wife and I liked. Two real challenges with kimchi making is the space required in the refrigerator and the strong aroma that kimchi gives off inside of the refrigerator. Many Korean households in the U.S. have separate refrigerators just for kimchi to address these challenges.

This got me thinking; there must be products on the market specific to kimchi storage, and sure enough I was able to find a line of plastic fermenters/storage containers that reportedly prevent kimchi from making the entire refrigerator smell like kimchi. A clever and useful feature of the design is a floating inner lid that keeps air away from the surface of what is beneath the lid. Maybe it was just the culmination of fine-tuning my recipe and technique, and using my new fermenter, but my kimchi went from pretty good to excellent. Without further ado, let's get busy!

The most common type of kimchi, tongbaechu kimchi, is made from whole napa cabbages that are quartered, brined, and coated, one leaf at a time, in a kimchi paste before packing into a fermenter. This type of kimchi is removed from the fermenter (which also acts as the storage container) and cut before serving. A variation on this type of kimchi is called mak kimchi and is easier to prepare and serve. Mak kimchi is what I will be describing how to make. I encourage folks interested in crafting kimchi at home to follow the procedure in this story to help get the basics down and to become familiar with the flavor and textural changes that occur during fermentation. Just like with brewing, variations are easier to execute after multiple wins with an established method.

EQUIPMENT

- Large cutting board
- Sharp chef's knife
- Colander or homemade double-bucket set-up
- Mandolin (optional)
- 2-quart saucepan
- Whisk
- Kitchen scale
- Vegetable peeler
- Kimchi fermenter (this recipe will yield about 2.5 liters of volume and require at least 3 liters of total vessel volume)
- Blender
- 2–3 mixing bowls
- Spatula

INGREDIENTS

Cabbage and Salt

- 2 kg (4.4 lbs.) napa cabbage (optionally, you can substitute up to 200 grams (7 oz.) of napa cabbage with baby bok choi)
- 120 g (4.2 oz.) coarse kosher salt

Porridge

- 130 g (4.6 oz.) water
- 20 g (0.7 oz.) sugar
- 15 g (0.5 oz.) sweet rice flour*

Kimchi Paste Components

- 120 g (4.2 oz.) Korean radish*
- 90 g (3.2 oz.) minced garlic
- 80 g (32.8 oz.) minced white onion
- 60 g (2.1 oz.) matchstick carrots
- 55 g (1.9 oz.) Korean coarse red pepper flakes (gochugaru)*
- 35 g (1.2 oz.) Three Crabs Brand Fish Sauce (Vietnamese nuoc mam nhi)*
- 15 g (0.5 oz.) salted fermented shrimp*
- 10 g (0.4 oz.) whole green onions
- 5 g (0.2 oz.) minced ginger

** These ingredients are carried in most Korean markets.*

SHOPPING

The best place to gather specialty kimchi ingredients is at a Korean market, but some larger grocery stores with a good selection will have most of the ingredients required for mak kimchi. Napa cabbage is often priced significantly lower in Asian markets, and you will often find it easier to buy large heads of napa cabbage there than in regular grocery stores.

Although very good kimchi can be made from less-than-perfect cabbage, you really want to buy the best looking heads available. This is also true of all of the other fresh vegetables that are used in the kimchi paste.

KIMCHI MAKING

This process takes about three hours from start to finish, and you will not have much downtime between steps. It's important to set aside enough time to completely finish the process and have your kimchi in the fermenter before settling down for a cool brew, so be prepared to be busy. This is a great team project if you can recruit some help.

CABBAGE PREP

This is the rate limiting part of the process, so get the cabbage prep completed before doing other work. Start by removing any wilted outer leaves and weigh your cabbage. I am a spreadsheet fiend and have developed a calculator to drive my entire ingredient list proportionally to cabbage weight, as well as giving me a few levers for tweaking the spice level and wetness of the finished product. This recipe is based on a single cabbage and you should be able to find one that weighs about 2 kg (4.4 lbs.) t the store. I usually double this recipe because it doesn't add much work or time, and also because my 5-liter kimchi fermenter is totally filled, with a bit of extra, when starting with about 4 kg (9.7 lbs.) of cabbage.

Rinse the cabbage, cut lengthwise into eighths, and then cut these wedges into pieces that are about 1.5 inches (4 cm) wide. I cut the wedges from the end opposite the base because the base of the cabbage head holds the leaves together when cutting. Almost all of the cabbage is used except for the solid bit near the base. Using a large, sharp, chef's knife makes this job relatively easy and safe, assuming the person doing the cutting has decent knife skills.

I constantly move cut cabbage from my cutting board into a 2-gallon bucket (2.5 kg max/bucket) during prep. After moving ~500 grams of cabbage (a quarter of it) into the bucket, sprinkle 30 grams (1 oz.) of kosher salt on top of the cabbage, and repeat this layering process until the bucket is filled. Allow this to rest for 30 minutes, give it a gentle stir to move the cabbage pieces around in the developing brine, and let it rest for another 30 minutes. Repeat process for a total brining time of two hours. The purpose of the brining step is to pull water out of the cabbage tissue and to prepare it for fermentation. Don't worry about the large amount of salt being used in this step (yes, it's a lot!) because the cabbage will be rinsed before the prep is over.

Allow the cabbage to brine for two hours.

PORRIDGE PREP (DONE WHILE CUT CABBAGE IS BRINING)

Combine cool water, rice flour, and sugar in a 2-quart (2-L) saucepan. Gently whisk to make a solution, then heat while constantly stirring until starch gelatinizes (solution becomes a translucent gel and the texture turns silky). This step is pretty cool from a brewing perspective because it reinforces starch chemistry and it gives time to think about brewing while constantly stirring! The transition from starch solution to a gelatinized paste happens very quickly and the feel of the whisk movement will be obvious. Once the starch gelatinizes, turn the heat off and allow the porridge to cool to room temperature before making kimchi paste. Occasional stirs after cooking help speed the cooling process.

Whisk the porridge until the starch gelatinizes.

KIMCHI PASTE PREP (DONE AFTER PORRIDGE PREP)

Mince the garlic, onion, ginger (a trick to mincing ginger is to peel the ginger using a vegetable peeler to easily strip the outer peel while minimizing waste), then combine in a blender with the fish sauce and fermented shrimp. Blend on a low-to-medium speed until all solids are pureed. The fish sauce and shrimp have pungent aromas, so be careful not to blow the top off the blender and paint the ceiling. Leave this mixture in the blender until needed.

Wash the green onions, carrots, and radish, and allow to drain in a colander before cutting. Cut the green onions on a bias into ¾-inch (2 cm) pieces. Peel carrots and cut into match sticks (julienne cut). Peel radish (or part of the radish depending on the size) and julienne into 2–3 inch (5–7 cm) strips; this is easiest to do using a mandolin if you have one as the texture and size of this vegetable is perfect for slicing with a mandolin.

Mix kimchi paste with vegetables until uniform.

I only use my mandolin for the radish prep because carrots and mandolins spell sliced fingers. Please be careful!

Transfer cut green onions, radish strips, and carrots to a large mixing bowl, add the gochugaru, puree from blender, and cooled rice starch porridge. Gently mix with a large spoon or spatula until uniform. This mixture is your kimchi paste; set aside until cabbage is rinsed and ready to be mixed with the paste.

RINSE THE BRINED CABBAGE

Unless you have a very large colander, a bit of homebrewing ingenuity makes cabbage rinsing easy and manageable. I have two 2-gallon (8-L) buckets that I use for brining and a third 2-gallon (8-L) bucket with a bunch of holes drilled in the bottom that is my kimchi colander. If this sounds like a borrowed design from Charlie Papazian's Zapap mash tun, it is! The cabbage volume is approximately halved during the 2-hour brining process, so even if you are starting out with 4 kg (8.8 lbs.) of cabbage, you can use one 2-gallon (8-L) bucket without holes and the one 2-gallon (8-L) bucket-colander for the rinsing step.

Transfer all salted cabbage into the bucket-colander (with the colander placed in a sink), rinse out the brining bucket(s), and insert the bucket-colander into a bucket without holes. Fill with cold tap water, stir, and allow to rest for about two minutes. To drain, simply lift the bucket-colander out of the solid bucket and put in sink to drain. Empty the rinse water in preparation for the next rinse cycle.

A minimum of four rinses is recommended to prevent kimchi from being too salty. I like to taste pieces of cabbage after the fourth rinse to check the saltiness. If the cabbage seems too salty for your preference, rinse more. Remember, kimchi is a preserved food and the salt does play into that equation, so don't rinse the cabbage too much. Gently press after the last drain step to remove free water.

BRINGING THE PARTS TOGETHER

Transfer about ¼ of the cabbage to one of your kimchi buckets, add about ¼ of the kimchi paste, then gently mix until uniform. Repeat this process three more times until all cabbage and kimchi paste is in bucket.

Transfer the fresh kimchi to your fermenter and pack the mixture so there are no air bubbles. This is fairly simple with mak kimchi. I have made the best batches of kimchi in my E-Jen fermenter and know this container results in a different product compared to a glass bowl with a water lock covering the top. In the past I used wide-mouth canning jars and never made great kimchi. Whatever you choose as your fermenter, the next couple of days are very important.

One thing to note here is that no starter culture is needed because there are plenty of lactic acid bacteria from the cabbage and other vegetables. There are also plenty of nutrients for these bacteria to consume during fermentation. This is why kimchi is considered a wild fermentation.

Leave your fermenter(s) at room-temperature (~68 °F/20 °C) for 2–3 days. If you are using glass bowls or jars, it's best to place these on plates or a sheet pan because some liquid may be pushed out during fermentation. Kimchi fermentation is nothing like fermenting beer and you will not see foam or the equivalent of kräusen forming at the top. You may, however, see gas bubbles and changes in the appearance of the kimchi paste. The first couple of days of fermentation builds the bacterial population and sets the stage for continued fermentation in the refrigerator. After 2–3 days, move your fermenters to a 39 °F (4 °C) refrigerator and allow to continue fermenting for about five days.

Although some commercial kimchi producers reportedly only use cold fermentation, I have had very poor results with this method. Although the kimchi texture and appearance are very nice and acid is produced, the flavor is one-dimensional and lacks the breadth of warm-started kimchi fermentations, in my opinion.

ENJOYING KIMCHI

You can eat your kimchi any time after the brined cabbage is rinsed and mixed with the paste. Some folks

Fermenter full of fermenting kimchi.

really like fresh, unfermented kimchi (this type is sometimes hit with a dash of soy sauce and topped with sesame seeds), others like kimchi a couple of days into fermentation, and most folks who eat kimchi on a regular basis like it best somewhere between weeks 1–3. The way I perceive the range of flavors is that young kimchi has not come into its own, the peak flavor and texture is between weeks 1 and 3, and beyond that time frame, as the cabbage tissue becomes very soft and the acidity becomes pretty intense, kimchi is best used for Korean soups, stews, and stir fries.

Koreans eat some sort of kimchi as an accompaniment to almost every meal, and you will always find kimchi served with any dish you eat in a Korean restaurant. So, serving with Korean food is a pretty obvious choice. A bowl of good rice served with a little dried squid or grilled meat and a healthy portion of kimchi makes for a great simple lunch or snack. Thinly sliced kimchi can also be used to add a dimension to hamburgers, fish tacos, omelets, pizza, or whatever else suits your fancy.

Since kimchi is the product of lactic acid fermentation, it is considered a probiotic food and a rich source of bugs for your gut's microflora. I don't do health advice, so be sure to read up on this topic if you are interested in learning more.

And, like other crunchy, sour, salty and spicy foods, kimchi definitely pairs well with beer! BYO

Photo by Charles A. Parker/Images Plus

Pantry Brew

Unique ingredients when supplies run low

by Ben Martin

Food security has been playing on my mind a lot in recent months. I don't know about your local area, but stores here in the UK temporarily ran out of a number of key supplies before and during COVID-19 lockdowns, which meant that on occasion I had to get a bit creative when cooking dinner. And this got me thinking; what if the same thing happened with brewing ingredients? Even though there were a few issues with delivering homebrew supplies during lockdown, I'm glad to say that they never actually ran out. But could you replace some of the key components of beer if there was nothing else or you were running low on your usual supplies, and what could you use?

This is a dilemma that has been faced by people across the world and throughout time, and we can learn a lot from them. Whether it's because Viking raiders burned down your barn, the latest supply ship to your New World colony is late, or 20th century wartime rationing, brewers have had to make do with what they have. And, to a lesser extent, it's a problem any one of us could face at any time. Even when there isn't a global pandemic to contend with, we may simply wake up on brew day to find out we have less malt than we thought we had, or the yeast we were planning to use is long past its expiration date. Thankfully, this needn't put a stop to your brewing pleasure. Through this article I'll go into detail about a whole bunch of things you might consider, depending on what you have available to you.

Before getting into ingredients to substitute, my first recommendation if you are short on ingredients would be to get in touch with your local microbrewery. Especially during the pandemic, many are still struggling due to restrictions and have had to scale back brewing, so they may have surplus ingredients. Give them a call or drop them a message, I'm sure they'd be happy to help if they can. Even when it isn't a pandemic, if you visit your local establishment enough that they recognize you, they may be happy to sell you a bit of grain in a pinch. But what if they can't . . .

KITCHEN AND GROCERY STORE

For beer to be, well, beer, malt should certainly be featured in the process. The enzymes malt contains are hard to replace, but there are ingredients you can find in any grocery store that can help to spread malt a little further when supplies are low. You may even have some of these at home right now. Those unmalted grains like rice, oats, and corn, well it's their time to shine, and other pseudo-grains like quinoa and buckwheat can also work. These will, of course, impart a different character to your beer — oats add body, for example, and buckwheat can add a nutty note. But when the chips are down, they are worth considering. Regular rolled oats for oatmeal can generally be used straight in the mash as they have been pre-gelatinized, but unprocessed grains will need to be cooked. One simple way to do this is boil them up in your mash water, allow the whole lot to cool to your strike temperature and then pour it into your mash tun with the rest of your malt, then mash as normal.

Another less obvious source of starch to eke out your precious malt is bread. Once dried at a low temperature in the oven (around 195 °F/90 °C for an hour) and broken into little chunks, it can be added directly to the mash, up to about 25% of your grist. Short on toasted malts? Cook it at a higher temperature to add a little color and flavor; it's highly versatile. One word of warning, however, is that due to the high wheat content, it can make the mash a little gummy, so it works best with brew-in-a-bag (BIAB) or with the addition of some oat husks or rice hulls if you are going above 10–15%.

Of course the whole point of mashing and malt is to make sugars for the yeast to devour, so why not cut out the middleman and just add some sugar? Sugar has been used to supplement limited malt supplies for centuries, so much so that in some beer styles it has become almost an essential component. So there is no reason why you couldn't use it to boost your original gravity (OG) in the event of a malt shortage. And yes I do mean ordinary, white sugar; for most beers, a 10% addition of this should have little or no noticeable impact on flavor and body. Other kinds (brown sugar, maple syrup, molasses, etc.) will do the same job, but may have a bigger impact on flavor, especially on pale beers. Because it also doesn't require mashing, this works just as well for all you extract brewers out there. Keep in mind that about 1.7 oz./gallon (13 g/L) will raise your gravity by five points (i.e. from 1.050 to 1.055).

What about yeast? Bread yeast will do if you have nothing else. In parts of Northern and Eastern Europe, bread yeast is used routinely to produce excellent farmhouse beers such as Sahti and Koduõlu, usually imparting banana and clove flavors similar to wheat beers. However, these yeasts often have a much higher bacterial content than brewing yeasts, which can result in souring. But those clever Finns and Estonians have deduced that by chilling their beer as soon as it has finished fermenting — essentially lagering it — they can prevent this from happening.

When you consider that hops are essentially a flavoring, even a seasoning, it isn't hard to find alternatives around your home. Your first stop should be your spice rack. I have made some fantastic beers with rosemary, cinnamon, nutmeg, and bay leaves, and I'm sure many of you have used coriander in Belgian-style beers. But what if you like the big, fruity flavors of IPAs? Well, you can take inspiration from the flavors and aromas used to describe your favorite hops. Does it give you grapefruit notes? Add some grapefruit zest at the end of your boil. Looking for a hint of mango? Add some puree to your fermenter. Lemongrass more your thing? Make a tea from it and add at racking.

Some herbs, such as sage and thyme, can provide a certain degree of bitterness, and you can even use the green, leafy parts of carrot tops for

Photo by Shutterstock.com

Short on malt? Adding sugar is an easy way to boost the gravity. In small percentages, white sugar will have little impact on flavor or mouthfeel. Darker sugars may impact flavor — use that to your advantage.

this purpose at a push, but they may not provide the "clean" bitterness you're used to from hops. Therefore, it might be best to prioritize whatever hops you do have for providing IBUs, or check out the "Going Wild" section later.

Your home can even be a source of sanitizer. If you've run out of Star San, or whatever chemical sanitizer you normally use, go and find some household bleach. The best kind is unscented and does not contain sodium laureth sulfate, but really any will do. Add 1 tablespoon to 5 gallons (19 L) of water and soak your equipment in this for at least 20 minutes before rinsing thoroughly (do not use bleach on stainless steel, as it may cause the metal to corrode or pit).

Photos by Ben Martin

Dry the popcorn when the sprouts on most popcorn kernels are double the length of the kernel (shown in top image). Once dry, put kernels in a pillowcase and shake to knock the withered shoots off. The shoots can then be sifted out using a colander (shown in bottom image).

MAKE YOUR OWN

If you have a bit more time on your hands, making your own brewing ingredients from scratch can be a fun and rewarding project that you can do with ingredients found in most grocery stores.

One of the easiest ways to make your own brewing malt is with regular popping corn from the store. Simply soak some corn in a bucket of water for 8–10 hours at room temperature, then drain the corn and let it sit for 3–8 hours. Repeat this process four times, then after the final draining, spread the corn on trays and cover them with a damp cloth. Leave it like this for several days, but be sure to gently turn the corn several times a day and remove any that have gone moldy. Once they have sprouted and the sprouts on most are twice the length of the corn kernels, you will need to dry them. The easiest way to do this is with a food dehydrator, but failing that you can put them at the bottom of your oven on the lowest setting with the door slightly propped open. You do not want to cook them or you will destroy the enzymes you need for mashing. Once your corn is nice and dry and the shoots are all withered, put it in a pillowcase, tightly tie the top, and thrash it around. This will knock off all the shoots, which you can then sift out with a colander. All you need to do then is crush your malted corn and you're ready to brew! It even has the added bonus of being gluten-free. You can mash malted corn as you would any other malt, but because it is likely to be less well modified than professionally-made malt, you might want to consider a decoction mash, doing a temperature-step mash, or even a longer single infusion mash to get the best out of it.

You can malt other types of grain and pseudo-grain too, including millet, buckwheat, quinoa, and sorghum, as well as barley, wheat, and rye. However, the exact conditions they need for malting will depend on the grain you are using, so have a look online. You'll also need to find wholegrain that hasn't been dehusked or heat treated, which can be tricky, but whole food stores can often help.

If you have any bottle-conditioned beer (that is, bottled beer with a live yeast sediment at the bottom) you can cultivate this yeast to ferment your own beer with. The beer can be homebrewed or professionally made, either is fine, but the fresher it is, the more

likely you are to find live yeast in it. Obviously filtered beer will not work. First, take your selected bottle and let it warm up to room temperature. Sanitize the entire outside surface of the bottle and the bottle opener. Open the bottle, sanitize the mouth of the bottle, then pour out the beer, leaving the yeasty dregs at the bottom. Make a small batch of weak wort (about 1.020) and pour one tablespoon into the bottle. Cover the mouth with a piece of sanitized kitchen foil. Leave for three days at room temperature (about 68–77 °F/20–25 °C) and, if all goes well, you should see some foam forming on the top. Next step is to make 5 oz. (150 mL) of a slightly stronger wort (about 1.030 or with 0.4 oz./11 g dried malt extract), pour this into a sanitized jar and then, when cool, add the contents of the bottle and cover with sanitized foil again. Leave for three days at room temperature, swirling the jar occasionally. Finally, make a 1.5-qt. (1500-mL) batch of wort at about 1.040 (with 5.5 oz./156 g DME), pour this into a sanitized glass container, such as a carboy, and add the contents of the jar. Cover the mouth with sanitized foil, keep at room temperature for three days, and then you should be ready to add it to a 5-gallon (19-L) batch of homebrew.

Happily, you won't need to do this each time you brew. When your full-size batch of beer has finished fermenting and you've racked it, boil a mason jar in water, allow it to cool and then pour some of the yeasty sludge from the bottom of your fermenter into it, seal it up tight and store it in the fridge. It should keep for at least a few weeks if not longer. When you are ready to use it, allow it to warm back up to room temperature and pour it into your next brew. I've done this with liquid and dry yeasts and it works well, as long as you follow good sanitation.

GOING WILD

When it comes to using wild ingredients in your beers, it is really important to get yourself a good quality guidebook to plants in your local area. Even plants that are edible in one part of the world may have look-a-like cousins in another that are toxic. Always make sure that what you are foraging is definitely what you think it is, and ditch it if there is any doubt. Beer isn't worth poisoning yourself for. And be sure to check what local laws are regarding foraging.

That said, people all over the world have been using wild plants to flavor and ferment beers for thousands of years. Some of these grow all over North America and Europe and can be used as a direct substitute for hops. For example, the wild herbs mugwort, horehound, yarrow, and ground ivy (also known as creeping Charlie or alehoof) were all used to add bitterness to beers in England and Belgium before hops became more commonly used. As recently as the 1800s, ground ivy was used in the making of Pennsylvania swankey. Even easy-to-identify plants like dandelion and stinging nettle can be used. If you're looking for something to add aroma in place of hops, you could try elderflowers, pine needles, juniper berries, or the young branches and tips of spruce and fir trees. There's also a multitude of wild fruits and berries that can add unique and interesting flavors to beers when hops are in short supply.

When you think of wild beers, you probably think of sour, spontaneously-fermented beers like lambics. If you have run out of yeast, leaving your brew kettle outside to cool down overnight and become inoculated with wild yeast and bacteria is certainly one way to deal with your problem, but it's not the only way to gather wild yeast. Another approach, which gives you much more

Photo by Shutterstock.com

Wild yeast can be captured from fruits and plants. I have used yeast from wild plums to great success after building it up in wort.

Pantry Brews

To Better Times (Farmhouse Table Beer)

(5 gallons/19 L, all-grain)
OG = 1.035 FG = 1.007
IBU = 10 SRM = 3 ABV = 3.7%

This recipe was created with one purpose in mind — to make a refreshing, tasty beer out of very little. The hops used are an illustration, but really any will do — the first time I made it, I just used a handful of wild hops.

INGREDIENTS

2.5 lbs. (1.13 kg) 2-row pale ale malt
2.5 lbs. (1.13 kg) Pilsner malt
1.9 lbs. (860 g) rolled oats/oatmeal
10 oz. (283 g) dried bread (made from about 1 lb./0.45 kg fresh bread)
3.3 AAU East Kent Golding hops (30 min.) (0.6 oz./17 g at 5.7% alpha acids)
25–30 bay leaves (30 min.)
Omega Yeast Labs OYL-033 (Jovaru Lithuanian Farmhouse), Lallemand Belle Saison, or bread yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Before brewing, dry the bread in the oven at 195 °F (90 °C), turning occasionally, for an hour or until completely dry, then break into small chunks. Mash all the grains and bread at around 149 °F (65 °C) for one hour. Collect 5.5 gallons (21 L) of wort in the kettle and boil for 30 minutes, adding the hops and bay leaves as soon as the boil begins.

At the end of the boil, remove the hops and bay leaves, then chill the wort to around 86 °F (30 °C) and aerate well before pitching the yeast. Ferment at 86 °F (30 °C) for five days, then chill to around 39 °F (4 °C), if possible, for two days. Rack to keg or bottles and either prime with the sugar or keg and force carbonate to around 2.0–2.5 volumes.

Crooked Nail Rustic Ale

(5 gallons/19 L, all-grain)
OG = 1.045 FG = 1.010
IBU = No hops SRM = 9 ABV = 4.6%

With no hops, homemade base malt, and recycled yeast, this beer is pretty rustic, but the wild herbs perfectly complement the grain bill to give a rich, earthy flavor. This brew uses a hybrid temperature step mash and cereal mash to get the most out of the home-malted corn.

INGREDIENTS

6.3 lbs. (2.86 kg) popping corn
2 lbs. (0.91 kg) Munich malt
13 oz. (370 g) rye malt
10 oz. (285 g) medium crystal malt (60 °L)
0.6 oz. (17 g) dried ground ivy (60 min.)
1.3 oz. (37 g) dried mugwort (60 min.)
1–1.5 cups of SafAle S-04 yeast trub from a previous batch (or other yeast trub)
¾ cup corn sugar (if priming)

STEP BY STEP

You will need to malt the popping corn 8–10 days before brewing according to the instructions on page 45, making about 5.7 lbs. (2.56 kg) of corn malt.

On brew day, heat 1.75 gallons (6.7 L) of water to around 109–111 °F (43–44 °C) and stir in the crushed corn malt to achieve an initial mash temperature of around 104 °F (40 °C). Hold it at this temperature for 30 minutes. Then add 2 quarts (1.9 L) of boiling water to raise the mash temperature to around 122 °F (50 °C) and hold at this temperature for 30 minutes. Then drain off 1.5 gallons (5.7 L) of the mash liquid and store this in the fridge (you will need this later). Add 0.8 gallons (3 L) of boiling water to the mash to raise the temperature to around 152–154 °F (67–68 °C) and hold it at this temperature for 30 minutes. Add another gallon (3.8 L) of water and heat the mash to around 194 °F (90 °C), holding at this temperature for 30 minutes. Cool to 169 °F (76 °C), then add the other malts and the 1.5 gallons (5.7 L) of liquid from the fridge and reheat the mash to 151 °F (66 °C) and hold at this temperature for 2 hours. Sparge with 170 °F (77 °C) water to collect 6 gallons (23 L) of wort.

Boil the wort for 60 minutes, adding the mugwort and ground ivy at the start of the boil. At the end of the boil, remove the mugwort and ground ivy, then chill the wort to around 68 °F (20 °C) and aerate well before pitching the yeast. Ferment at 68 °F (20 °C) for 7 days, then chill to around 39 °F (4 °C), if possible, for two days. Rack to keg or bottles and either prime with the sugar or carbonate to around 2.0–2.5 volumes.

Photo by Ben Martin

control over the process, is to capture it from fruits and flowers. This method is very similar to the way we build up yeast from bottle dregs, as described earlier. First, find some edible flowers or berries (I've used dandelion and clover flowers, as well as wild plums). Drop these into a small, sanitized jar of weak wort, cover and keep at room temperature for a few days. If you start to see signs of fermentation (bubbles, suspended yeast, etc.), then remove the fruit or flowers and follow the same process as with the beer dregs, moving the yeast into successively larger amounts of stronger wort until you have enough to pitch into a full batch. However, if you get mold or bad smells (vinegar, baby diaper, vomit, etc.), then ditch it and start again.

WHEN ALL ELSE FAILS

My mom grew up in a tough neighborhood and if she taught me anything, it's this — cut your cloth to suit your means. Sure, you might have had your heart set on making a double IPA or imperial stout, but if you have no prospect of getting fresh supplies anytime soon, maybe you could use those ingredients to make a couple of batches of something more sessionable, rather than just one strong one. This approach basically kept Britain brewing through two World Wars. Whilst things like meat and butter were rationed, beer never was because national leaders feared it would impact morale too much. But with grain supplies critically low, brewers were repeatedly forced to cut the strength of beer. It is no coincidence that ordinary bitter and dark mild were popular at the time; judicious use of crystal and chocolate malts allowed brewers to make tasty beers with less grain and hops.

If you are determined to make something stronger then you should consider a parti-gyle approach; whereby you make another weaker beer with the second runnings from your mash. Once you've collected all the wort you need for your strong beer, you just continue sparging your mash, but collect this wort in a separate vessel. You may only collect a gallon or two (4–8 L) before it starts getting too weak, but you can make a nice table beer with it. I've done this when making an imperial stout and got an additional 2.5 gallons (9.5 L) of amber ale that was just lovely.

It can be easy to view a shortage of ingredients as a disaster, but a different way to look at it is as an opportunity for experimentation. Remember that necessity is the mother of invention, and necessity has created some of our most beloved beer styles. If refrigeration had been available in the 1800s, for example, California common would never have been invented. For centuries saison and other farmhouse ales were brewed with whatever was available. By trying out some new or unusual ingredients and techniques to make your limited supplies go further, you might just find a fantastic new beer.

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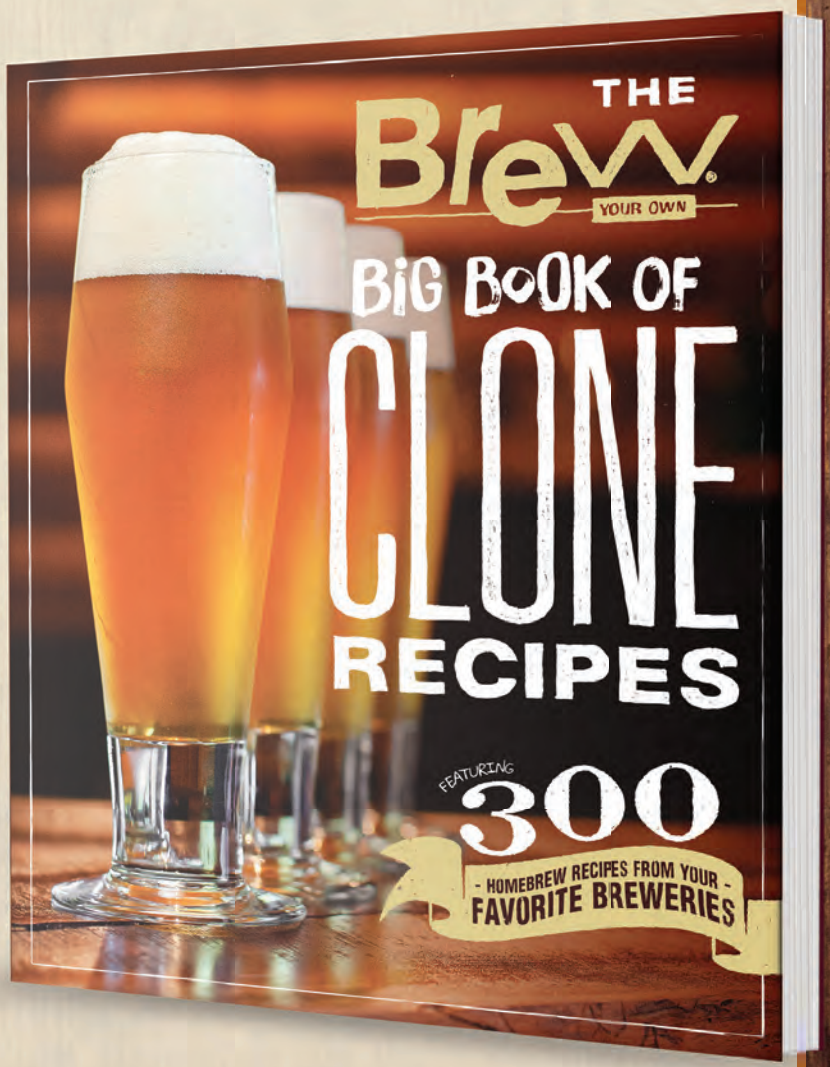

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THE RISE OF BRAZILIAN BEER

Tapping into local culture and ingredients

by Gordon Strong

I think most people know that I enjoy traveling for beer, whether I'm judging, teaching, brewing, consulting, giving judging exams, or just being a beer tourist. I have greatly enjoyed most of the places I've visited over the years, but Brazil will always have a special place in my heart. From my first trip there nearly ten years ago to my last travel prior to the coronavirus lockdowns, Brazil has never failed to impress me with its scenic beauty, friendly people, and passion for craft beer.

Brazil is a very large country in South America, the fifth largest by land mass in the world (a little larger than the continental U.S.) and the sixth in population with over 200 million citizens. Over 20 million people live in São Paulo, the capital city, and many people live in coastal cities. The Amazon River basin dominates the northern portion of the country, and there are several inland mountainous areas across the country as well. Much of Brazil's industry has historically been based on agriculture and natural resources.

As the equator runs through the northern part of the country, Brazil in general has a very warm climate — a factor that greatly influenced the development of beer. Brazil is different from most Latin American countries in that its people speak Portuguese, not Spanish. Brazil is fairly advanced for Latin America, but I would still consider it a developing country. English is taught in school, so many people I have met speak at least some English, which helps them with much of the brewing literature. American television and media are available, and does seem to have had an influence on popular culture. So, the population is diverse, generally educated and industrious, and very thirsty for good beer.

Photo by Charles A. Parker/Images Plus

CRAFT BEER IN DEVELOPING COUNTRIES

Brazil is similar to many other countries I have visited when it comes to craft beer. The industry is relatively new (maybe within the last 20 years, although much has been accomplished in the last 10 years). Similar to the U.S. in the 1970s and many other countries without a traditional brewing industry, Brazil's beer market was previously dominated by a few brands that produced industrial lager. Then craft beer introduced new products, but many consumers don't really understand them. In some countries that have craft beer, brewers are rediscovering historical styles — this isn't the case in Brazil since there really weren't any.

Even with countries with some traditional brewing industry (such as Ireland and Australia), I have seen modern craft beer have a strongly American influence. Modern styles such as hazy IPAs are competing with more established traditional styles, and some breweries are very focused on experimentation and trying out new techniques and styles. Some breweries are trying to develop barrel programs, while others are incorporating local ingredients. Here is an area where I think Brazil does have an advantage — more about that later.

Many of the larger or more well-established craft brewers have been purchased by Anheuser-Busch InBev. There is some resentment among craft brewers and consumers over this trend, and there is a growing desire to recognize independence among craft brewers, similar to trends in other countries. There are many micro- or nano-breweries with small capacities; it seems like the barrier to becoming a commercial brewery are low (or are ignored), although it is often difficult to source equipment and ingredients.

Homebrewing is well-established in Brazil, and it is often difficult to tell the difference between homebrewers and small commercial brewers. I'm not sure of the legalities, so I often don't ask too many of those questions. But there is definitely a path for homebrewers to go pro, as well as working in larger breweries.

I often get asked questions about the Brazilian beer identity, or what I think of their beer culture. Those questions are difficult to answer, as I think Brazilians are searching for these answers themselves. I think they are producing good quality beer in general, but they seem to think they are missing something. Maybe it's a desire to be well-known, but I think that producing quality beer is a good goal.

OBSERVATIONS ABOUT BRAZIL

When I first came to Brazil a decade ago, I only had two comments about their beer — "too sweet" and "too cold." People would get defensive and try to justify why this was the case ("we are a hot country" or "people grow up eating a lot of sugar"). Maybe they thought I was attacking them; but they asked what I thought of their beer. I guess they weren't really ready for an honest answer, but it was certainly accurate for the time.

Thankfully, that time has changed. Much of the beer I have tried recently would be welcome anywhere in the world. Crisp, dry IPAs; clean, well-attenuated lagers; tart, fresh sour beers; and many others. Sure, there are some that aren't so good, but the quality in general is among the best in Latin America. The most popular styles that just about every brewery has seem to be Pilsner, IPA, and weissbier. Some regions also have many traditional German styles, stouts and strong beers are well-known, and black IPA is also popular.

I had many brewers tell me they use the Beer Judge Certification Program (BJCP) Style Guidelines almost as a recipe book — inspiration for new styles, and descriptions of what the beers should taste like. I had no idea the guidelines were used this way; I was flattered and humbled, and feel a greater responsibility to think globally when describing styles.

Homebrewers seem to be organized into state-level groups called ACervA (short for *Associação dos Cervejeiros Artesanais*, or Association of Craft Brewers). I have seen more homebrewing competitions in Brazil than elsewhere in Latin America, and there is a national championship. Commercial competitions are common, as with most other countries, but Brazil runs the largest in Latin America — the *Concurso Brasileiro de Cervejas* (Brazilian Beer Competition). Held in Blumenau in the southern state of Santa Catarina, this is the competition I judged at just prior to coronavirus. Blumenau is an interesting city, like a little Bavarian village dropped into the mountains thousands of miles away.

Interestingly, Blumenau was the first city I visited in Brazil. I remember having *feijoada* (one of their famous national dishes, a hearty bean and meat stew) with Pete Slosberg on a Wednesday (Brazilians only eat this

Photo by Gordon Strong

A flight of Catharina sours featuring different fruits judged at a Brazilian homebrew competition.

Photo by Shutterstock.com

With such a diverse and interesting array of fruits grown in Brazil, as shown here at the traditional market in the country's most populous city of São Paulo, brewers are incorporating them more and more into their beers — resulting in unique flavors in styles such as Brazil's Catharina sour.

dish on weekends so they all thought we were crazy). It was here I learned that Brazilians consider bottled beer and draft beer two different products (*cerveja* and *chopp,* respectively) with different laws. I saw *cerveja* pasteurized (which harmed the character of IPAs and fruit beers) in order to protect it from rapid spoilage when being transported in the hot weather. *Chopp* is unpasteurized and typically very fresh beer, but not a distinct beer style.

I have been to homebrew club meetings all over Brazil, from Recife and Salvador in the Northeast to Ribeirão Preto and São Paulo in the Southeast to Porto Alegre, Caxias do Sul, and Florianópolis in the South. Homebrewers are alike around the world; people are friendly and curious, interested in learning new things, and they all enjoy good beer. Many of them are proud to show off their home areas, and to have you sample their best beer.

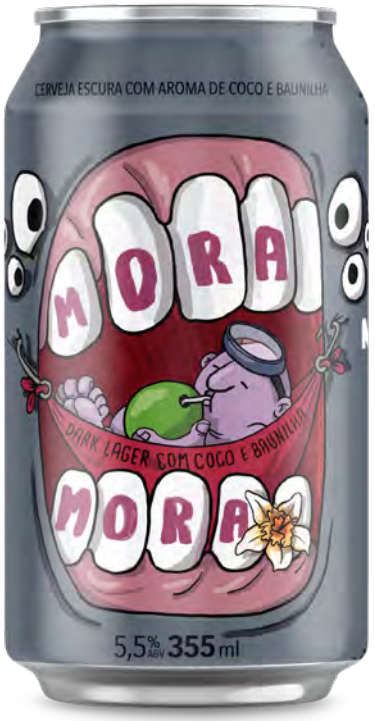
I have made several collaboration brews with Brazilian breweries and homebrewers. I made a batch of mead on my first trip using mango, lime, mint, and chiles, as well as one with a Brazilian fruit called *jaboticaba,* kind of a cross between a grape and a blueberry. I brewed a double IPA with honey and Mosaic® hops with Cervejaria Seasons, a dry-hopped grisette with Salvador Brewing, a grape ale with local Moscato grapes and Amarillo® and Mandarina Bavaria hops at Cervejaria 4 Árvores, and a mango-passion fruit Catharina sour with Armada Cervejeira.

Having observed those working in and around the beer industry, I noticed a group of people known as beer sommeliers at work. Sort of like beer experts and consultants, I see this group doing consumer education and training, as well as consulting with bars and restaurants on pairings and building a good beer menu. I have many friends in this group, and many are also BJCP judges. Brazil also seems to have many independent schools for those interested in learning about beer and brewing, such as the Escola Superior de Cerveja e Malte (college of beer and malt) in Blumenau. Not like university programs, the equivalent in the U.S. might be the Siebel Institute. But it's interesting to see that there is a market for beer education and training.

UNIQUE BRAZILIAN INGREDIENTS

Like elsewhere in Latin America, malt extract is unknown so all brewers are all-grain brewers. Use of dry yeast is widespread, although there is some domestic liquid yeast being made (Levteck is one producer in Florianópolis). It is easy to get local base malts, as those are used by the big breweries. Imported German malts such as Weyermann are common, but those from other countries are less common. There are some local producers of specialty malts. Hops are not commonly produced, so imported pellets are most frequently used.

When I judge in South America, I often ask to be placed on flights with fruit beers, spice beers, and wood-aged beers so I can learn more about local ingredients. When not drinking beer, I often enjoy the local cocktail scene. Brazil is known for its famous distilled spirit, *cachaça,* made from sugar cane, and the cocktail made with it, the *caipirinha. Cachaça* is a little like rum, but it is sometimes aged in wood barrels, and a *caipirinha* is a little like a more limey mojito without the mint.



CERVEJARIA NARCOSE'S MORA MORA CLONE

(5 gallons/19 L, all-grain)
OG = 1.055 FG = 1.013
IBU = 20 SRM = 23 ABV = 5.5%

Mora Mora is a dark lager with coconut and vanilla brewed by Cervejaria Narcose in Capão da Canoa, Brazil.

INGREDIENTS

6 lbs. (2.7 kg) Pilsner malt
4 lbs. (1.8 kg) flaked rice
10 oz. (283 g) dark Munich malt
10 oz. (283 g) Caramunich® I malt
6 oz. (170 g) Carafa® Special I malt
4 oz. (113 g) roasted barley
1 lb. (454 g) rice hulls
5 AAU Magnum hops (first wort hop) (0.5 oz./14 g at 10% alpha acids)
10 oz. (283 g) shredded coconut, toasted
Natural vanilla extract to taste
SafLager W-34/70, or Wyeast 2124 (Bohemian Lager), or White Labs WLP830 (German Lager) 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. calcium chloride to the mash.

This recipe uses a step mash. Mash the Pilsner and dark Munich malts and the flaked rice in 16 quarts (15 L) water at 140 °F (60 °C) then step to 151 °F (66 °C) for 30 minutes. Step to 162 °F (72 °C) for 30 minutes. Add the rice hulls and dark grains, mix well. Begin recirculating, then raise to 172 °F (78 °C) for 10 minutes. Allow a good filter bed to form with the rice hulls, keep recirculating.

Add the first wort hops in the kettle during sparging. Sparge slowly and collect 6.5 gallons (24.5 L) of wort. Boil the wort for 60 minutes.

Chill the wort to 50 °F (10 °C), pitch the yeast, and ferment for three days. Raise the temperature to 54 °F (12 °C), add the toasted coconut, ferment for one day. Raise the temperature to 57 °F (14 °C) until the beer reaches attenuation. Add vanilla extract before packaging.

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

CERVEJARIA NARCOSE'S MORA MORA CLONE

(5 gallons/19 L,
extract with grains)
OG = 1.055 FG = 1.013
IBU = 20 SRM = 23 ABV = 5.5%

INGREDIENTS

3.3 lbs. (1.5 kg) Pilsen dried malt extract
2.6 lbs. (1.18 kg) rice syrup
10 oz. (283 g) dark Munich malt
10 oz. (283 g) Caramunich® I malt
6 oz. (170 g) Carafa® Special I malt
4 oz. (113 g) roasted barley
5 AAU Magnum hops (first wort hop) (0.5 oz./14 g at 10% alpha acids)
10 oz. (283 g) shredded coconut, toasted
Natural vanilla extract to taste
SafLager W-34/70, or Wyeast 2124 (Bohemian Lager), or White Labs WLP830 (German Lager) 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). Steep the malts for 30 minutes. Remove and rinse. Turn off the heat. Add the malt extract and rice syrup and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on, add the hops, and bring to a boil.

Boil the wort for 60 minutes, adding hops at the times indicated in the recipe.

Chill the wort to 50 °F (10 °C), pitch the yeast, and ferment for three days. Raise the temperature to 54 °F (12 °C), add the toasted coconut, ferment for one day. Raise the temperature to 57 °F (14 °C) until the beer reaches attenuation. Add vanilla extract before packaging.

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

TIPS FOR SUCCESS:

Narcose makes their own vanilla extract, but for coconut uses commercial shredded toasted coconut. They soak cut up vanilla pods in grain alcohol to extract vanilla flavor. The usage rate varies based on extraction time and the quality of the vanilla, so they always do it to taste. Commercial (real) vanilla extract could be a substitute — added to taste.

Special thanks to Daniel Diehl of Cervejaria Narcose for providing us with this recipe.

CERVEJARIA UNIKA'S CATHARINA SOUR WITH STRAWBERRY & COFFEE CLONE

(5 gallons/19 L, all-grain)
OG = 1.049 FG = 1.008
IBU = 9 SRM = 3 ABV = 5.5%

A unique take on Catharina sour with the addition of strawberries and coffee from UNIKA, in Rancho Queimado, Brazil.

INGREDIENTS

6 lbs. (2.7 kg) Pilsner malt
4 lbs. (1.8 kg) wheat malt
10 AAU Citra® hops (whirlpool)
(0.67 oz./19 g at 15% alpha acids)
14 lbs. (6.4 kg) fresh strawberries
24 oz. (700 mL) cold-brewed coffee (light-bodied, fruity)
1.25 g *Lactobacillus plantarum*
1.25 g *Lactobacillus casei*
SafAle US-05, or Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) 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. calcium chloride to the mash.

This recipe uses a kettle souring method. In 15 quarts (14 L) water, mash the grain at 154 °F (68 °C) for 45 minutes. Sparge slowly and collect 6.5 gallons (24.5 L) of wort. Boil for 30 minutes without hops. Cool to 97 °F (36 °C) and pitch the *Lactobacillus*. Let it sour until a pH of 3.2 is reached (usually 36–48 hours). Boil for 45 minutes, adding the hops in the whirlpool after the boil is complete. Cool to 68 °F (20 °C) and pitch the ale yeast. More yeast than is normal may be needed due to the low pH.

Add the strawberries on the third day of active fermentation. Do not wait for fermentation to slow down, they must be added at high kräusen. The fermentation temperature can rise as high as 73 °F (23 °C), allow to ferment to completion. Cold crash the beer, rack off, then add the cold brewed coffee at packaging.

Prime and bottle condition, or keg and force carbonate.

CERVEJARIA UNIKA'S CATHARINA SOUR WITH STRAWBERRY & COFFEE CLONE

(5 gallons/19 L, extract only)
OG = 1.049 FG = 1.008
IBU = 7 SRM = 3 ABV = 5.5%

INGREDIENTS

6.6 lbs. (3 kg) wheat liquid malt extract
10 AAU Citra® hops (whirlpool)
(0.67 oz./19 g at 15% alpha acids)
14 lbs. (6.4 kg) fresh strawberries
24 oz. (700 mL) cold-brewed coffee (light-bodied, fruity)
1.25 g *Lactobacillus plantarum*
1.25 g *Lactobacillus casei*
SafAle US-05, or Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) 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) and then turn off the heat. Add the malt extract and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil.

Boil for 30 minutes without hops. Cool to 97 °F (36 °C) and pitch the *Lactobacillus*. Let it sour until a pH of 3.2 is reached (usually 36–48 hours). Boil for 45 minutes, adding the hops in the whirlpool after the boil is complete. Cool to 68 °F (20 °C) and pitch the ale yeast. More yeast than is normal may be needed due to the low pH.

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

TIPS FOR SUCCESS:

The strawberries are prepared by washing, coring, and running them through a juicer, then using the juice and pulp. This is to create more surface area. Use very fresh, ripe strawberries in season. If strawberries are frozen, make sure they are frozen for no more than a week or two. Make sure to account for the extra volume needed in your fermenter for the strawberries.

The coffee is prepared by the cold brew method. Using a 7:1 ratio of water to coffee (7 oz. water per oz. of coffee beans by weight or 700 mL water per 100 g of coffee), combine coarsely ground coffee with cold filtered water, and let steep for 12 hours. Strain the coffee or use a French press. Use the indicated amount of the liquid coffee; measure the finished amount of liquid for the recipe. Use very fresh coffee, preferably from a local roaster who can grind it for you — be sure to tell them it's for cold brew so they grind it coarsely.

Lactobacillus can be a pure pitch or obtained through probiotic drinks. The brewery uses *Lactobacillus* from an Italian pharmaceutical supplier, www.probiotical.com. It comes in 50 g sachets; they use 50 g of each in a 211-gallon (800-L) batch, so 2.5 g total should suffice for a 5-gallon (19-L) batch. Many brewers use just *plantarum*, so it isn't vital to source both varieties. They switched from using probiotic drinks to make the product vegan-friendly, not because of problems with probiotics.

Special thanks to Vinicius Carpentieri of Cervejaria UNIKA for providing us with this recipe.

ALEM BIER'S MUSCAT BRETT SAISON CLONE

(5 gallons/19 L, all-grain)
OG = 1.056 FG = 1.007
IBU = 13 SRM = 3 ABV = 6.8%

This saison with Brettanomyces *from Alem Bier in Flores da Cunha, Brazil incorporates local Muscat grapes.*

INGREDIENTS

11.5 lbs. (5.2 kg) Pilsner malt
7 AAU Magnum hops (60 min.) (0.7 oz./20 g at 10% alpha acids)
1.25 gallons (5 L) Muscat grape must
French oak, medium toast
Bio4 Saison and LevTeck B1 (Brettanomyces blend), or Wyeast 3711 (French Saison) and White Labs WLP650 (Brettanomyces bruxellensis), or The Yeast Bay WLP4636 (Saison/Brettanomyces Blend II)
⅞ 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 0.5 tsp. calcium chloride and 0.5 tsp. of calcium sulfate to the mash.

This recipe uses a step mash. In 18 quarts (17 L) water, mash in at 104 °F (40 °C) for 10 minutes. Raise to 126 °F (52 °C) for 10 minutes. Raise to 144 °F (62 °C) for 60 minutes. Raise to 153 °F (67 °C) for 10 minutes. Mash out at 169 °F (76 °C) for 15 minutes, recirculating.

Sparge slowly and collect 6.5 gallons (24.5 L) of wort.

Boil the wort for 60 minutes, adding hops at the beginning of the boil.

Chill the wort to 79 °F (26 °C), pitch the yeast, and ferment. When the beer is about 1.020 gravity, add the grape must, and ferment until complete.

At the brewery, this beer is aged in an old French oak barrel that had Ancellotta wine in it (an Italian grape variety with plantings in Brazil). *Brettanomyces* was pitched in the barrels. This can be simulated by using French oak cubes or spirals, pre-boiled for 15 minutes prior to use. Use 1 oz. (28 g) of oak for 9–12 months along with the *Brett*. Age the beer at cellar temperatures, 54–62 °F (12–17 °C), during this time.

Rack the beer, prime, and bottle condition, or keg and force carbonate to a high carbonation level.

ALEM BIER'S MUSCAT BRETT SAISON CLONE

(5 gallons/19 L, extract only)
OG = 1.056 FG = 1.007
IBU = 26 SRM = 3 ABV = 6.8%

INGREDIENTS

6.2 lbs. (2.8 kg) Pilsen dried malt extract
7 AAU Magnum hops (60 min.) (0.7 oz./20 g at 10% alpha acids)
1.25 gallons (5 L) Muscat grape must
French oak, medium toast
Bio4 Saison and LevTeck B1 (Brettanomyces blend), or Wyeast 3711 (French Saison) and White Labs WLP650 (Brettanomyces bruxellensis), or The Yeast Bay WLP4636 (Saison/Brettanomyces Blend II)
⅞ 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 malt extract and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil.

Boil the wort for 60 minutes, adding hops at the times indicated in the recipe.

Chill the wort to 79 °F (26 °C), pitch the yeast, and ferment. When the beer is about 1.020 gravity, add the grape must, and ferment until complete.

At the brewery, this beer is aged in an old French oak barrel that had Ancellotta wine in it (an Italian grape variety with plantings in Brazil). *Brettanomyces* was pitched in the barrels. This can be simulated by using French oak cubes or spirals, pre-boiled for 15 minutes prior to use. Use 1 oz. (28 g) of oak for 9–12 months along with the *Brett*. Age the beer at cellar temperatures, 54–62 °F (12–17 °C), during this time.

Rack the beer, prime, and bottle condition, or keg and force carbonate to a high carbonation level.

TIPS FOR SUCCESS:

The yeasts used by Alem Bier are Brazilian, so some substitution is probably necessary (we've provided a couple of suggestions) but you could substitute with some other favorites of yours. Use a saison strain that is not overly clove-like. The *Brett* blend is mostly *B. bruxellensis*, but it is not very funky — it is floral and fruity. The *Brett* can take the beer down to 1.000 gravity.

The Moscato (Muscat) grape is very fresh, peachy, and floral in character. The target combination of the beer is to be floral and fruity with a bubbly texture, like a high-quality Asti sparkling wine.

The beer I judged was aged in the bottle for a further year and a half; two years would be a good target if you can wait that long.

Special thanks to Carlo Mioranza of Alem Bier for providing this recipe.

IMPERIAL STOUT WITH DRIED MUSHROOMS AND *CUMARU*

(5 gallons/19 L, all-grain)
OG = 1.097 FG = 1.017
IBU = 61 SRM = 80 ABV = 10.6%

Courtesy of Daniel Ropelato, this imperial stout incorporates dried mushrooms and the unique flavors of cumaru *seeds (tonka beans).*

INGREDIENTS

10 lbs. (4.5 kg) pale ale malt
3 lbs. (1.4 kg) flaked oats
1.5 lbs. (680 g) Caramunich® III malt
2.5 lbs. (1.1 kg) Carafa® III malt
3 lbs. (1.4 kg) Belgian dark candi syrup, D-90
3.7 AAU Challenger hops (first wort hop) (0.5 oz./14 g at 7.5% alpha acids)
7.5 AAU Challenger hops (60 min.) (1 oz./28 g at 7.5% alpha acids)
7.5 AAU Challenger hops (30 min.) (1 oz./28 g at 7.5% alpha acids)
7.5 AAU Challenger hops (10 min.) (1 oz./28 g at 7.5% alpha acids)
1 oz. (28 g) dried porcini mushrooms
8 *cumaru* beans (or use vanilla extract, to taste)
SafAle S-04, or Wyeast 1028 (London Ale), or LalBrew Nottingham 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. calcium chloride to the mash.

This recipe uses a step mash. In 26 quarts (25 L) water, mash the pale ale malt and flaked oats at 126 °F (52 °C) for 10 minutes. Raise to 156 °F (69 °C) and hold for 120 minutes. Start recirculating wort. Add the Carafa® and Caramunich® malts and raise the temperature to 168 °F (76 °C) for 15 minutes. Sparge slowly and collect 6.5 gallons (24.5 L) of wort.

Boil the wort for 90 minutes, adding hops at the times indicated. First wort hops go in the kettle prior to sparging. Add the candi syrup at the end of the boil and stir well until dissolved.

Chill the wort to 68 °F (20 °C), pitch the yeast, and ferment until complete.

Make a mushroom extract by soaking mushrooms in 100 mL (a little less than half a cup) of vodka while the beer is fermenting. Strain the extract off the mushrooms prior to adding. Make *cumaru* extract by soaking 8 whole beans in 300 mL of vodka for at least two months. Strain and use to taste; start with about 10 mL. Add the mushroom and *cumaru* extracts at packaging to taste. Rack the beer, prime, and bottle condition, or keg and force carbonate.

IMPERIAL STOUT WITH DRIED MUSHROOMS AND *CUMARU*

(5 gallons/19 L, extract with grains)
OG = 1.097 FG = 1.017
IBU = 55 SRM = 80 ABV = 10.6%

INGREDIENTS

8.5 lbs. (3.9 kg) pale liquid malt extract
1.5 lbs. (680 g) Caramunich® III malt
2.5 lbs. (1.1 kg) Carafa® III malt
3 lbs. (1.4 kg) Belgian dark candi syrup, D-90
3.7 AAU Challenger hops (first wort hop) (0.5 oz./14 g at 7.5% alpha acids)
7.5 AAU Challenger hops (60 min.) (1 oz./28 g at 7.5% alpha acids)
7.5 AAU Challenger hops (30 min.) (1 oz./28 g at 7.5% alpha acids)
7.5 AAU Challenger hops (10 min.) (1 oz./28 g at 7.5% alpha acids)
1 oz. (28 g) dried porcini mushrooms
8 *cumaru* beans (or use vanilla extract, to taste)
SafAle S-04, or Wyeast 1028 (London Ale), or LalBrew Nottingham 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). Steep the malts for 30 minutes. Remove and rinse. Turn off the heat. Add the malt extract and stir thoroughly to dissolve completely. Turn the heat back on and bring to a boil.

Follow the remainder of the all-grain recipe instructions.

TIPS FOR SUCCESS:

The brewer called the mushrooms *funghi secchi*, but that just means dried mushrooms. He said they were Italian; further questioning led me to believe they were porcini mushrooms. I think any earthy, wild mushrooms would work, but porcinis are particularly intense. Specialty or gourmet cooking supply stores carry them.

Cumaru seeds are also called tonka beans in North America and other places (they are quite large, thumb-like in size). If you can't get your hands on *cumaru* then use vanilla (*cumaru* is sometimes called Amazon vanilla, but it has an almond-like aroma). Vanilla extract can be made in the same way as the mushroom extract, or commercial extract (natural, please) can be used. Alternatively, the batch can be split and the base beer dosed with the vanilla and mushrooms directly, then the two batches can be blended to achieve the desired flavor profile.

Dark candi syrup was all that was specified in the recipe so I would use something like D-90 candi syrup. The brewer originally made the syrup at home, so a commercial substitute is recommended.

Photo by Gordon Strong

Amburana *is the most famous Brazilian wood, but many exotic woods native to Brazil have been used to great success in their beers.*

The wood-aged beers in Brazil are impressive. The most famous wood is *amburana,* which is used to age *cachaça*. It is a very strongly-flavored wood, but has a complex spicy flavor like cinnamon and cloves, with some toasty cocoa and vanilla flavors as well. One brewery told me after they aged beer in a new *amburana* barrel for six months that they would then use that beer to blend into other beers, but using only 5% of the barrel-aged beer in the blend. Powerful, indeed. An imperial stout aged in *amburana* won best of show at this year's Concurso Brasileiro de Cervejas. In the U.S. some craft breweries have been using *amburana* as well, including Cigar City and Against the Grain.

Some other woods that have good use for beer are *bálsamo* (balsam), *castenheira* (chestnut), *ipê, jaqueira* (jackfruit), *putumuju,* and *jequitibá.* They also use *carvalho* (oak), *cedrinho* (cedar), and *eucalipto* (eucalyptus). Blending woods is common; I remember the Best of Show beer from a competition in Chile that was a Belgian dark strong ale aged with four woods. Usage rates are typically 100 g of medium-plus toast wood cubes (1 g each) per 50 L of beer (roughly 2 oz. per 5 gallons), aging from three to six months. Blending of aged and unaged beer is common to get the desired character.

Most brewers seem to use the wood directly, rather than in used barrels. There is some usage of old *cachaça* barrels, but not as common as used Bourbon barrels in the U.S. Brazil doesn't have a large wine industry so the use of old wine barrels seems to be limited to the small area where wine is produced. Barrels for beer are reused, as they are expensive, and brewers have to take the time to blend old and new beers to get the right intensity of wood flavor.

As a tropical country, Brazil has a cornucopia of fruit. I often seek out the ones with no translation into English, since those are often most perishable and likely not to be exported. Brazilians often group fruit blends, calling red and darker fruit "red fruit" (cherry, strawberry, raspberry) and pale fruit "yellow fruit" (mango, peach, guava, melon, starfruit, pineapple). One time in Brazil I was taken to a juice bar (no alcohol, surprisingly, but it was still in the morning) so I could sample many of the native juices.

Some of the more unusual fruit I have had in beer include *cajú* (the fruit, not the nut, from the cashew tree), *jaboticaba, butia* (sometimes used to flavor *cachaça*, kind of tannic and dark), *guaraná* (the cherry-like flavor in Red Bull), and *cupuaçu* (chocolate-like). Many fruits are tart and citrusy and often tannic, with complex tropical flavors and floral aromas. Every breakfast in Brazil has papaya, and many of these fruits are commonly enjoyed as juices.

Many of these fruits are featured in the Brazilian beer Catharina sour, which is a kettle soured beer that has fresh fruit added post-fermentation. As a quick beer, the clean lactic sourness provides the tart edge to the sweetness of the fruit. It is very important for this beer to use fresh, not frozen, fruit and to not pasteurize the beer. The fruit needs to taste fresh, not like jam. Sometimes these beers have herbs and spices, such as basil, to complement the fruit. I have been to many competitions where this style is the third most-frequently entered after IPA and pale ale. It's an incredibly refreshing beer perfect for the warm climate, and featuring their wonderful native fruit.

Grapes are also a popular fruit ingredient. The winemaking region of Brazil is fairly small and in the far south, but there is an Italian heritage there. I collaborated on a Moscato-based grape ale, and really enjoyed a Muscat *Brett* saison on my last trip. The brewery where I made the collaboration has used that beer as the basis of a series of beers with different grape varieties; I need to try those next time. *Brettanomyces* is fairly rare in usage, but I did try a

great *Brett* IPA from Cervejaria Way on one trip.

Brazil has great coffee and chocolate, and those have found their way into beer. Hop Arabica is a great blonde ale with coffee, and I also had a very interesting strawberry coffee Catharina sour minutes after getting off the plane in Florianópolis. Coconut, vanilla, and other spices are commonly used in beer. I had an interesting imperial stout made with *funghi secchi* (dried mushrooms) and *cumaru* (a seed with a flavor like vanilla) — a homebrew recipe that inspired a commercial beer (a recipe for this beer is on page 57). Other variations of this beer included versions with chili peppers, cocoa, and wood aging. The spices are often extracted with vodka and blended in to taste.

On my last trip, I saw some brewers experimenting with cocktail-like beers. The most interesting concept I saw was a Negroni Baltic Porter, combining one of my favorite cocktails with one of my favorite beer styles. This concept still needed some work, but it has me intrigued. I will have to see if this develops into a trend.

PARABÉNS, BRASIL

Brazil has made remarkable progress in beer, and deserves congratulations. While it is still struggling to find an identity of its own, I think it has the basis for greatness already present. Beer has ceased to be overly sweet, and more local ingredients are being used. The brewers have the necessary creativity and skill, and people seem eager to learn.

Sometimes I remark to Brazilians that I can't understand why they attempt to make hazy IPAs. You want tropical fruit flavors in your beer, right? Why do you use a lot of expensive hops (which you don't have) when you could use actual tropical fruit (which you do have, and it's the best in the world)? It makes no sense to me. I think maybe it's the desire to show they can make the same beers as in the U.S., but they should be proud of what they can make on their own.

Brazil has come a long way in the last ten years, and I'm proud to have been a witness to the evolution of beer there. I can't wait to see what the next ten years holds. *Obrigado.*

RECIPES

I talked to several brewers who were happy to share their recipes. I have selected a few commercial beers and a homebrew recipe that I tried and thought showcased some of the interesting ingredients and methods I described in this article. Thank you to Daniel Diehl of Cervejaria Narcose for their Mora Mora rice dark lager with coconut and vanilla, Vinicius Carpentieri of Cervejaria UNIKA for their Catharina Sour Morangueiro Cafeina (strawberry and coffee), Carlo Mioranza of Alem Bier for their Muscat Brett Saison, and Daniel Ropelato for his Imperial Stout with Dried Mushrooms and *Cumaru*. Also, very big thank you to my good friend Fernanda Meybom for helping with the research and introductions.

Photos by Charles A. Parker/Images Plus

DOPPEL YOUR PLEASURE, DOPPEL YOUR FUN

4 Pros share tips to brewing doppelbock

by Dave Green

Doppelbock is often deemed one of the harder beer styles to brew well. First off, it's big and bready — the monks brewed it specifically for times of fasting to stave off hunger pangs. But it should not be cloying or overly sweet. This isn't supposed to be a dessert beer; the finish is meant to be smooth and crisp with toasted cracker malt character, although there are versions that lean more towards dried fruit and some sweetness. Secondly, it's a lager, which means strict temperature control should be applied to make sure fermentation proceeds slow and steady and brewers need to pitch a lot of yeast.

Doppelbock is a traditional style that dates back hundreds of years in the Bavarian region of Germany. If you trace the roots of doppelbock you'll find the Paulaner Friars of Munich, a Franciscan order founded by St. Francis of Paula that later became the famous Paulaner brewery. While it was originally brewed in the 1630s to sustain the monks during Lent and Advent, the Paulaner doppelbock Salvator (savior) wasn't released to the public until 1780. As a tribute, many brewers have stuck to the tradition of naming their doppelbocks with the "–ator" suffix.

By current German law, doppelbocks must have an original gravity of 18–28 °Plato (1.074–1.112 specific gravity) and an end alcohol content of 7.5–13% ABV. Decoction mashing was historically used for this style, but it is up to the brewer to decide if they want to invest the time into this technique. If you do opt for a decoction mash, I recommend reading advice from Dan Carey of New Glarus Brewing Co., found here: https://byo.com/article/brewing-doppelbock-tips-from-the-pros/

As we turn the corner into cooler and shorter days here in the Northern Hemisphere, four American masters of brewing doppelbocks answered ten questions homebrewers may have when approaching this style. I enlisted the help of Jamil Zainasheff from Heretic Brewing Co. in Fairfield, California; Dave Colt from Sun King Brewing Co. in Indianapolis, Indiana; Andrew Blakeslee from Thomas Hooker Brewing Co. in Bloomfield, Connecticut; and John Trogner from Tröegs Independent Brewing in Hershey, Pennsylvania.

So, pull up a seat at the table!

Pitching plenty of healthy German lager yeast is critical in the flavor profile of an authentic doppelbock.

RECIPE DESIGN

1. Malts: ***What recommendation would you give to homebrewers? Any specialty malts you consider key?***

Andrew Blakeslee: I believe in an assortment of different specialty malts to layer flavor, but without going overboard. I've seen some recipes with only 1–2 specialty malts, and some with over 10. The lower end doesn't have enough, and the higher end has too many and a lot of them are lost due to low percentages. We use five different specialties in our doppelbock ranging from Munich to chocolate malt. In a doppelbock I consider melanoidin malt to be essential, and a small amount of high-SRM malt with low roastiness for color (I like to use de-husked Carafa® Special III). A small amount of special B malt to enhance the dark fruit character is also a good idea if you want that flavor to stand out.

David Colt: If you are looking to do an authentic/traditional doppelbock-style for your recipe, then we recommend Weyermann malts. We like to use a 50/50 blend of standard two-row and Weyermann Pilsner. Some other specialty malts we use are Munich, Vienna, and melanoidin.

JamiI Zainasheff: I think you only need three malts for the perfect doppelbock: Munich, Pilsner, and Caramunich® (or a similar continental caramel malt). I think the key is using quality continental malts to develop that traditional flavor.

John Trogner: I'm a huge fan of Weyermann and Durst malts for these styles. Both use a roasting process that can provide a huge range of flavors. I avoid any malt that has a biscuity flavor to them . . . I want bready, straw-flavored malts. 20% Vienna, 20% Munich as a base with a layer of mid and darker caramel and specialty malts. If you want more shelf-stable beer, go lighter on darker caramel malts and melanoidin. I like a very small addition of chocolate and melanoidin malts — less than 1% each. A little goes a long way.

2. Hops: ***Is there any philosophy that you follow when it comes to hops in the kettle?***

JamiI Zainasheff: For doppelbock it's all about restraint. Often brewers struggle with getting the proper attenuation or have added far too many or too much specialty malt. The sweetness in doppelbock comes more from lower bittering than it does low attenuation.

John Trogner: I find hops to be a big controller of the beer's texture in a style like doppelbock. Personally, I like German Northern Brewer hops, which provide a bright and lemony character earlier in the boil, then Hallertau Tradition for our late addition. We want them to be a background, supporting role in this style, but not to get in the way of the malts here. They're the real stars of this show.

Andrew Blakeslee: I believe in tradition when it comes to this style, and as such I use traditional hops. We use Hallertau Mittelfrüh exclusively in this recipe, minus a small 60-minute addition of Columbus strictly for IBUs. Doppelbocks are meant to be malt-forward, so the hops are there for balance so it isn't too sweet on the palate. I recommend 20–30 IBUs total, spread out over additions throughout the boil. We do a 30-minute, 20-minute, and 10-minute schedule.

David Colt: For the bitter addition we use a neutral, high-alpha bittering hop such as Warrior® or Pahto™. For the flavor and aroma additions we use Hallertau Mittelfrüh.

3. Yeast: ***Are there any special considerations when deciding?***
Jamil Zainasheff: You can't make a doppelbock with ale yeast. If you do, it is something else. A strong ale perhaps? You need a German lager strain. My preference is White Labs WLP833 (German Bock Lager) or WLP830 (German Lager). At Heretic, we ended up using WLP830. When Joe Formanek gave me a 50-point score in the American Homebrewer's Association (AHA) Nationals that was with WLP833.

David Colt: During Sun King's history we've tried several German lager strains, but we've come to prefer Augustiner for this particular style. For homebrewers, Imperial Yeast's L17 (Harvest) or White Labs WLP860 (Munich Helles), Wyeast 2352 (Munich Lager II), or even SafLager 34/70 would all work well here.

John Trogner: I'm a big fan of Weihenstephan's 34/70 strain of yeast. It's widely available to homebrewers in both liquid and dried strains and is an absolute workhorse of a lager yeast. When handled properly it produces very little esters and low sulfur.

Andrew Blakeslee: Crisp, clean lager yeast is traditional. There are many strains out there that will do this job well; we use White Labs WLP830 (German Lager) yeast. Another yeast I haven't personally used but think could do well for someone looking for large amounts of dark fruit flavors is Belgian dark ale yeast. This yeast tends to create lots of dark fruit esters, such as fig, plum, etc. that can enhance the malt flavors. This yeast will attenuate much higher than a lager strain however, so some recipe modification would be necessary to maintain an acceptable body/ flavor profile.

4. Water: ***What brewing salts work with this style and how do you approach residual alkalinity (RA)?***
David Colt: Indianapolis has very hard water. Sun King uses a blend of reverse osmosis and municipal water to closely mimic conditions brewers in Bavaria have.

John Trogner: Here at Tröegs we like a very soft water profile to brew Troegenator. We use 90% reverse osmosis water with the remaining 10% being filtered tap water. Once we have that nice clean profile, we add in calcium chloride to achieve roughly 50 ppm calcium and 100 ppm chlorides (give or take some points depending on our tap water profile). We don't add gypsum for this beer.

Andrew Blakeslee: For a rich, malty brew such as a doppelbock, I would recommend a softer water profile. Ideally, low alkalinity, with calcium at 30–50 ppm, chloride at 30–60 ppm, and sulfate at 20–50 ppm. Add lactic or phosphoric acid as needed for pH of 5.4–5.5 in the mash as well.

Jamil Zainasheff: Don't overdo it: Everything in moderation. I would definitely keep RA moderate. This isn't a dark beer, most of the color comes from the caramel malt, which doesn't have the acidification of roast malt, which is one reason you might go with a higher RA.

BREW DAY

5. ***How do you approach a big beer like this when it comes to your mash schedule?***
Andrew Blakeslee: We have used a single infusion mash with a low-end mash temperature (150 °F/66 °C). We have a steam jacketed mash tun, so after a 30-minute mash rest at 150 °F (66 °C), we begin to ramp up to mashout at 170 °F (77 °C). A single- or double-decoction mash is something I have wanted to do with this beer and hope to this fall. This will bring more color, flavor, and melanoidins into the beer. A decoction mash will also typically increase mash efficiency, and be slightly more fermentable (higher attenuation).

David Colt: Most malts are highly modified these days, so we only do a single step infusion mash at 154 °F (68 °C).

Jamil Zainasheff: We use 152 °F (67 °C) when we want good attenuation. We've found that the traditional lower mash temperatures really didn't result in much lower attenuation and

PROS

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Dave Colt
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Co-Founder/Brewmaster
Heretic Brewing Co.
Fairfield, California

John Trogner
Co-Founder/Brewmaster
Tröegs Independent Brewing
Hershey, Pennsylvania

can negatively impact overall extract. The way you get great attenuation is paying attention to your yeast. If you do, you can have great attenuation. The residual longer chain sugars really aren't very sweet, so as long as you get great attenuation, you will avoid that cloying sweetness problem, regardless of mash temperature. For doppelbock, I think a mash temperature aiming for 154–156 °F (68–69 °C) is ideal. You want some fullness to the beer and a higher mash temperature will help without making it sweet.

John Trogner: While we do perform a decoction mash for our annual Märzen beer, Troegenator is not one we perform a decoction on. Instead we perform a five-step mash that can take upwards of 2.5 hours to finish the mashing process.

But ultimately it depends a lot more on the malt you are utilizing and your brewing system rather than what works for others. It's not just about getting conversion complete with an iodine test; it's about getting maximum conversion for a style like this. Homebrewers could slowly ramp up the mash temperature starting around 140 °F (60 °C) up to mashout temperature or 2–3 key mash rests should provide a nice dry beer as a result. Our research has shown 143.5 °F (62 °C), 149 °F (65 °C), and 154.4 °F (68 °C) are our key rests for a dry beer.

6. Are you looking for low-, mid-, or high-attenuation from your yeast?

JamiI Zainasheff: It is better to think of mash temperatures and yeast attenuation as two completely separate things. You always want complete attenuation, as much as the yeast will give you under ideal conditions. You don't want to leave unfermented, worty-tasting beer. So you can mash at whatever temperature you want, just make sure to ferment completely.

David Colt: Sun King feels like a medium attenuation is perfect for this style of beer.

John Trogner: We're after a higher attenuation since the malts should produce plenty of depth and character.

Reducing dimethyl sulfide (DMS) precursors with an extended boil is critical in doppelbocks.

Andrew Blakeslee: For a doppelbock we look for medium attenuation, around 75% with the lager yeast we use.

7. Any special considerations once the wort is in the kettle?

David Colt: Nothing special, our brewers use a standard 90-minute boil. We prefer to use a direct fire kettle.

Andrew Blakeslee: An extended boil can increase SRM as well as melanoidins in the beer. A longer boil is also helpful when using Pilsner base malt to reduce dimethyl sulfide (DMS) in the wort. We use a 90-minute boil for this beer, however you can go longer if you'd like and increase to 2–3 hours. If extending the boil, one must account for boil-off reducing volume and increasing starting gravity.

JamiI Zainasheff: I believe in a gentle but obvious 90-minute boil for lagers to reduce DMS precursors.

John Trogner: DMS needs to be taken seriously with this style and skimping on your boil time may not help your cause. We employ an 85-minute boil but we also have the ability to reduce the pressure within the boil kettle to reduce the boil temperature. I would recommend a gentle boil for homebrewers because we don't want caramelization reactions to occur in the boil kettle.

FERMENTATION AND AGING

8. Do you approach fermentation for a big lager like this differently than you would for a lower gravity lager?

John Trogner: I suggest homebrewers pitch double the amount of yeast than they would in a smaller lager like a Pilsner. The difference between getting a 12 °Plato (1.048 gravity) and a 19 °P (1.079 gravity) wort to ferment dry is big for a lager yeast. We ferment around 52 °F (11 °C) and hold at this temperature for the duration of active fermentation. Previously we fermented a bit colder and then performed a diacetyl rest but found with our 100 BBL fermenter size that our new fermentation schedule works just as well to eliminate diacetyl.

Andrew Blakeslee: We typically will brew one batch day one, and then another batch on day two and put them into a double-batch fermenter. The first batch we pitch slightly warm and with a higher oxygen level. This allows the yeast to propagate for the first 24 hours, and right as they go anaerobic we feed them with more wort, and a small amount of oxygen, and drop to primary fermentation temperature. We also use yeast nutrients to supply the yeast with free amino nitrogen (FAN), zinc, and other important nutrients.

JamiI Zainasheff: We use the same strain (WLP830) as our regular lagers because it is better to pitch enough healthy yeast than it is to get exactly the right strain. For example, if you have some other German lager yeast fermenting already, I would use a pitch from that. If you have some ale yeast or some lager strain that is inappropriate, I would not use that. I would start up a new pitch. So, if you want to use WLP833, then brew a lighter lager with it first to grow it up and then repitch the yeast into the doppelbock. I would never brew a beer like a doppelbock from a new pitch.

David Colt: The only similarity in fermentation between our doppelbock and Pachanga (our Mexican-style lager) is the temperature. Because doppelbocks have such a high gravity, fermentation takes longer and you need to be sure you're pitching enough yeast and that their vitality is strong.

9. *Do you have a recommended conditioning time for a big beer like this? Do you perform a diacetyl rest?*

JamiI Zainasheff: I would start with pitching cold and working upward on temperature. At Heretic, for a normal strength lager we pitch below 50 °F (10 °C). We let the temperature climb unrestrained to 50 °F (10 °C) and then each day we let it rise one or two degrees (0.5–1 °C). After seven days (about eight days total), we are in the mid 60s °F (upper teens °C), and attenuation is complete. We hold it at this warmer temperature and check for diacetyl and acetaldehyde. It always has been clean at this point, but we will usually hold it another week before packaging. We feel like some lagering time improves the beer. For a beer like our doppelbock, most everything is the same, but it takes an extra couple of days to reach terminal gravity.

David Colt: We do not do a target diacetyl rest for any of our beers. We test for it in our lab. I highly recommend taking a small sample to assure that diacetyl is not present before you plan to drastically drop temperatures if a diacetyl rest was not performed.

John Trogner: For homebrewers, I definitely recommend a diacetyl rest because there is nothing worse than a butter-bomb lurking beneath your doppelbock. Our aging period depends largely upon what we are tasting from the beer, but a 6–8 week lagering period around 40 °F (4 °C) is a good benchmark. Also, making sure to dump the yeast/racking off the yeast once active fermentation is complete and some settling has occurred greatly benefits a beer like this. Beef broth components do not help this style at all.

Another, more advanced technique I think can be hugely beneficial is kräusening. I have found this to add a lot of character to German-style beers when done properly. Finally, we do spund Troegenator. Just like kräusening, I find that if the yeast is healthy and happy at this stage in fermentation, this technique adds lots of complexity and character to the beer compared to non-spunded versions.

Andrew Blakeslee: Once the yeast has attenuated about 60% we let the beer free-rise up to 65 °F (18 °C) for a diacetyl rest. Upon completion of fermentation we taste daily to pass diacetyl sensory, and once it passes we start dropping the temperature 5 degrees (2.5 °C) every 12 hours until we hit 32 °F (0 °C). We usually see diacetyl completely clear after three days. Another option to help with diacetyl is an enzyme called ALDC that prevents the formation of diacetyl by removing its precursor, alpha acetolactate.

As for the lager period, I would recommend six weeks. That time is obviously dependent on personal taste preference, but four weeks should be the minimum to develop a smooth flavor profile.

10. *Any other things you think are important with this style?*

John Trogner: You need to start by picturing the perfect doppelbock beer in your head. Do you envision a drier, crisper version or one that is a more chewy, caramel, raisin rendition? Decide which side of the fence you want to land on. I personally like the dry and crisp version that almost tastes sessionable. That is the flavor profile that Troegenator is based on. As a German brewer once told me, when drinking a great doppelbock, you don't know you're drunk until you stand up.

JamiI Zainasheff: It is important to ensure that the beer is clean, not too alcoholic, and attenuates enough to avoid a cloying finish. It is very common to find homebrew versions with fermentation problems. Often the beers did not attenuate completely or they fermented too warm. You don't want an estery or hot alcohol character. Pitch plenty of clean, healthy yeast and ferment under controlled temperature conditions.

A common flaw is making the beer overly big and alcoholic. Avoid the temptation to go too big on the alcohol. This, like all German beers, should still be easy drinking. Another flaw is making the beer too rich in melanoidin. Too much can make the beer taste meaty or brothy. The cause is often excessive boiling, excessive decoction, or the overuse of specialty grains.

Andrew Blakeslee: Layers of flavor with none of them overpowering nor underwhelming. Caramel flavors should be present but not over the top. Dark fruit can add a nice complexity to the beer. Color should be a copper-ish red to brown. A healthy fermentation and extended lagering are also extremely important.

On a separate note, this style of beer also does well with barrel aging in a wide array of vessels. Bourbon-barrel aging, neutral-oak aging, and Port-barrel aging can all increase the depth of character in this style of beer. Bourbon aging will add coffee, toffee, char, and some caramel. Port barrels can increase the dark fruit aspect of the beer and add richness. Neutral oak can add some toasted marshmallow and caramel notes. In general, oak aging will typically create a drier tasting body, despite the final gravity not changing.

David Colt: Relax. Give it time. Enjoy responsibly with some schnitzel!

A Harmony of Fruit and Honey

Brewing fruit meads at home

by Jason Phelps

Meads containing fruit are a perpetually hot topic amongst home meadmakers as well as being a huge part of the commercial mead conversation. Taking what we know about making mead from just honey and then adding fruit doesn't seem to be all that complex of a leap, but I assure you that the adventure of smashing fruit and honey together is way more interesting than just saying, "I made fruit mead!"

Making mead with fruit is a creative journey. What fruits and combinations you use, where and when you use them in the process, and what attributes of the fruit you work to express are all creative choices. Unlocking the secrets of all these different choices is the key to being able to mix them up to create your own hits.

As with any adventure, it is best to jump right in!

Photo by Charles A. Parker/Images Plus

Ancient Fire Mead & Cider's 60% Of The Time clone

(5 gallons/19 L, bottled under cork)
OG = 1.152
FG = 1.028
ABV = 16%

INGREDIENTS

16 lbs. (7.3 kg) wildflower honey
2.5 gallons (9.5 L) 24 °Brix Black Muscat grapes
2 Tbsp. pectic enzyme
Water to 5 gallons (19 L)
20 g Lalvin KV1116 yeast
10 g Fermaid-K
2.5 g di-ammonium phosphate (DAP)
1.67 g potassium metabisulfite
4 g potassium sorbate

STEP BY STEP

Prepare the pectic enzyme by mixing with a small amount of 65 °F (18 °C) tap water. Crush the grapes, mix the pectic enzyme mixture with them and perform a two-hour cold soak prior to pressing off the juice. The grape pomace can be discarded.

Combine grape juice, honey, and water to 5 gallons (19 L). Re-hydrate and pitch the yeast. Degas and feed nutrients at 24, 48 and 72 hours. Ferment to target final gravity and stabilize with sorbate and metabisulfite. Rack off sediment. Bottle under cork.

TIPS FOR SUCCESS:

The above directions results in an "orange" pyment due to the skins not being part of the ferment. This was a creative choice. Fermenting with the skins will produce a much darker color, but even more of the specific grape character as well.

Photo by Shutterstock.com

CREATIVITY ABOUNDS

At Ancient Fire Mead & Cider (where I'm the Owner/Meadmaker) in Manchester, New Hampshire, we produce three different product lines, including draft style meads, draft ciders, and honey wines. We use fruit in a number of different ways in all of these products. We are constantly dreaming up new combinations and innovative ways to layer fruit, honey, and other ingredients to make delicious new beverages.

This adventure is also based on a whole bunch of questions. Here are some I get from meadmakers all the time: What kinds of fruit should I use? Should I combine different fruits? How do I handle and prepare whole fruit? How do I integrate fruit into my process? Are juices and concentrates good to use, and if so, how? Are there specific fruit combinations that work really well together? How about any that don't? Got any secrets to share?

Let's take a look at a recipe for an example of using fruit in mead, in this case wine grapes. In the fall of 2018 I acquired Black Muscat grapes from California through Musto Wine Grape Company. We used the grapes to make a 15.5% ABV honey wine named 60% Of The Time (a clone recipe can be found to the left).

I am a big fan of Muscat grapes, having made wine and mead with them a number of times in the last 15+ years. Despite this, I hadn't worked with the Black Muscat variant, a dark red grape as opposed to the usual white, pink, or orange-hued grape. Muscat grapes are known for their distinct and pronounced aromatics, and the grapes we got were no slouch in that regard! To balance the expression of the grapes with the honeys we planned to use, wildflower and red bamboo in our case, we decided to perform a short cold soak on the crushed grapes and then press them pre-fermentation. Cold soaking is a technique by which freshly crushed grapes are allowed to soak in their free run juice before pressing or fermenting them. Extraction of color and flavor are the main goals. When done at cool temperatures (40–50 °F/4–10 °C) and also being pre-ferment, the extraction of tannins during this process is lessened. Prior to the cold soak we introduced pectic enzyme to help break down the fruit for more effective pressing. The result is an orange wine due the skins not being part of the fermentation. Using the grapes in this way, their juice became a specific part of the volume of the initial must and with a gravity reading we could easily estimate how much of the total fermentable sugar they would introduce. This was a fairly simple example of using fruit in mead. Let's now take a look at other techniques and tips.

FORMATS & PROCESSING

Fruit comes in a number of different forms, and all of them have comparable advantages and disadvantages, but from experience there is definitely a format that best fits every project.

Depending on what form you plan to use, you will need to identify any processing requirements and include that in your batch planning. You want fresh and ripe fruit. They should not have any rotten or moldy spots, but cosmetic issues or blemishes are not a problem. In some cases buying the ugly pieces gets a price break at farm stands, and sometimes otherwise good fruit ends up on the discount rack at the grocery store. All you need is good timing! Whole fruit is a great format to work with, but depending on what volume you plan on using, the processing might well be much more effort than you want to commit to. Cutting the tops off of strawberries is easy, but it still takes time to get through even 20–30 pounds (9–14 kg) of berries!

Juices and concentrates are another great source, and because they are liquified they don't need any special processing. They mix together with honey and water very easily. The quality of concentrates and juices vary, and there are sources of cold-pressed concentrates that are high quality and retain the complete expression of the aromas, flavors, and colors of the source fruit. We use a passion fruit concentrate that is borderline puree, but the concentration allows for small amounts to be used to get incredible flavor and texture. You want to avoid

Photo by Michael Tonsmeire

When working with citrus fruits you can use the peels, which contain dozens of terpenoids (essential oils) that produce desirable aromas and flavors. An electric potato peeler works great for cutting off the outer peel without the white pith beneath, which is bitter and should not be used.

PRO TIP: Use an electric potato peeler to peel citrus quickly and easily, typically with minimal pith!

juices containing preservatives (sorbate, benzoate, others). Cold-pressed variants that also need to be stored in the refrigerator generally are not affected by processing like pasteurized products can be. You are still looking for as much of the freshness of ripe fruit as you can get!

Citrus is a great example of fruit that can be freshly juiced for fresh inclusion in projects. Remember, if you are juicing your own citrus don't throw away the peels. The peel is where some of the most important action is, including the dozens of terpenoids, known colloquially as essential oils, that produce the aromas and flavors we associate with citrus. We want the peel and not the white pith — which is quite bitter, especially for limes. Most citrus meads I make include both fresh peel AND juice, something I feel allows for all the desired attributes to make their way into the final product.

Purees are widely available, and those that are in aseptic packaging are a great choice due to their shelf stability prior to use. I have used purees in my meadmaking, and sometimes still do, but to be honest I don't prefer the puree format. There is just too much loss involved with most fruit particles that don't want to settle out into a compact layer at the bottom of a carboy. Small-scale filtration isn't really a solution here, and most other "neat tricks" involve excess oxidation so I won't even cover them. One trick I have used successfully is to pour the puree into a large nylon straining bag that will hold the majority of the pulp back, while still imparting flavor and color. This could be done at any point you wished to use the fruit, allowing the majority of the pulp to be removed easily. This isn't a reason to avoid using purees, but setting some expectations for when you do. There are exceptions — for instance, Amoretti Craft Purees are filtered and super concentrated to avoid the issue of large particles not settling out.

What else is there? Dried fruits. Think raisins, Zante currants, dates, figs, and dehydrated papaya or apricots. All of these can be used to introduce flavor into mead. When using dried fruit, I recommend chopping them up to increase the surface area for contact with the mead.

PRO TIP: Take into account the loss of fruit during processing. The loss from processing strawberries can easily be 10-15% of the starting weight, and will be more if the berries are small. This is useful to plan for when purchasing fruit with a particular amount in mind. Buy more to offset the loss.

ADDING FRUIT TO THE PROCESS

Now that we've covered different formats you can source fruit in, we need to cover some considerations for actually applying it to the process of making mead.

When we talked about juices and concentrates, I indicated that having a liquid form was an advantage to getting your must mixed up. This advantage also extends to being able to estimate and immediately measure the gravity of a must. Other forms of fruit have the sugars locked up inside them, making an initial reading of gravity exclusive of their contribution. Juices and concentrates can be measured up front (commercial products will often state the Brix) so that their contribution can be included in a recipe calculation. This also creates ease in calculating their impact during use in backsweetening as well. The same contribution from whole fruit can be estimated, but you'll need to know the typical percentage sugar that the fruit contains. The USDA publishes this information so that the "stereotype" percent sugar content for many fruits — in whole or processed forms — can be included as a recipe component. This information can be found at: https://fdc.nal.usda.gov

Working with whole fruit or puree will be messy. Fruit wants to break down, and you want it to, but it quickly makes a mess that even cold crashing might not easily solve. I mentioned the use of nylon straining bags as a "trick" with puree, but realistically you are going to create a puree out of whole fruit with maceration, so on a small scale you can use these bags with your fruit chunks to help contain some of the mess. After removing the bags from a ferment or a post-ferment

Ancient Fire Mead & Cider's Leaping Off The Ledge clone

(5.25–5.5 gallons/20–21 L, keg carbonated)
OG = 1.058
FG = 0.997
FG = 1.010 (after backsweetening)
ABV = 7%

INGREDIENTS

8 lbs. (3.6 kg) orange blossom honey
Water to 5 gallons (19 L)
10 g SafAle US-05 yeast
7.5 g Fermaid-K
2.5 g di-ammonium phosphate (DAP)
1.67 g potassium metabisulfite
4 g potassium sorbate
1.75 oz. (50 g) Citra® hops
3 lemons, peeled and juiced
12 oz. lemon juice
2 lbs. (0.9 kg) orange blossom honey (for backsweetening)
3 quarts (3 L) water

STEP BY STEP

Mix the initial honey and water (some hot, the rest cold) to 5 gallons (19 L). Re-hydrate and pitch the yeast. Degas and feed nutrients at 24 and 48 hours. Ferment dry and stabilize with sorbate and metabisulfite. Rack off sediment. Add lemon peels, lemon juice, hops, and honey (diluted with water) a few days before packaging. Rack off peels and hops when transferring to keg or bottles.

Photo by Shutterstock.com

steep I run what's left through a small fruit press to ensure I get all the liquid. I have scaled this method up a bit in my commercial operation, but I do want to make it clear, there are limitations to this technique. Moving and pressing larger volumes of fruit-laden must using typical winery methods and automated equipment is the next stage.

So, you may be wondering at what point(s) you should use fruit in the meadmaking process. At every point!

The topic of when to use fruit in mead is hotly debated, and just to be clear, there is no correct answer. One's own experience definitely will identify tricks and tips as well as repeatable outcomes from one technique or another, but there is no objective way to understand how a mead was made from just tasting it. We can produce multiple very similar meads with the fruit having been introduced at different points, and while we might be able to tell that there are differences, it would be luck to consistently associate the mead with the process that created it. For more on the impact fruit will generally have depending on when they are added, refer to Chart 1, below.

Now let's take a closer look at another recipe I named Leaping Off The Ledge (left), and specifically consider how fruit contact time plays a role as well as how acidity needs to be accounted for.

Contact time, the time the fruit is in contact with a fermenting or a post-ferment product, is going to influence how robust the fruit expression is. The amount of fruit (more on this later) is a huge factor in how much fruit character you can expect, but how long the fruit is applied can be used to moderate or direct the outcome. More importantly, managing the contact time ensures that you don't get an over-expression of a fruit leading to undesired flavors or aromas.

Citrus peels are back! I only steep lemon peels for a few days when I use them, and I typically apply them in secondary where I can best judge how much influence they've imparted. I check the progress of steeping the peels at 24 hour increments until I've reached a point that the flavors are

Chart 1: Impact of fruit addition timing

Process Application	Outcome / Considerations
Fruit added in primary fermentation or included in the fermentation.	The available sugar in the fruit is fermented. Even adding it after the initial ferment will lead to this result. You may also find the color from heavily-pigmented fruits lightens up quite a bit when used this way. The flavor and acidity from the fruit should remain. The aromas should too, but since they are volatile they may also be blown off from an overly vigorous fermentation.
Fruit added in secondary or post-stabilization.	When used this way, the sugar in the fruit is retained, and when taken together with aromas, flavors, and acidity of the fruit results in the most "like the real thing" experience. You can certainly backsweeten fruit meads that have been fermented dry, but the exact composition of the sugars can't be replicated so it may not taste exactly like the source. The aromas and color are also a lot more stable in this method.
Fruit added during both primary fermentation as well as secondary or post-stabilization.	The result is what you might expect; fermented fruit sugars, but fresh fruit added after the fermentation that brings back the full complement of aromas and flavors, and often bumps the color back to the expected hue and depth.

Going Big — Fruit Bombs

With fruit meads being all the rage right now, the topic of how much fruit you can stuff into a mead is also popular. A mead with an overwhelming amount of fruit is affectionately called a "fruit bomb." So, what exactly does this mean?

This practice can simply be understood as drastically increasing the amount of fruit, to 6,8,10+ pounds per finished gallon (0.7–1.2+ kg/L), and either foregoing any water or using only enough to liquify the honey and mix it with the fruit. With any "extreme" technique there are inevitably challenges and/or considerations. Jamming a massive amount of fruit into a fermentation definitely brings the volume question into consideration. How big exactly is that fermenter you plan to use?

You will also need the ability to pump or "move" that must to a press basket and press out the liquid. Fruit not only takes up quite a bit of volume, but until you get the water freed from it, it is also heavy. Water alone is 8 lbs./gallon (1 kg/L), so it doesn't take much imagination to understand what can happen next.

Depending on the fruit(s) being used you need to consider how much acidity is going to be contributed by the fruit. For meadmaking, just like winemaking, the pH during fermentation is optimally 3.2 to 3.6, with honey also having enough acid that when mixed together you may find a lower than expected pH. You can buffer this with potassium bicarbonate to help bring the pH up during the fermentation, but the outcome of the ferment will drive the pH slightly lower, so being at or below the bottom of the range at the beginning likely means you will be right back there post-ferment. You may or may not find you wish to adjust the residual sugar to balance the impression of excess acid.

Many fruits also have lots of tannin in them — think blackberries or black currants — and the more of it that sticks around the more it factors in the ultimate balance you have to consider. The presence of wood and fruit tannins can be a huge boost to the complexity of a fruit mead. Aging is an asset in helping the tannins soften and mellow, much like excess alcohol.

Balance is a popular word in the sensory world of beer and wine. When I first began making wine in 2004 I was also learning to appreciate different styles of wine from all over the world. I was naturally curious, but I also knew this education would inform my homebrewing projects. Balance came up a lot, and I gravitated towards a more harmony based view of balance. All the parts needed to fit together in a tight little package just so. Over time as my education has continued I've met many more beer, mead, and cidermakers who use contrast and even boldness of individual ingredients in less "harmonious" ways to create really interesting outcomes.

Fruit bomb meads push the fruit forward — all of it. The flavors, acidity, tannins, colors, it all gets magnified. The components should still feel like they belong there but can be forward and even sometimes angular or perpendicular to the other remaining pieces. The outcome still has to taste good, but highlighting something by bringing it very forward has been fun to experiment with. The creativity of the choices adds a lot of potential projects to the meadmaking calendar!

Ancient Fire Mead & Cider's Granola Bar! clone

(5 gallons/19 L,
bottled under cork)
OG = 1.131
FG = 1.020
ABV = 14.5%

INGREDIENTS

18 lbs. (8.2 kg) buckwheat honey
Water to 5 gallons (19 L)
20 g Lalvin 71B-1122 yeast
10 g Fermaid-K
2.5 g di-ammonium phosphate (DAP)
1.67 g potassium metabisulfite
4 g potassium sorbate
2.5 lbs. (1.1 kg) dried zante currants/corinthian raisins

STEP BY STEP

Mix the initial honey and water (some hot, the rest cold) to 5 gallons (19 L). Re-hydrate and pitch the yeast. Degas and feed nutrients at 24, 48 and 72 hours. Ferment to target final gravity and stabilize with sorbate and metabisulfite. Rack off sediment. Add Zante currants and/or raisins and steep to taste (this will take weeks, in my experience). Rack off currants/raisins prior to bottling (or pull the bag of them if you added in bagged). Bottle under cork.

Photo by Shutterstock.com

developed to the effect I am looking for. This is done to taste, and ultimately training your senses to be able to choose your own "sweet spot" for ingredients you plan to use is another of the exciting experiences on this journey. You can easily steep citrus peels for too long. A bitterness can quickly develop from the pith, and the more pith that makes its way into the steep the more quickly this undesired outcome will evolve. Lime peels get here very quickly, and this is one of the reasons why I don't typically use them in favor of lime juice.

Leaping Off The Ledge is a product that was in our starting lineup in 2018 and has elicited some of the most interesting responses to any of our products. Using a base of orange blossom honey we add fresh lemon peels, lemon juice, and hops to flavor the mead. The outcome is pretty much dry hopped lemonade. Fans have said it tastes like summer. The hops also need contact time monitoring, so for this mead that topic is extremely important in the finishing steps because you have two ingredients that absolutely can be in contact with mead too long, leaving behind more than you hoped for.

LAYERING

One of the most exciting aspects to using fruit (as well as spices, hops, etc.) to make mead is layering the ingredients to create interesting outcomes. I love citrus with berries. Strawberry and lemon or blackberry and lime are two specific combinations that really sing. I'd use orange blossom honey with the strawberry and lemon concept, but might use wildflower or raspberry blossom honey with the blackberry and lime idea. Why? The harmony of these different combinations is created by how the differences in each ingredient play with or off of each other. The citrus-laden honey is very complementary to strawberries and lemon, with some of the total citrus expression coming from the honey. Blackberries are a more robust berry and using a honey that has a richer, fruitier character that can stand up to the berries better ensures the honey doesn't get lost.

Photo by Jason Phelps

After removing the fruit, press the remaining juices to be added to the mead.

You get to choose how your layers interact. Want to create a street fight? Then put together lots of bold ingredients like blackberries, vanilla, maple syrup, and cinnamon. Want to appreciate the subtlety of an ingredient like elderflower? Don't overpower it with other strong flavors. Try a fruit like pear and a honey that exudes delicate floral notes like an early season wildflower.

The recipe for Granola Bar (to the right) layers dried fruit on top of very characterful honey (buckwheat) to create big flavors and big enjoyment!

KEEP THE ADVENTURE ALIVE

Whether it is boldly overstuffing your meads with blueberries and black currants, trying to tease the most beautiful subtlety out of a small amount of backyard berries, or layering several fruits together to create something new, the possibilities are limitless.

One of the first things I do when I get a new-to-me honey to work with is taste it and start imagining all the possibilities. Fruit is almost always the first thought. Your adventure continues here!

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WEDNESDAY, NOVEMBER 3, 2021

INSIDER TOUR OF DENVER-AREA CRAFT BREWERIES - You'll tour – and taste – at four different craft breweries in the Denver area during this pre-event optional offering. You'll have the opportunity to meet brewers and ask questions in addition to sampling their beers. Includes a beer-pairing meal. A great way to kick off your BYO Boot Camp experience and check out some of Denver's thriving craft beer scene.

THURSDAY, NOVEMBER 4, 2021 DENVER BOOT CAMPS

Each Boot Camp will run from 9:30 a.m. to 5 p.m. and is limited to just 35 people. Your Boot Camp will include lunch as well as a post-Boot Camp Colorado Beer Reception with local craft breweries pouring samples to wrap up your full day.

TROUBLESHOOTING HOMEBREW FAULTS & FIXES – ***with Ashton Lewis*** – Join *Brew Your Own*'s Mr. Wizard and Technical Editor Ashton Lewis as he walks you through the potential minefield of beer flaws and faults homebrewers can face. You'll learn how to troubleshoot – and fix! – your own homebrews with Ashton who has helped thousands of homebrewers over the last 20+ years troubleshoot common and not-so-common beer problems as *BYO*'s Mr. Wizard. You'll have a chance to experience many faults first-hand to better recognize them later. Plus as a special bonus, bring in your own troubled homebrews and Ashton will use your beer as a live example walking the class through the thought process as he figures out what might have gone wrong with your homebrew and what you can do to fix the problem moving forward.

ALL-GRAIN BREWING ESSENTIALS – ***with John Palmer and John Blichmann*** – Designed for intermediate to beginner homebrewers getting into all-grain brewing, this full-day workshop will cover all you need to know to successfully make great homebrews using all-grain brewing both with traditional and newer techniques. *How To Brew* author John Palmer and equipment guru John Blichmann will take you hands-on through the full all-grain process from milling, mashing, and sparging before going into the boil. You'll get to know the equipment, techniques, and ingredients first-hand and learn all-grain brewing by doing in a small-class environment. They'll also cover newer homebrew all-grain techniques such as Brew-in-a-Bag and No Sparge in addition to traditional mash methods and some advanced tips as well.

RECIPE FORMULATION ESSENTIALS – ***with Brad Smith*** – Learn the best ways to jump into creating your own signature recipes and understand the keys to developing a specific grain bill, hop schedule, and ingredient proportions to meet your homebrewing goals. Brad Smith, owner of Beersmith software and a *Brew Your Own* Contributing Writer, has helped thousands of homebrewers design their own beer recipes and now you'll learn first-hand from this recipe building expert how to use both artistic and scientific approaches to beer design to end up with the beer you had envisioned in your glass. You'll explore ingredients, techniques, and even your own brewing system during this practical boot camp that will get you on the right path to craft your own recipes for better beers at home. Please note Brad will also be offering an advanced recipe design workshop on Saturday as well.

SIMPLIFY YOUR BREWING – ***with Drew Beechum and Denny Conn*** – As a homebrewer progresses through the hobby there comes a temptation to feel you need to keep adding more equipment, more techniques, more ingredients, and more of everything. At a certain point you can find yourself wondering how it all got so complicated and even less fun than it was at the beginning. BYO Techniques Columnists, book authors, and podcasters Drew Beechum and Denny Conn will spend the day making sure you still produce great beer, but with less headaches, worries, and time. From streamlining your brewing process to simplifying your recipes without sacrificing beer quality, Denny and Drew will free up your time to brew more often and have more fun and success as they remind you why you fell in love with homebrewing in the first place.

ADVANCED ALL-GRAIN TECHNIQUES – ***with Gordon Strong*** – Pull out the mash tun and get ready to learn advanced all-grain techniques hands-on with *Brew Your Own* "Style Profile" Columnist, book author, and President of the Beer Judge Certification Program, Gordon Strong. Gordon will walk you through a world beyond straight infusion mashing with keys to mastering step mashing, sour mashing, and decoction mashing. Plus you'll learn about playing with mash thickness and other ways to control your all-grain wort production. Please note this workshop will also be offered on Saturday as well.

ADVANCED YEAST TECHNIQUES – ***with Dr. Chris White*** – Join Dr. Chris White of White Labs as he discusses how to master different yeast-related techniques including harvesting yeast, figuring cell counts, the dos and don'ts of repitching including steps such as yeast washing, building up a proper yeast starter, storing your yeast samples, and much more. Here's your chance in a full-day seminar format to learn about getting the most from your yeast from one of the true leaders in the beer yeast field.

ADVANCED HOMEBREW HOPPING TECHNIQUES – ***with Dave Green*** – Join *Brew Your Own*'s Dave Green as he explores when and how to add hops to create awesome hop-forward brews. You'll explore the basics of hop biology (and why it matters to us!); techniques and timing of hop usage including mash hopping, boil hopping, whirlpool/knockout hop stand additions, and dry hopping; hop varietal choice strategies including hop pairing/blending; evaluating hops including hands-on hop rubbing and sensory training; and practical usage techniques including hop extracts, boil-hops "management" (bags, filters, free addition), and water adjustments for hoppy beers. By the end of the full day Dave will make sure you are making informed hops decisions and getting the most out of your hops – and into your glass!

FRIDAY, NOVEMBER 5, 2021 BONUS BOOT CAMP SEMINARS 9:15 A.M. TO 5 P.M.

We are adding a third bonus day to our normal event schedule based on feedback we've received from past attendees who wished they had a chance to learn from all our assembled speakers beyond their Boot Camp workshops. So for 2021, we've scheduled a full day of seven different seminars led by our cast of brewing all stars who will share their knowledge with you on their area of expertise. It will be a full day packed with great tips and techniques from the best in the industry so get ready to learn. Plus you'll have even more time to check out the latest homebrew gear and ingredients with our Boot Camp sponsors located right in the meeting area.

9:15 A.M. – 10 A.M.
Brad Smith on Recipe Design

10:15 A.M. - 11 A.M.
Dr. Chris White on Yeast Propagation for Homebrewers

11:15 A.M. – NOON
Ashton Lewis on Avoiding Brewing's 5 Biggest Mistakes

NOON TO 1 P.M.
Lunch

1:15 P.M. – 2 P.M.
Gordon Strong on Evaluating Homebrew Like a Beer Judge

2:15 P.M. – 3 P.M.
John Blichmann on Layout Designs for Homebreweries

3:15 P.M. – 4 P.M.
John Palmer on Brewing Water Demystified

4:15 P.M. – 5 P.M.
Kara Taylor on Yeast and Fermentation Myths Busted

TURNING PRO & COMMERCIAL BREWERY START-UP: THREE-DAY BOOT CAMP

– with Steve Parkes – By popular demand, we're expanding our past two-day Brewery Start-Up Boot Camp to three full days to better cover more material in more depth for you. When you register for this class you will attend it for Thursday, Friday, and Saturday unlike our other offerings.

Opening up a commercial brewery is a far cry from just ramping up the amount of beer you brew. Steve Parkes, who has trained hundreds of pro brewers as lead instructor and owner of the American Brewers Guild, will walk you through the steps, planning decisions, and keys you need to know if you want to open a successful commercial craft brewery. Learn from his decades of expertise and wide range of experience to help you better achieve your goals of turning pro. Over three full days Steve will guide you in depth through all the various elements you'll have to know for the next big step toward starting a craft brewery.

SATURDAY, NOVEMBER 6, 2021 DENVER BOOT CAMPS

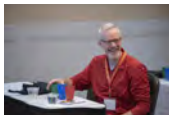
Each Boot Camp will run from 9:30 a.m. to 5 p.m. and is limited to just 35 people. Your Boot Camp will include lunch as well as a post-Boot Camp Colorado Beer Reception with local craft breweries pouring samples to wrap up your full day.

ADVANCED RECIPE FORMULATION – ***with Brad Smith*** – Take your recipe creations to the next level by dialing in the specific grain bill, hop schedule, ingredient proportions, and water treatments to meet your brewing goals. Brad Smith, owner of Beersmith software and a *Brew Your Own* Contributing Writer, has helped thousands of homebrewers design their own beer recipes and now he's ready to get in-depth on the details of beer design so you end up with the beer you had envisioned in your glass. You'll explore ingredients, techniques, and understanding your own brewing system during this boot camp designed for advanced homebrewers that will help you craft your own recipes for better beers. This workshop can be taken in combination with Brad's Recipe Formulation Essentials class on Thursday that offers more of an introduction to intermediate and beginning brewers to the concepts of writing your own recipes.

ADVANCED YEAST LAB – ***with Kara Taylor*** – Join White Labs' Laboratory Operations Manager Kara Taylor for some hands-on yeast lab work to develop skills you can bring back home to help you make better beer. Learn how to accurately count yeast using a microscope, culturing yeast, using slants, harvesting yeast, washing and reusing yeast, propagation and determining growth rates, and more. Here's your chance to learn hands-on what you may have read in books and magazines, or listened to in seminars, and Kara's the perfect teacher to lead you through the world of yeast using lab equipment you can source for your home use.

HANDS-ON HOMEBREW SCIENCE – ***with Ashton Lewis*** – Get hands-on with pH meters, slants and loops, stir plates, centrifuges, and other brewing science gear with *BYO* Technical Editor and Mr. Wizard Columnist Ashton Lewis. Ashton will walk you through how to best use scientific gear at home to help you improve the quality of your beer. You will have the chance to understand not only how to use and care for the equipment properly, but also how to take the results and put that data into action to produce better beer in your glass. This workshop will focus only on those pieces of equipment suitable – and affordable – for your homebrewery.

BREWING WATER ADJUSTMENTS – ***with John Palmer*** – Water is the least understood ingredient when making great beer. John Palmer, who literally wrote the definitive book on the subject, *Water: A Comprehensive Guide for Brewers*, will help take the mystery out of water's role in brewing and how to make better beer as a result. You'll learn how to read water reports, understand flavor contributions, and how to adjust your brewing water to make different styles of beer. You'll leave with not only an understanding of the chemistry concepts of brewing water, but also the practical how-to aspects of getting the most from from this critical brewing ingredient.



HOMEBREW EXPERIMENTS – ***with Drew Beechum and Denny Conn*** – Developing your own recipes, refining your own brewing techniques, and tweaking your equipment set-up all require the know-how to conduct your own homebrew experiments. Without reliable results you rely on guesswork instead of facts to improve your brewing. Join two of the true leaders in experimenting with homebrews – podcasters and book authors Drew Beechum and Denny Conn from Experimental Brewing as they first walk you through how to properly conduct your own experiments at home including structured blind evaluation techniques, and then walk you through some real life homebrew case studies to show how these experiments can play out. Get ready to roll up your sleeves and get your science on!

ADVANCED ALL-GRAIN TECHNIQUES – ***with Gordon Strong*** – Pull out the mash tun and get ready to learn advanced all-grain techniques hands-on with *Brew Your Own* "Style Profile" Columnist, book author, and President of the Beer Judge Certification Program, Gordon Strong. Gordon will walk you through a world beyond straight infusion mashing with keys to mastering step mashing, sour mashing, and decoction mashing. Plus you'll learn about playing with mash thickness and other ways to control your all-grain wort production. Note: This Saturday workshop is a repeat of the Thursday class and is offered twice due to its popularity.

HOME CHEESEMAKING – ***with Pamela Zorn*** – You make your own beer so now it's time to learn how to make your own cheese to pair with it! Pamela Zorn has been teaching people how to make their own cheese for years from her Colorado cheesemaking retail shop. You'll learn hands-on how to craft soft cheeses as well as be introduced to the world of making your own hard cheese plus understand the keys to making great cheese from a variety of different kinds of milk. Get ready to roll up your sleeves with this full-day introduction to the fun world of home cheesemaking – a perfect fit with your homebrewing!

SUNDAY, NOVEMBER 7, 2021

INSIDER TOUR OF DENVER-AREA CRAFT BREWERIES

You'll tour – and taste – at four different craft breweries in the Denver area during this post-event extra offering. You'll have the opportunity to meet brewers and ask questions in addition to sampling their beers. Includes a beer-pairing meal. A great way to wrap up your BYO Boot Camp experience and check out some of Denver's thriving craft beer scene.

Three-Day and Two-Day Registration Options Available.
Full Event Details Available at: BYOBootCamp.com

BY DREW BEECHUM & DENNY CONN

TESTING YOUR HYPOTHESIS

Experiments you should do

In the always-ongoing quest to improve the beer they produce, homebrewers have become enamored with experimentation. Experiments about hops, experiments about malts, experiments about water, maybe even experiments about experiments! But there's a hole in the boat . . . homebrewers are reading about experiments, but not many are actually doing experiments. Why let someone else tell you how to brew your beer?

Denny started doing homebrew experiments over 20 years ago, long before *Experimental Brewing* or our good friend Marshall Schott's *Brülosophy* existed. And Denny certainly wasn't the first homebrewer to experiment with processes and ingredients. Both of us remember sheaves of experiments being reported on the old "Home Brew Digest" and various USENET groups. Heck, the Tinseth hop bittering calculation that most of us use started as a backyard experiment!

When we started *Experimental Brewing* five years ago, our concept was to test the conventional homebrewing wisdom and find what worked and what didn't. *Brülosophy* was started with the same goals. Homebrewers immediately glommed onto the findings from both of them in an effort to improve their beer. And while that's a good thing, there's a downside, too. It's great that people are doing these experiments for us, but how do you know if the conclusions actually relate to your brewing? For example: That Tinseth formula – Glenn Tinseth admits the number is accurate for his homebrew system, in the 1990s, using whole hops. Its mathematical relationship to the rest of us is a bit fuzzier.

See, as enlightening and convenient as it may seem to have somebody experimenting for you, you need to keep in mind that it's "citizen science," not real science. Someone trying something and relating the results constitute a data point, not a scientific conclusion. Real science demands repeated trials under the same circumstances. Findings need to be confirmed by multiple researchers. I mean, have you read a scientific report that doesn't end by saying "more study is needed"?

With *Experimental Brewing*, we tried to simulate this by having a group of experimenters each doing the same experiment before presenting the results to panels of blind tasters. The good part of that is that you had a group of people doing the experiments on their own equipment, giving kind of a real world point of view. The bad part is that you had a group of people doing experiments on their own equipment, which meant that it was difficult to maintain a controlled situation. In addition, while it's great to have a wide array of data points, it's also difficult to compile data given the variables.

Brülosophy takes a different approach. They have one person doing the experiment before presenting it to a panel of blind tasters. While it reduces the number of trials of the hypothesis, it also allows them to maintain much better control over experimental variables. It also makes interpreting the data much easier, but the lack of replicates does just make it a single data point.

Again, it's very important to stress – that regardless of the approach, most of these homegrown experiments, regardless of source, are loosely scientific at best and serve as interesting pieces of data, but not rock solid valid experimental conclusions.

This is why it's so important for you to do your own experiments. Only you know what the variables are in your

Someone trying something and relating the results constitute a data point, not a scientific conclusion.

Photo by Marshall Schott

Testing a hypothesis of yours can be as simple as splitting a batch in two or three, or you can try to enlist your homebrew club and see if most folks come up with similar results.

own homebrewery and your palate. So why aren't more people doing their own experiments?

It seems that one of the biggest issues is time. We've heard over and over again that someone doesn't have much time to brew, so they want to go with what (they think) they know. They don't want to take a chance of possibly producing beer they don't like as a result of an experiment. Also, people have the fear of wasting money. Remember, a batch of beer is relatively cheap and learning is part of the fun!

Another reason is equipment and space limitations. Many experiments require brewing a large batch of wort and then splitting it to examine the effects of something like different yeasts or hops. That can require two brewing and fermentation setups, which need to be as identical as possible. Most homebrewers aren't set up to do that.

Finally, let's get real . . . another reason people don't do the experiments themselves is laziness. If someone has already done the experiment and told you the result they got, why should you bother? It's simply human nature to conserve effort. Let's not forget that homebrewers can't completely ride the science done by professional brewers — our small setups and volumes change a number of the variables from their efforts. It's both freeing and frustrating simultaneously.

But if you truly want to improve your brewing, you need to see how things work out in your own brewery. Here's an example . . . Does mash temperature make a difference in the finished beer? Maybe, it seems to depend to a great extent on what malt you use and how the maltster treated it. As far as we know, no one who has done this experiment has tried it on multiple brands of malt. That's simply unworkable for homebrew experimenters. But you can do it to find out about the malts you use. In that sense, "science" becomes a personal thing and you can learn more about your favorite malts.

We have a few tips to consider before you start designing your experiment. First, you need to eliminate as many variables as possible. Unless you have perfect brewing control – Ha! — you're going to need to find ways to eliminate brew day replication. If you're doing a split boil, it's a great help to have two identical kettles and heating sources. You also need to have identical fermentation setups. This might look like overkill, but it really does help eliminate the wibbly factor. If you have a truly automated repeatable system, you can do back-to-back brewing, but remember – wibbly is a thing.

Here's our guide to finding your own truth:

THINGS TO CONSIDER CAREFULLY

In designing an experiment, there are a few steps to go through before you whip out the burner and start brewing. The first, and most important, is "What do I care about?" Crafting a hypothesis is deceptively tricky. You need to think about, "Is my hypothesis falsifiable?" E.g. it's clear when you're wrong. And keep in mind that just because you get a positive result doesn't mean you're right! It may be something else.

Here's an example of the steps in designing an experiment you can run:

Start with the Question: "Do decoctions matter?"

Then the hypothesis "Decoctions do not create a noticeable sensory difference over an infusion mash."

Then the Protocol: Do two mashes – one decocted, one just taken through the rests. Ferment and package the same (unless one of these are your variable).

Evaluation: Check out our December 2019 column for recommendation on best practices here.

Got that? OK, then, here are some experiments we think you might find valuable. We're sure you'll come up with some of your own variables to test too.

MASH EXPERIMENTS

Question: Does step mashing affect our beer flavor in a perceivable manner?

- **Hypothesis:** Step mashing does not alter the body and flavor of a beer compared to a single infusion mash.
- **Brewing Sessions Needed:** 2
- **Protocol:**
  1. Mash one batch of beer with a stepped mash, with rests of 145 °F (63 °C) for 30 minutes and 158 °F (70 °C) for 30 minutes.
  2. Mash a second batch at 152 °F (67 °C) for 60 minutes.
  3. Ferment both batches the same way: Yeast strain, temperature, and fermenter geometry must be consistent for both.

Evaluation: Perform the triangle and ranking tests, asking the tasters to rank the samples in order of most to least body, head formation, and head retention. Ask them which they prefer and why.

Question: Does adjusting your water chemistry for style produce a more enjoyable beer than the same recipe using unadjusted water?

- **Hypothesis:** Changing the water profile for your favorite style of beer will not produce a different tasting beer.
- **Brewing Sessions Needed:** 2
- **Protocol:**
  1. Choose a recipe that you enjoy and are familiar with.
  2. Brew one batch with your normal water.
  3. Get a water analysis and plug the values in the water calculator of your choice.
  4. Choose a target water profile. Find them listed in your water calculator, a book, or on the Internet. Calculate your adjustments in the program.
  5. Brew a second batch with your new, tweaked brewing water profile.
  6. Ferment both batches the same: Same yeast strain, temperature, and fermenter geometry.

Evaluation: Perform the triangle and ranking tests, asking your tasters which sample most closely tastes like the style it's supposed to be, as well as asking about body and sweetness. Ask them which they prefer.

BOIL EXPERIMENTS

Question: Will adding sugar to the kettle negatively impact beer flavor or attenuation?

- **Hypothesis:** Adding simple sugar to the boil will cause

yeast health and attenuation problems.

- **Brewing Sessions Needed:** 1 (split with two kettles)
- **Protocol:**
  1. Brew a simple recipe that you trust and is balanced. We recommend a Belgian tripel possibly for this one. Split the wort evenly into two kettles. Add the sugar to one kettle at the beginning of the boil.
  2. Treat the beers the same through to the middle of fermentation.
  3. After 4–5 days, add sugar to the batch that didn't receive it in the kettle. Let both batches ferment for another 1–2 weeks. Be sure to take a final gravity reading for each batch.
  4. Package each batch the same way.

Evaluation: Perform the triangle and ranking tests, asking the tasters about sweetness and dryness as well as off-flavors that could be attributed to poor fermentation, such as sourness, phenolics, and diacetyl.

- **Protocol:**
  1. Split a batch of wort between two fermenters.
  2. In one fermenter, pitch two different yeast strains. In the other, pitch only one of the two strains used in the first fermenter. Be sure to pitch the same amount of yeast into each. That means that the total pitched of the two-yeast batch will equal the amount in the one-yeast batch.
  3. After three days to a week, pitch the other strain into the second fermenter (the fermenter that originally got only one strain). Pitch the same amount of this yeast as the original strain so that one will have less chance of overwhelming the other.
  4. Let the ferments finish and package.

Evaluation: Perform the triangle and ranking tests, asking tasters to describe any differences in flavor, aroma, or mouthfeel. Does the flavor of one beer show more or less of a yeast flavor characteristic than the other?

> **In designing an experiment, there are a few steps to go through before you whip out the burner and start brewing.**

Question: How does the bittering from first wort hops (FWH) compare to the bittering from a 60-minute addition?

- **Hypothesis:** Some studies have shown that FWH actually produces about 10 percent more measureable IBUs than a 60-minute addition, but it tastes less bitter.
- **Brewing Sessions Needed:** 1 (split with two kettles)
- **Protocol:**
  1. Evenly split your wort into two kettles. Add your nominal 60-minute addition in one kettle as FWH before adding the wort. Note: We recommend Cascade hops for testing due to their noticeable, but non-dominating, character.
  2. Steep the hops in the kettle while you sparge. Evenly split the sparge runoff between the two kettles.
  3. Bring both kettles to a boil.
  4. Add the same amount of the same hops as a 60-minute bittering charge to the other kettle after it comes to a boil. Boil both kettles for 60 minutes with no other hop additions.
  5. Cool, pitch, ferment, and package.

Evaluation: Perform the triangle and ranking tests, asking tasters about the quality of bitterness (harsh, neutral, smooth) and hop flavor.

FERMENTATION EXPERIMENTS

Question: Does the way you use multiple yeasts change the flavor?

- **Hypothesis:** Pitching more than one yeast strain at a time yields unpredictable results. Pitching strains sequentially gives each a chance to develop flavors independently and improves repeatability for future brews.
- **Brewing Sessions Needed:** 1 (split with two fermenters)

Question: What is the effect of yeast pitch rate on yeast's ester production?

- **Hypothesis:** Pitching less yeast will result in fewer esters due to lack of acetyl-coA to create esters while it builds yeast cells.
- **Brewing Sessions Needed:** 1 (split with two fermenters)
- **Protocol:**
  1. Save the yeast slurry from a 5-gallon (19-L) batch of beer in two sanitized containers. The easiest way to do this is to weigh the slurry so you have about ⅔ of the total in one container and ⅓ in the other.
  2. Produce a batch of wort and split it evenly between two fermenters. Pitch one container of slurry into each fermenter.
  3. Ferment, package, and serve. Take periodic specific gravity readings to compare the fermentation profiles.

Evaluation: Perform the triangle and ranking tests, asking the tasters about their perception of fruity esters in both the aroma and the flavor of the beer.

OK, that should be enough to get you going. Remember, the pursuit of these experiments isn't empirical, universal truth — it's the deeply personal truth of what fits you, your needs, and your desires. Think of the fast warmer lager techniques — it may work well for a great many (Drew: It does … for me!), there are plenty for whom there's always a nagging sulfurous, lingering doubt that robs any chance to enjoy the beer. Maybe a 30-minute boil works for us, but your system has a gentler boil and you need longer to achieve boiled goodness. Those are questions we, and others dabbling in experimentation, can't answer for you!

So … 3, 2, 1 — Let's science!

BY COLIN KAMINSKI

MOVING BEER

Advanced draft designs

Keeping a draft system running can be complex enough that it's some people's full-time job. The goal of any draft system is to dispense beer without changing the carbonation level designed into the product, at the correct serving temperature, with proper head, and very low beer loss. This becomes complex when you have different beers at different carbonation levels on the same tower. The largest system I have had responsibility for was 90 faucets. The most complex was a three-faucet tower, with one nitro draft line and two fully carbonated beers, where all the kegs were 75 ft. (23 m) away and three stories below the bar. I have also seen draft lines that are long enough that the line holds gallons (>4 L) of beer.

A standard carbonation chart will show you the relationship between CO_2 pressure, temperature, and carbonation level. We will assume you are an advanced brewer and have used this chart before, and that your keg is carbonated to the carbonation level and temperature you would like to serve it, and the keg is at equilibrium with these conditions. Now, if we match the CO_2 pressure and the temperature from the chart, we know we won't change our carefully crafted CO_2 volume. In a kegerator, the most common example of a short-draw system, we can simply connect the keg to the faucet using a short section of draft line, but our beer will likely flow out too fast and become a foamy mess when it enters the glass. When this occurs, many folks make the mistake of lowering the CO_2 pressure to slow the flow. While this works in the short term, the CO_2 pressure should match the chart for the carbonation level to stay the same over a longer time frame.

The solution to this problem is simple; increase the tubing length between the keg and the faucet in order to slow beer velocity and to balance the system. The friction between beer and tubing creates restriction, known as pressure drop, and we can do some simple math to calculate the length of tube required. If you look at the restriction chart (page 85), you will see that different tubing material and diameter affect restriction. The sum of all the different components, namely the beer line length, reducers, and the faucet, sets the pressure drop of the whole system. In a kegerator you can simply add a length of 3⁄16-in. (5 mm) inside diameter (ID) tubing between the keg and the faucet to add sufficient pressure drop, slow the flow, and correct the problem.

The simplest way to calculate line length is to begin with your serving pressure. Let's use 12 psi (83 kPa) in this example (2.55 volumes of carbon dioxide at 38 °F/3 °C), subtract 0.5 psi (3.4 kPa) — because we do want some flow coming out of the faucet — and divide it by the restriction. We've picked 3⁄16-in. (5 mm) ID vinyl tubing with 2.2 psi restriction per foot (50.6 kPa/m) for this example because this is the normal liquid line used to connect with U.S. beer taps (even systems with larger diameter beer lines use this section of "choker" for the final few feet and into the faucet). The hose length calculates out to be:

[(12 psi - 0.5 psi) ÷ 2.2 psi/ft.] = 5.2 ft.

Or

[(83 kPa – 3.4 kPa) ÷ 50.6 kPa/m] = 1.6 m

The restriction charts are not perfect and we'll want more flow than a trickle. Starting long and cutting the tubing back is a perfect way to fine-tune the flow. If the pressure, temperature, or desired CO_2 level changes, we can no longer use this length because the system balance is specific to these conditions.

This exercise brings up a practical question; how fast should the beer come out of the faucet? Bar systems are set up to minimize fill time and waste, and a great commercial install can fill a

Keeping a draft system running can be complex enough that it's some people's full-time job.

Photo courtesy of Shutterstock.com

pint in less than 10 seconds. Time is money at a busy bar, but speed is not so critical at home where the most important factor is minimal uncontrolled gas break out and a proper pour. Although the standard beer faucet is usually open or closed, a skilled operator can play tricks with barely cracking the faucet open to pour foam, or vary how the beer enters the glass to prevent or cause gas breakout and foam formation.

KEEP IT COLD

One of the key things often overlooked when installing draft systems is that not all the beer in the system is at the same temperature. The most common problem is the beer faucet warms up, resulting in a foamy first pour. This initial foam causes nucleation sites in the glass, making the rest of the pint more likely to foam. One strategy is to dump the first ounce of beer if the faucet is warm after sitting unused for a while. Another general strategy is to install some sort of cooling system to keep the beer lines and the beer faucet cold; as it turns out there are several ways to cool a draft system.

The easiest way to keep a system cold is to install faucets on the side of a refrigerator or cooler. Most taproom breweries these days have this type of installation and you may have unknowingly seen these due to tile, metal, and/or wood façades installed on the exterior of coolers. While a convenient and functional design that does not take up bar space, these installations do require bartenders to turn away from the bar to serve a beer, adding time and making the interaction with patrons a bit different compared to pouring beer from faucets mounted on the bar.

These cooler systems are easily made by boring a 15⁄16-in. (24 mm) hole through the cooler wall (or refrigerator door), installing a beer shank with 3⁄16-in. (5-mm) ID bore, attaching a 3⁄16-in. (5-mm) hose barb x beer nut adapter inside of the cooler (or buying a shank with a permanent barb installed), and connecting the beer faucet on the exterior of the cooler. You may be wondering how this system keeps the faucet cold. It turns out that the beer shank acts as a heat sink by conducting heat into the cooler where it is removed by the refrigeration system. In fact, a longer shank can work better than one sized to neatly fit the width of the door or wall panel. Although beer shanks installed in the walls of refrigerators and coolers are not perfect, they work pretty darn well.

Another common system is a kegerator with a draft tower mounted on top of the cooler. A draft tower is like the second story of a house, with the beer line extending from the first floor, through the second floor, and out of the roof of the house. In this analogy the first floor contains the air conditioner unit. Hot air rises and the air in a tower is not cold. This is why beer poured from a tower's faucet can be fussy. Fortunately, cooler fans provide an inexpensive and effective fix to this physics problem. Fans can also be used in remote faucet systems where the tower is installed away from the kegs by installing a simple air conduit between the refrigerated space used for keg storage and your faucets. This type of system works best in towers that have two connection points to the bar top because cool air can be routed into one side and out the other, but also works well in towers with a single connection if the air hose is pushed towards the top of the tower.

If you are looking for the cat's meow in cooling, the best method for remote systems is to use so-called python lines (also known as trunk lines), which contain beer lines and glycol lines (supply and return), tightly wrapped with a moisture-barrier adhesive foil, and all neatly bundled into a urethane insulation jacket. Pythons can be mounted to walls, ceilings, and run through underground conduits. And most pythons are connected to liquid-cooled draft towers that make these systems the best choice for remote installations. They also allow for the use of towers with aluminum blocks connected to the shank that give the faucet's exterior that oh-so-cold and frosty look to let folks know that ice-cold beer is indeed on tap. The practical problem with these systems for the homebrewer is the cost of a glycol system, coupled with the more advanced and costly draft line package.

WHEN PRESSURE DROP EXCEEDS EQUILIBRIUM PRESSURE

It's not uncommon when moving beer long distances, especially when elevation changes are added into the mix, for the pressure drop of the system to exceed the equilibrium pressure of the beer(s) being poured. Most draft beer contains about 2.55 volumes of carbon dioxide with a corresponding pressure of 12 psi (83 kPa) at 38 °F (3 °C). OK, time for a little beer math that accounts for elevation changes. We need to know how much pressure is required to lift beer and we can use the fact that 2.3 ft. (0.7 m) of water column is equal to 1 psi of pressure (0.435 psi/ft. or 10 kPa/m) as a close approximation for most beer.

This means if beer is being moved from a basement cooler to a second-floor bar, about 20 ft. (6.1 m) for ease of discussion, the vertical rise is equal to ~8.7 psi or 60 kPa (20 ft. x 0.435 psi/ft. or 6.1 m x 10 kPa/m). Let's consider this scenario with a system having 30 ft. (9.1 m) of 3⁄8-in. (9.5-mm) beer line with 0.2 psi/ft. (4.6 kPa/m) restriction and 1 ft. (0.3 m) of a 3⁄16-in. (5-mm) choker hose.

The total system drop = (20 ft. x 0.435 psi/ft.) + (30 ft. x 0.2 psi/ft.) + (1 ft. x 2.2 psi/ft.) = 16.9 psi

Or

The total system drop = (6.1 m x 10 kPa/m) + (9.1 m x 4.6 kPa/m) + (0.3 m x 50.6 kPa/m) = 118 kPa or 1.18 barr

This requires 17.4 psi (120 kPa) pressure at the inlet of the beer line to give us the ~0.5 psi (3.4 kPa) needed after the faucet. If we simply crank the keg pressure up to 17.4 psi (120 kPa), the beer will become over-carbonated because the equilibrium carbonation level at 38 °F (3 °C) and 17 psi (117 kPa) is 3.03 volume. The two most common ways to deal with this scenario are beer pumps and mixed-gas dispense (nitrogen + carbon dioxide).

Beer pumps and mixed-gas draft system are beyond the demands of most home systems, but for those with an interest in these topics, here is a bit of information. Electric and gas-operated beer pumps are commonly used in long-draw systems and are a handy way of separating beer carbonation concerns (gas pressure and beer temperature) from beer pumping because pumps add pressure to the system without

affecting gas solubility. In this perspective, beer pumps are simple to use. The downside to pumps is that they have to be cleaned, maintained, and powered with compressed gas or electricity.

Another option for long-draw systems is the use of mixed gas blends that allow for higher applied pressures to be used to maintain normal carbonation levels. For example, a gas blend of 70% carbon dioxide and 30% nitrogen at 38 °F (3 °C) and 25 psi (172 kPa) is the correct equilibrium condition for beer with 2.55 volumes of carbon dioxide (online calculators are available from suppliers of gas blenders like McDantim). Aside from the cost of a blender or the added cost of purchasing pre-blended gas, mixed gas systems do not require additional hardware, like pumps, to maintain. And once a brewer is using blended gas and becomes familiar with the gas tables, producing nitro beers is pretty hard to resist.

Restriction Chart and Beer Volume Inline

Vinyl Beer Line (ID)	Pressure Drop per Length	Line Volume
3⁄16 inch (5 mm)	2.20 psi/ft. (50.6 kPa/m)	0.18 oz./ft. (17.7 mL/m)
¼ inch (6.4 mm)	0.65 psi/ft. (15 kPa/m)	0.33 oz./ft. (32.5 mL/m)
5⁄16 inch (7.9 mm)	0.40 psi/ft. (9.2 kPa/m)	0.51 oz./ft. (50.2 mL/m)
3⁄8 inch (9.5 mm)	0.025 psi/ft. (0.58 kPa/m)	0.73 oz./ft. (72 mL/m)
½ inch (12.7 mm)	0.025 psi/ft. (0.58 kPa/m)	1.31 oz./ft. (129 mL/m)
Barrier/Python line (ID)	**Pressure Drop per Length**	**Line Volume**
¼ inch (6.4 mm)	0.3 psi/ft. (6.9 kPa/m)	0.33 oz./ft. (32.5 mL/m)
5⁄16 inch (7.9 mm)	0.1 psi/ft. (2.3 kPa/m)	0.51 oz./ft. (50.2 mL/m)
3⁄8 inch (9.5 mm)	0.06 psi/ft. (1.4 kPa/m	0.73 oz./ft. (72 mL/m)

FAUCETS CONTROL THE FLOW

Walk into any old-school dive bar pouring cold draughts of golden lager and you are likely to see on/off beer faucets. Although these faucets are designed to be either closed or open, they do allow frothy beer to flow when barely opened and give the skilled beerista an element of foam control. However, they cannot be used to consistently and easily add pressure drop at the faucet like a control valve designed to precisely scrub pressure without introducing excessive turbulence. What if a control valve was added to a draft system that allowed for minor system balance adjustments at the faucet without having to change line length? The cool thing about this idea is that these sorts of faucets are indeed available and are becoming more common and price-effective as demand for this type of faucet is increasing. But these types of faucets should never be considered a solution for a highly imbalanced draft system.

BY CAMERON JOHNSON

PASSION AND PLANNING

A strategic pause

While the lessons of 2020 may be hard learned, they are incredibly helpful reminders that we may use to guide us towards emerging from this time stronger, more focused, and ready to succeed anew.

Photo by Christian Lavender

While nobody could have predicted 2020 to be so hard on many nanobrewer's business models, now could be a time to clean house and reimagine your brewery to get you on the right track.

It is a time of chaos. Rogue yeast cells, led by the treacherous Lord *Brettanomyces* have infiltrated the Brewers' home base of Cylin'droconica in an attempt to depose their rightfully elected Queen, *Saccharomyces*. Yet hope remains in those few who remain loyal to the cause of the brewers, those champions of craft who harness their passion for better beer for all. Those tireless artisans, standing ready on their brew decks, steeling themselves against the waves of disorder all around caused by the COVID-19 outbreak, are poised to resume their essential work once more.

Okay, so maybe we're not quite heroes worthy of story and song and action figures, but this time of interruption is an important one nonetheless. These moments of abnormality and hardship give us pause — a glimpse into the relative effectiveness of our previous considerations of a worst-case scenario. While few, if any, could have prepared for this kind of situation, we can distill from this disarray the key factors of distress for business: Sudden loss of revenue; forced closure or limitation of operations; and as almost always the lynchpin of success, cash flow, or more specifically in this case, cash reserves. I will not pretend to be an expert in business finance (thankfully we have Audra Gaiziunas to lean on for this — I recommend checking out her May 9th podcast appearance on CraftBrewery Finance.com, as well as her September 2020 issue column about cash flow statements). So instead, I will examine how we can address the above through a critical examination of what makes our industry work, in theory, practice, and merging these two, praxis. While the lessons of 2020 may be hard learned, they are incredibly helpful reminders that we may use to guide us towards emerging from this time stronger, more focused, and ready to succeed anew.

SECTION I - THEORY

While we often consider a business to be something impersonal or incorporeal, it simply cannot exist without people — people with a shared mission and purpose towards achieving something. In this way, a business is an expression of an idea. That idea, in our industry anyway, is that beer is something we care a great deal about, and want to convince others to care about with similar fervor. Without a belief in your product and your ability to make it something worth paying money for, your business and any plans quickly unravel. Fortunately, one thing I have found time and again in overwhelming quantity among brewers is belief — belief that beer is good, and that their beer contributes positively to the incredible selection available to us. The next step is effectively, and consistently, communicating that belief to your target audience. In "Marketing and Branding: Understanding the core components," (May-June 2020 issue) I reviewed several strategies for creating a brand message based around your company's ethos. One of the most important points of this examination was the process of developing your brand's positioning in your market using a value matrix. This technique helps to focus that passion we all have in abundance, and direct it towards an effective marketing strategy.

Passion is important, but in order to organize these ideas into something actionable, we must proceed to our next topic: Business planning. You've likely heard it enough to make you roll your eyes at this point, but a business plan is a critical element of any operation's

success. This plan is a tool by which you make informed decisions; examine your past, current, and future states; and evaluate your successes and failures. But more simply put, a business plan is an evolving story of your company — a narrative of sorts, like a journal, but empowered by data and driven by critical analysis. Perhaps you never fully fleshed out yours or it was pushed to the side by more immediate tasks. Or maybe you diligently created a detailed document in order to secure your initial funding from a bank. Wherever in this spectrum you might fall, this time of operational pause is a perfect time to review or construct your plan. Simplified to its most basic components, a business plan consists of the following: A description of you/ your business/ your product, an examination of your market and strategies for addressing it, and a collection of financial data, both current and projected. While I will not attempt to review how to compose a detailed business plan in this article, many free resources exist to aid you in this work. I have found the SBA's (Small Business Administration) website to be a wealth of usable information and templates.

SECTION 2 - PRACTICE

So we've reviewed our business plan, possibly editing a section or two, and reminded ourselves of the importance of collecting and reviewing objective data in order to inform our decisions and measure our relative success. Let's now talk a bit more practically about what can be accomplished during this downtime — let's look at operations. When I say operations, I simply mean anything that involves or directs your daily work at a brewery. These are usually referred to as SOPs, or standard operating procedures/practices. You can think of SOPs like the business plan equivalent of your day-to-day best practices. They're a set of standards that not only instruct new people on how to do certain tasks safely, which is often why they are written and emphasized in our industry, but they are also a reminder to more seasoned employees of a formalized method of ensuring quality and consistency. Indeed, this consistency is what defines a product line, and moreover, the brewery putting that product out. Sam Adams' founder Jim Koch regards the nature of adherence to SOPs as they relate to the customer's experience with the end product, "The operational definition of quality is conformance to specifications. Typically those specifications are consumer expectations. So quality, in one sense, is meeting or exceeding consumer expectations." SOPs force us to leave ego aside and focus on the practical . . . the everyday menial tasks. For example, when is the last time you pulled spears from a selection of your kegs? Are you absolutely sure your keg washing practices are maintaining your standard of cleanliness inside of those vessels that we so seldom see? How about the vessels whose insides are easier to see, but aren't often looked into, like your hot liquor tank (HLT)? So many of these tanks are heated by electric elements, which can very quickly become coated in layers of carbonate. This can cause them to overheat, crack, and fail (ask me how I know).

The small-scale craft brewing industry is an interesting anomaly in the business world. We are small and flexible enough to often get away with thinking, and even acting, like homebrewers. But at the end of the day what we are trying to achieve is a successful business. In order to be a successful business you have to maintain your quality, most importantly in the eyes of your customers, and quality can quickly falter when we allow ourselves to get used to inconsistencies. But cleaning house is a pretty obvious suggestion during slow times. Many of us probably work this into our slow seasons as it is. And cleaning, despite how thorough you may want to be, can only occupy you for so long. During a slow down such as this, it is also helpful to review your practices of selling your product. At our small scale, it is often rather easy to simply skate by, making enough money to pay the bills and letting the idea of growth and development be for the "other guys." But that kind of complacency in business strategy is akin to complacency in cleanliness — it only takes a bit of sloppiness to ruin the whole batch. Your brewery can quickly slide from the hot new name in town, coasting on the laurels of "newness" and small-batch uniqueness, to give way to reviews of inconsistency or trend chasing that so often bogs down our industry, not to mention our tank space.

SECTION 3 - PRAXIS

So let's look at merging these two concepts, the theory and the practice — the reason for our business and the ways and means of our business. In philosophy, this is referred to as praxis, but in the brewing world it seems to me to be more appropriate to think of it as the product in the glass. It takes more than a great idea to make a business effective, just like it takes more than a simple recipe and heated kettle to make beer. That beer, specifically one being served over the counter to a paying customer, is the fulfillment of your theory and your practice. It is an expression of yourself, your business, and your ethos. We put together theory and practice to create something unique and expressive of ourselves, and in the case of a business, we hope people like it enough to pay for it — and keep paying for it. Nanobrewing, and any small business operation, depends on a mutual belief in the product on the side of the creator and the patron. But belief by itself is not enough — behind that belief must be a well-conceived strategy.

> **During a slow down such as this, it is also helpful to review your practices of selling your product.**

To better explain the critical nature of strategy in business, I will lean upon my friend Dr. Sam Holloway, Associate Professor at the Pamplin School of Business at the University of Portland. Together with Dr. Mark Meckler, Sam outlines business strategy as being composed of three key overlapping elements:

1. **The strategy itself:** What are we doing to add value and utility to the business?
2. **Innovation & creativity:** How will the strategy be implemented (new technologies, approaches, or techniques required)?
3. **Leadership:** Why does this strategy matter, and how will it be communicated in an actionable way to employees?

Laid out simply, it is easy to see that strategy in business is akin to praxis — it is a critically analyzed synthesis of theory (the why of the strategy) and practice (the how of enacting the strategy). To illustrate this concept, Dr. Holloway has a diagram he graciously shared. You can find the diagram at https://www.byo.com/article/passion-and-planning. He suggests using it as a worksheet when making any important decisions regarding your business plans, filling in the what (strategy), how (innovation), and why (leadership) in order to ensure your decisions are driven by critical analysis, and incorporate a plan to enact and measure your success.

SECTION 4 - Q&A

And now we've come again to my favorite segment, the industry Q&A. I get the chance to pick the brains of those either more successful, more experienced, or better looking than I; and this time they're all three! Today, you'll have the pleasure of learning from the following brewers: Charlie Johnson, Founder/Brewer of Ronin Fermentation Project (Graeagle, California) and Head Brewer of Gweilo Beer (Fo Tan, Hong Kong); Thomas Croskrey, Founder/Head Brewer of Emrys Fermentations, Liberty Lake, Washington (opening 2021) (previously Co-Founder/Head Brewer of Bellwether Brewing, Spokane, Washington); Nathanial Senf, Founder/Head Brewer of Lightheart Brewing, Vancouver, British Columbia.

1. What lessons of brewing and small business has the current state of closures reminded you of, or taught you anew?
   - **Charlie:** Craft brewing is all about community. I really believe in being grateful for every sale and interaction with customers, thanking them for their time and remaining positive with everyone.
   - **Thomas:** Adaptation while maintaining your identity is the key to long-term success. Whether it's cultural shifts, regulatory changes, or anything else that can be thrown at a small business, adapting to that (in a profitable manner) is absolutely critical. One thing this does not mean is wholly losing your brand identity. It's rarely the case that adaptation requires an abandonment of self . . . adapt and adjust, but keep the thrust that made the brand interesting to begin with.
   - **Nathaniel:** Business is an evolve or die world. The breweries that have managed to change their model to package/delivery have managed to survive.

2. In your opinion, what are the most important aspects of operating a successful small craft brewery during times of hardship (e.g. COVID-19, hop shortage, mass market consolidation, etc.)?
   - **Charlie:** Quality, branding, and quality. Investing in QC lab equipment really has been something that has helped us a lot.
   - **Thomas:** 1) Adapting — creating exciting products, campaigns, live streams, and other ways to engage with your customer base. 2) Transparency in communication — being honest about the hardship without seeming whiney or entitled, while presenting your solutions and calls to action clearly. 3) Collaboration and philanthropy: Ideas, beverages, events . . . these automatically generate a sense of camaraderie and community. It shows engagement and care for the community, which improves your reputation, creates a stronger network of collaborators, and provides the foundation for "think tank" tactics with other business/non-profit owners.
   - **Nathaniel:** The old saying of "mind your nickels and dimes and the dollars will start to make cents" comes to mind. It's all about the small victories to win the battle.

3. In the "post-COVID" world, what do you believe will set apart a brewery that simply survives, from one that thrives?
   - **Charlie:** Quality will set people apart, but also embracing your concept. I think it's harder these days to be a brewery that makes everything. Jumping to a trend just makes your brand conception weaker in my mind. Cash flow and keeping your debt low I think is really important. If you're a newer brewery, or thinking of opening one, hire a consultant and reach out to others (in the industry).
   - **Thomas:** It's hard to say if the public will still remain abundantly cautious in regard to disease and sickness, and what that "abundant caution" would look like. I think the desire for strong takeaway options is here to stay, so that will be important to bolster, as will desires for extra cleanliness and touchless sales systems.
   - **Nathaniel:** Breweries are all about innovation, logistics and relationships. Finding new ways to keep your costs in check, keep track of your kegs/accounts payable, remain relevant and still remaining on good terms with your customers is the challenge.

SECTION 5 - CONCLUSION

During this time, let's all continue to work to support each other in maintaining and strengthening our industry and our belief in our work. Craft brewing is far more than the wonderful liquid we create. We may have gotten into it because we enjoyed the buzz, but what has sustained us and kept us striving and growing over the past several decades of craft beer growth is a different kind of buzz. The hum of conversation in the taproom; the din of a late-night gathering over a shared last bottle of your favorite batch; the uproar at a beer festival when that rare and anticipated beer is finally tapped; the explosion of excitement when the brewery's name is called at the podium, whether in a five-person homebrew contest or a five-thousand-strong national event. We have passion — we have it in excess. But passion without direction is chaos. Let's temper the chaos we find ourselves in these days with critical examination, renewed vigor, and collaborative support of the industry, the product, and the people that brought us all together on this crazy adventure. Cheers, fellow brewer!

POWER YOUR PROPANE BURNER

Run your flames on a simple switch

BY JP MARTEL

As a homebrewer I am interested in the process of making beer, and of course the beer itself. However, as I came to realize, there is another aspect to the hobby that I wasn't fully aware of . . . all the cool hardware and gadgets that are available to us homebrewers. When I first started brewing, many of the kettles, pumps, hardware, and other gadgets were just not available.

Like most homebrewers I began my all-grain brewing journey with a small kit consisting of a mash cooler and one pot. Brewing inside was time consuming and messy, so I bought my first propane burner and moved outside. This would provide me with other challenges such as how to keep the mash from cooling down too much on cold-weather brew days. Up to this point I would only brew during the summer months, but my homebrew supply suffered in the off-season. I needed a solution, one that a bit of research would provide.

I discovered a new term and a solution to my temperature issues. Enter the heat-exchanged recirculating mash system, or more colloquially known as HERMS. In case you are unfamiliar, a HERMS recirculates wort from the mash tun through tubing that is immersed in hot water, usually a hot liquor tank. This water is heated just above the desired mash temperature and maintained. Many systems have an automatically lit burner powered by a controller with temperature sensors. The temperature is set and when the temperature drops in the hot liquor tank the controller calls for heat and the burner ignites. There are two main types of HERMS tank heating options — electric and propane (or natural gas if available to you). Electric would be impractical for my conditions so I opted to go with propane.

The problem I had was trying to find information on building a pilot-lit burner while at the same time making it safe to operate in outdoor conditions. I was finding a lot of designs that used a pilot light that was constantly lit but not controlled by a sensor and valve. The pilot light being blown out with a gust of wind was a concern. So, I set my sights on using a smart valve that would control the flow of propane safely.

This build needed to meet one more criteria to be a viable solution. Since I brew outside and store my brew setup indoors, I would need a brewery that I could take apart and easily move indoors for storage. The burner modification had to be contained to my burner's housing unit, making it tough for an automated, sensor-driven system.

When I started my HERMS system project build I broke it up into three phases so it wasn't so daunting. First the HERMS tank and heat exchanger, second was the burner, and finally the controller. These instructions will concentrate on my burner modification itself rather than my HERMS setup. The burner can be used without a controller by means of a manual switch if building this in a phased approach like I did. When my brewstand is built, a controller will turn the burner on and off for me.

Tools and Materials

- Smart valve, low-pressure (I used a Honeywell SV9501)
- Hot surface igniter pilot
- Propane burner
- Low-pressure propane regulator (11-in. WC) and hose
- ¼-in. MNPT x ⅜-in. MGF control valve orifice (CVO)
- Pilot light aluminum tubing ¼-in. OD
- Copper tubing ¼-in. ID
- (2) ¼-in. flare to ½ male brass fittings
- 24V 40VA transformer
- Power strip with on/off switch
- Copper tubing flaring tool

The pilot light being blown out with a gust of wind was a concern. So, I set my sights on using a smart valve . . .

Photos by JP Martel

STEP BY STEP

1. MODIFY BURNER TO RAISE IT CLOSER TO THE TOP OF THE STAND

If you already have a burner and you're not looking at increasing your BTU output or kettle size, then great, you can check that off the materials list. If you need to get a burner, look for one with a solid BTU output. I already had a Bayou Classic stand with a banjo-style burner so I was set. It's quiet and heats water quickly.

When you use one of these high-BTU burners you notice that the flame can be set really low, or scary jet engine level high. When we introduce a smart valve, we will lose that range and it will always be at a lower setting. The propane pressure needs to be lowered for the smart valve to function properly. A lower flame means longer heat times, but there is a fix. What we need to do is move the burner head closer to the bottom of the pot. To do this you might have to cut some of the burner housing and drill new holes for the screws. I moved mine up two inches (5 cm) and found that the heat times before and after reducing the pressure were nearly the same. I am considering making this change to my other burner as well just to save on propane. Also, you can check out the "Heat Shield" build in the September 2020 issue of *BYO*.

2. MOUNT SMART VALVE

You will need to install the smart valve onto your burner's housing unit on the same side you have your propane tank. The smart valve has gas-in and gas-out ports. In my case, my tank is on the right-hand side of my burner so I mounted the smart valve on the right.

Using a piece of 2-in. x 6-in. (5-cm x 15-cm) metal plate, I drilled a ¾-in. (19-mm) hole that fit against the smart valve where the gas-out port is. This allows the brass fitting to be connected to the gas-out port described later. Drill four holes that line up with the four holes in the smart valve. Drill two more holes that allow a U-bolt to be used to mount the plate and smart valve to the frame of the burner. Mount the plate to the smart valve with four screws and then using the U-bolt, mount the plate and valve to the frame of the burner.

Attach the brass fittings to the smart valve gas-in and gas-out ports.

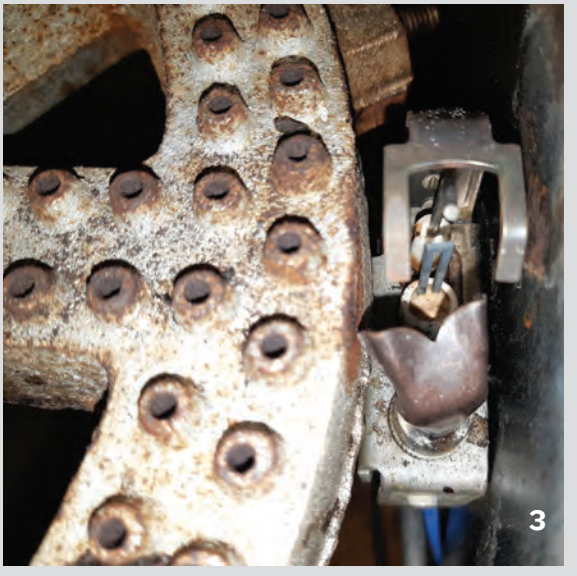
3. INSTALL THE IGNITER AND IGNITER END OF ¼-INCH ALUMINUM

On the same side that the smart valve is installed locate a spot between the burner housing and the burner head. The igniter has a small plate with a hole in it that can be used to mount it to the burner housing. Make a mark on the inside of the burner housing where the hole is on the small plate making sure that the igniter is about 1 in. (2.5 cm) above the burner head. Drill a hole at the mark.

Using a small pipe bender bend the ¼-in. aluminum tubing so that it will fit between the igniter and the smart valve igniter port. Connect the igniter end and mount the igniter to the burner housing.


1


2


3

4. CONNECT TUBING AND PROPANE VALVE

Install the new needle valve to the burner. To do this remove the existing propane hose and orifice that is connected to the burner head and thread the valve in its place making sure that the gas-in side is pointing towards the gas-out of the smart valve (photo 4A).

Cut a piece of ¼-in. ID copper tubing to the length between the gas-out fitting of the smart valve and the needle valve on the burner. Using a flaring tool, flare the ends and connect the tubing to the smart valve gas-out and the needle valve. Tighten the brass fittings.

Connect the ¼-in. aluminum tubing to the igniter port on the smart valve with a small brass compression fitting. The igniter I bought came with these fittings included.

Connect the new low-pressure propane tubing coming from the propane tank to the gas-in brass fitting on the smart valve (photo 4B).

5. HOOK SENSOR CONNECTORS AND POWER TO VALVE

There should be two connectors on the smart valve, and they each have a different number of pins. Plug in the igniter connector then the control connector (photo 5A).

Take the wires coming from the control connector and connect them to the transformer (photo 5B) on the 24V side. On the other side wire the transformer to the 120VAC power strip. (In a slightly more advanced build, a digital temperature sensor could signal a PID controller when to have the burner turn on and off automatically based on a pre-set temperature in the HERMS kettle. Due to my current logistical restrictions, my system works well for me as I monitor the temperature manually and play the part of the PID controller with the power strip switch.)

6. TESTING

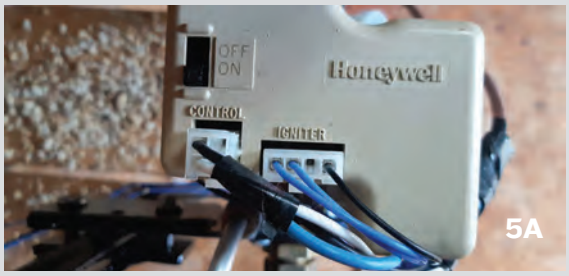
Check to make sure the smart valve is switched on and the needle valve on the burner is open fully. Open the propane tank valve. With some soapy water and a small paintbrush, brush some soapy water on the connection between the propane tank and the smart valve to check for gas leaks. The soapy water will bubble if there are any.

With the transformer plugged into a power strip with an on/off switch, plug the power strip into an electrical outlet and make sure the switch on the power strip is on. The smart valve should attempt to light the igniter. This might take several attempts since the air in the lines will have to be forced out by propane. Once the igniter is lit the burner should then light. Check the other connections with soapy water. Tighten any leaky connections. To shut the burner off, just switch the power bar off and, when all wrapped up, turn off the valve on the propane tank.

Brewing with electricity and propane can be hazardous. There is a risk of electrical shock or death. If you decide to build this, your design and finished project should be reviewed by a licensed electrician. Any 120VAC power used in brewing operations should be protected by a Ground Fault Circuit Interrupter (GFCI).


4A


4B



5A

5B


6

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BY JASON RICH

CHEERS TO MY DAD

My journey from macro to micro

When it comes right down to it, I got into the beer world purely because of my dad. Until about four years ago I had no idea there were more than two categories of beer. There was beer I would tolerate and everything else lumped into the other category; beer I wouldn't touch. To be fair, the only beer I'd tried back then was a few domestic and import beers that you can find everywhere: Stella Artois, Blue Moon, Corona, etc. I've been active duty U.S. Air Force since 2011. While stationed in South Korea from October 2015 to October 2016, I never even bothered with beer because mixed drinks with Soju was just so cheap.

After my time in South Korea, I got stationed near home at Travis Air Force Base in California. That's when I found out my Dad, Troy Todd, had been brewing beer for quite a few years at that point. I had no idea. So while beer didn't excite me, it would have been rude not to try his homebrew. Turns out this filial obligation was a revelation for me. His beer was essentially my gateway to a new way of life. I started making a point to go to every brewery in and around Sacramento and the Bay Area to try craft beer and see what it was all about. I started attending beer festivals and release parties trying all styles of beer. Drinking alcohol was no longer a means to get drunk. I enjoyed socializing with a well-brewed beer.

Also I started brewing beer with my dad. Now full disclosure, he is the real expert and his brew system has come a long a way even since I started helping him. Every time I come over for a brew session he'll have some new toy or some fancy innovative way to make a process better from just things he found at Lowes or Home Depot that he repurposed. I always found it to be very impressive. I learned quickly that brewing is a lot of janitorial work, but it's worth every second for a quality product. When I left for another deployment, my dad retired and started working as a brewer at a local brewery, Heretic Brewing Company. Coincidentally, the owner of Heretic, Jamil Zainasheff, is the Honorary Commander for my squadron, the 60th Mechanical Squadron (MXS). Needless to say he picked up a few neat tricks and wealth of knowledge working with Jamil.

During my next deployment to the Middle East I started getting into designing labels and other artsy things during what little time I had off. I would send my dad some labels for holiday beers, like one we came up with as "Santa is Alive!" because Heretic had a beer called Dead Santa. I also designed a military challenge coin while I was there that got a lot of positive feedback and convinced me to keep doing design work.

Inevitably, brewing beer with my dad and designing homebrew labels became a way to bond with my dad. What better way is there to do that than over a beer? This led us to join a local homebrew club. Through the brew club we had some opportunities to pour our homebrew for charity at a couple small brewfests. For this reason, you can imagine my excitement when there was a homebrew competition on base in October 2019. My dad and I entered two beers including our Peanut Butter Banana Time Stout. At 8.2% ABV, it was the strongest beer in the competition. Unfortunately we were out of labels and ink for printing, so I ended up printing the labels in black and white and on paper. I basically just cut out the paper and taped it around the cans for the competition. It sure looked tacky, but it was still delicious. As it was a popularity contest for best beer, it was quite humbling when our Peanut Butter Banana Time Stout took first place.

Inevitably, brewing beer with my dad and designing homebrew labels became a way to bond with my dad.

Photo by Jason Rich

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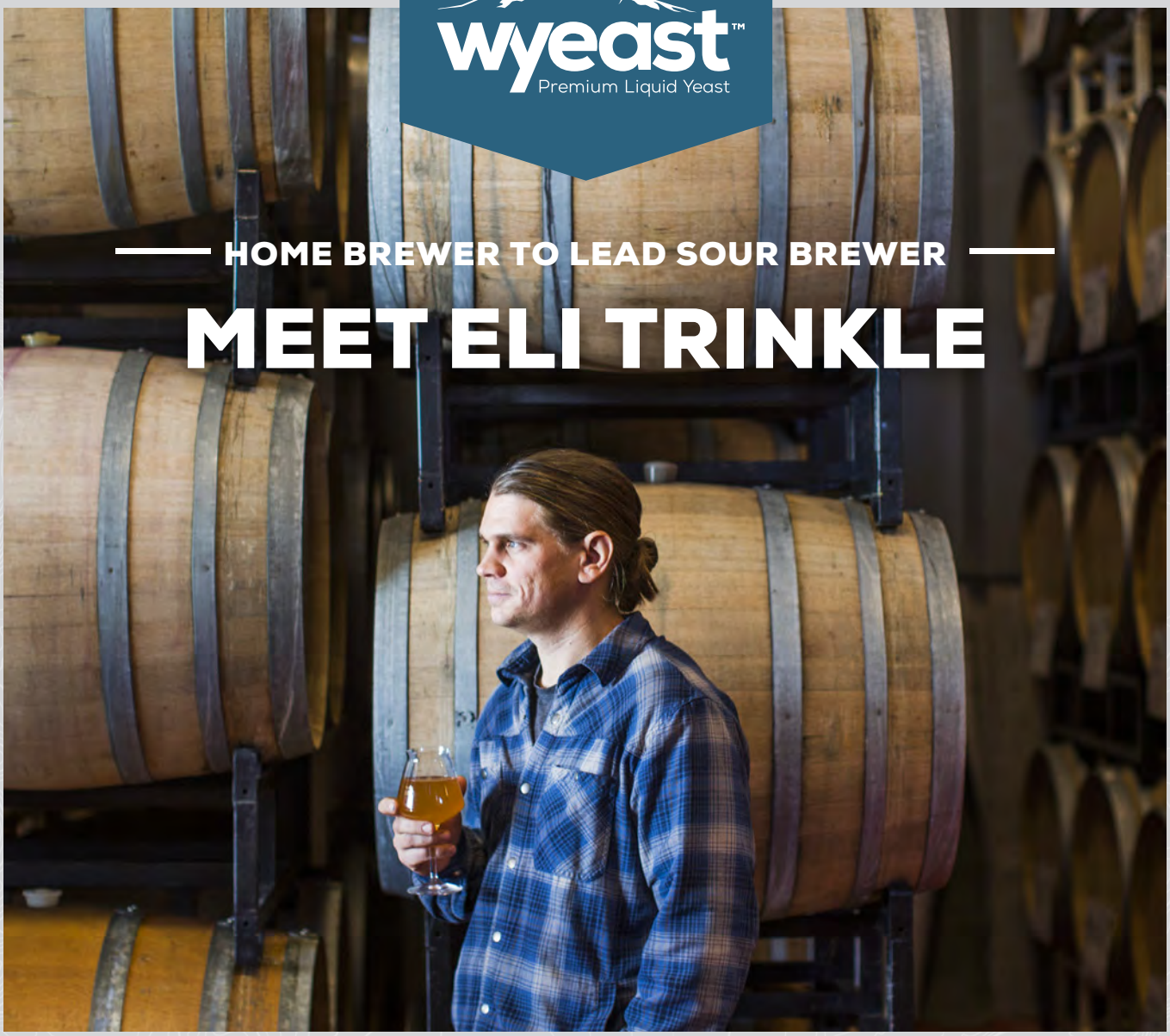

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MEET ELI TRINKLE

Eli Trinkle of Upland Brewing Co. was immediately drawn to home brewing after being introduced to it by his neighbor. After just one month of owning his own home brew setup, Eli was brewing all-grain with Wyeast smack-packs and kegging his own beer. He admits he was so intrigued by the process, it consumed his life. He spent countless hours researching and experimenting–he even worked as an assistant brewer while finishing his degree in engineering technology. Post-graduation, Eli decided that instead of pursuing more education, he'd turn his passion for brewing into a career.

Today, Eli has crafted a diverse portfolio of award-winning sours for Upland. He attributes his present-day brewing devotion to his colleagues at Upland, to the people of Bloomington, IN and the pride associated with pioneering a quality fermentation product. At Wyeast we share these same values, which is why we're pleased to toast the work of Eli and the rest of the Upland Brewing team.

See **wyeastlab.com** for homebrewing recipes from Eli and other commercial craft brewers.

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