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THE HOW-TO HOMEBREW BEER MAGAZINE

MARCH-APRIL 2023, VOL.29, NO.2

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features

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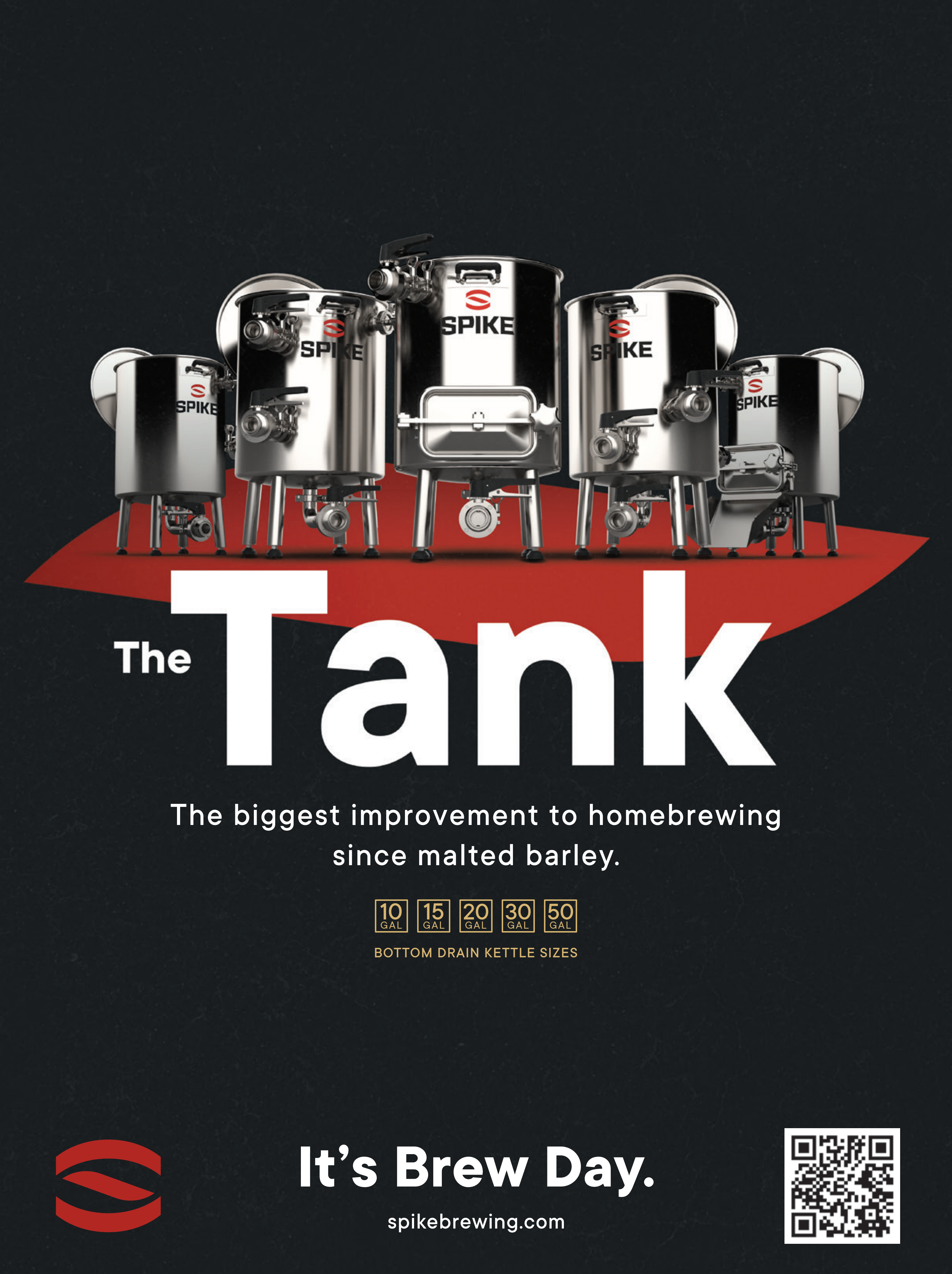
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RECIPE INDEX

RECIPE STANDARDIZATION

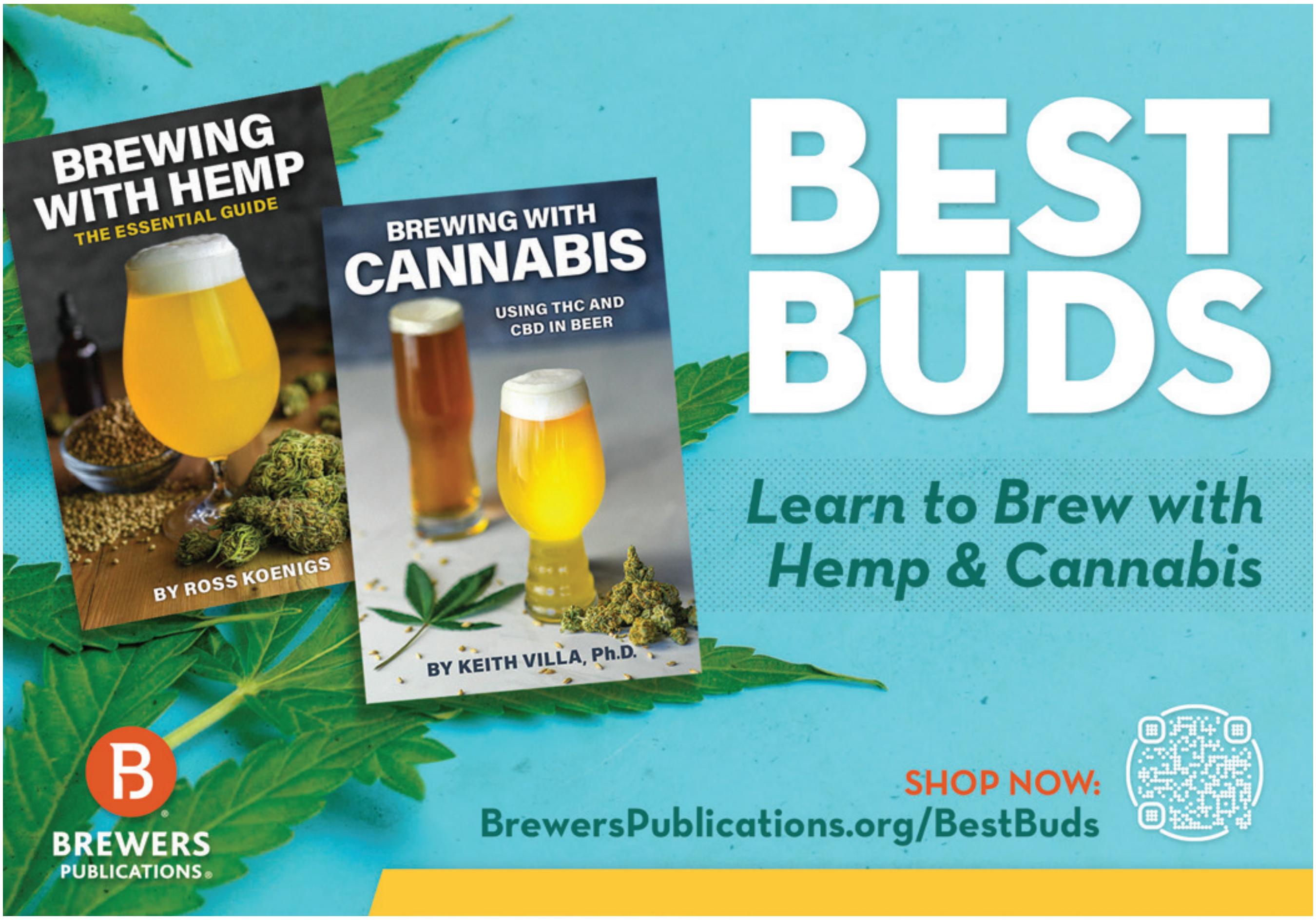
EXTRACT EFFICIENCY: 65%
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one U.S. gallon of water, would yield a wort of 1.024.)

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

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

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

Gallons:
We use U.S. gallons whenever gallons are mentioned.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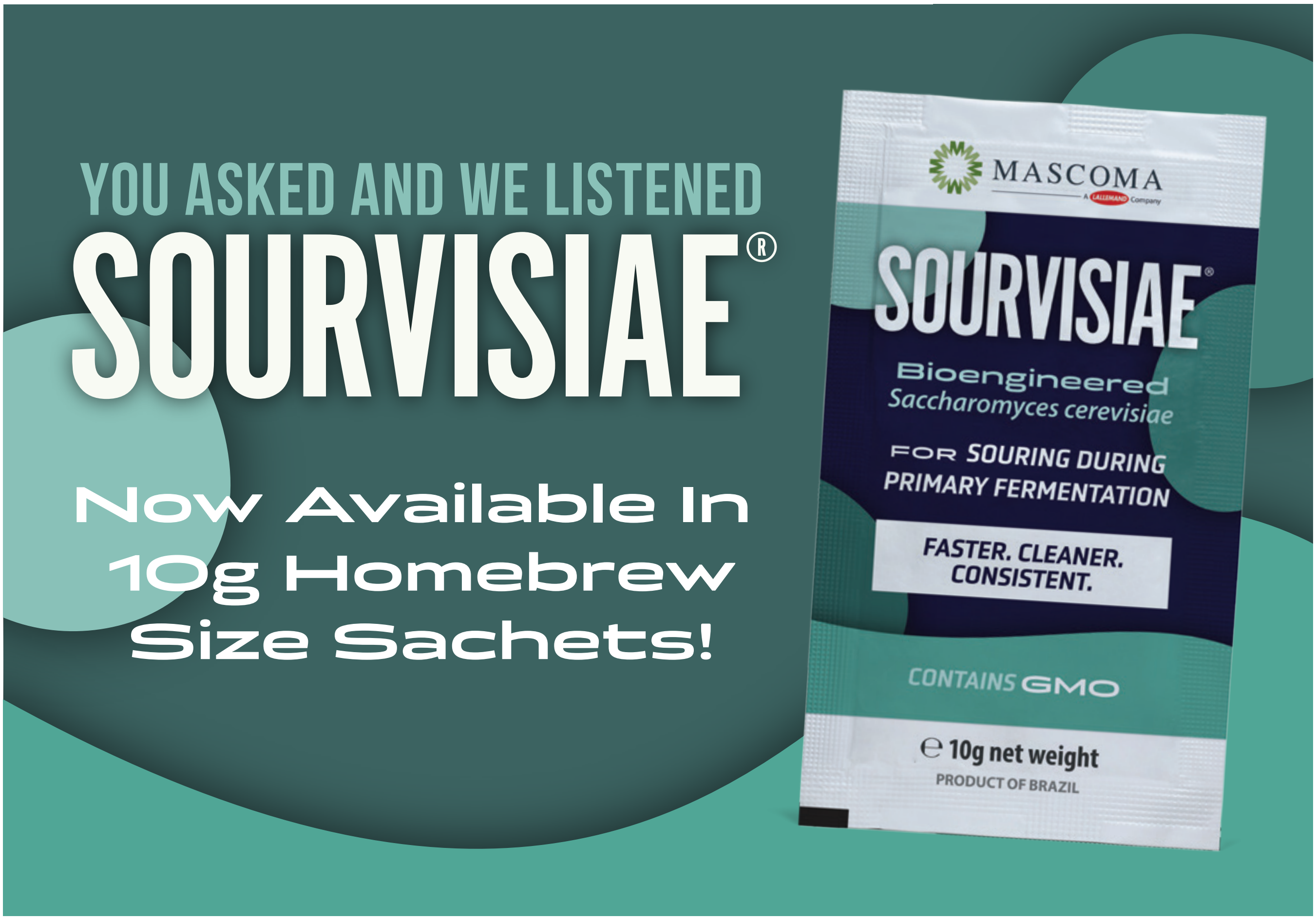
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Cover Photo:
Charles A. Parker/Images Plus

Q

If you could brew a beer with anyone, who would it be?

If I could just hang out with someone and homebrew, it would be a TV food celebrity. I personally really like food shows and internally grumble about the near-absence of episodes about beer. So my selection here definitely has a motive, and that is to promote homebrewing to a broader audience. There are many food celebrities who really have a passion about food, but maybe not so much about beer. That's why my pick is Baek (Paik) Jong-Won, the host of an awesome show about Korean food and drink called *Paik's Spirit!*

If I were to brew with a professional brewer, it would have to be Matt Brynildson of Firestone Walker. Everything that brewery makes is first class and Matt just has a magic touch for bringing the best out of any beer he makes. Now if the person I'm brewing with does NOT have to be a pro brewer, then I would brew a beer with singer Bruce Dickinson of Iron Maiden. Bruce seems to enjoy his beers, and I certainly enjoy his band's music, so we'd have a lot to talk about. I'd offer to teach him a few things about brewing if he could teach me how to hit those crazy high notes!

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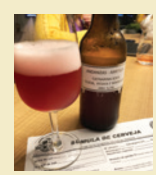
Turbid Mashing

Turbid mashing is a method that is still practiced in a few smaller lambic breweries in Belgium, such as Cantillon and Boon. If you have interest in brewing lambic-styled beers or you just want to try an experiment — then utilizing a turbid mash may push your Belgian-inspired or concept beer to the next level. https://byo.com/article/turbid-mashing/

MEMBERS ONLY

The Lacto Lounge

Kettle souring has become very popular because of the time savings and lower risk of contaminating the brewery compared to other souring techniques. However, the process comes with its own cons too. This DIY "kettle"-souring keg solves many of those problems. https://byo.com/article/the-lacto-lounge/



Catharina Sour

Fruit-forward sour beers have been increasingly making their mark in the craft beer world. In Brazil, a style known as Catharina sour is one example of this trend. Learn what sets this style apart and how to brew one yourself. https://byo.com/article/catharina-sour-brazilian-kettle-soured-fruit-beer/

MEMBERS ONLY

Clarity, Fining, and Recipe Decisions

While promoting clarity in your beer may not be your top priority, there are benefits to the pursuit of clear beer. Take a walk through the various reasons brewers may want to clarify their beer and ways to achieve it. https://byo.com/article/clearing-it-out-clarity-fining-and-recipe-decisions/

MEMBERS ONLY

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MAIL

INDUCTION EXPERIENCE

I am writing in response to the letter in the "Mail" section of the January–February 2023 issue of *BYO* about induction brewing (from Chris Mull). I started using an induction cooktop with my 5-gallon (19-L) system in 2016 when I decided it was time to get off the kitchen stove. I purchased an inexpensive 115V induction unit on Amazon, loaded it up with 7 gallons (26.5 L) of water, and set it to full temperature to see how long it would take to get up to boil. THEN I read the instruction manual that stated the maximum weight it could handle was 35 lbs. (16 kg). (I figure I had close to 70 lbs./32 kg on the unit at the time.) I then made three furniture feet to suspend the weight and started using it with my brewing. Most do not know that induction cooktops do not need to be in contact with the surface of the pot to work. I used mine with about 1-2 mm of space between the cooktop and the pot and it worked perfectly.

With only 1800W of cooking power it was slow getting 7–8 gallons (26.5–30 L) of liquid to a full boil so I added a drop-in HotRod with a homemade PID controller. With another 1650W I now had enough power to make beer happen in a reasonable amount of time and the HotRod/controller combination allowed me much more accurate temperature control.

After using the cooktop for six years and approximately 80 brew days, I discovered that the unit did not bounce very well when I dropped it while my putting equipment away after a long brew day. I replaced it with a 1800W metal-framed unit and gave up on the furniture feet. I then decided it might be nice to have two heating elements so I purchased another of the same inexpensive unit for my second cooktop.

Things to consider: It would be wonderful to have 220V commercial cooktops to do this, but they are kind of pricey. The downside of using these 115V-heating units is each one draws 15 amps, which is the limit of most standard household plugs. Each one of these heating elements has to be on a separate circuit or you are blowing switch breakers for sure.

I am surprised that more brewers have not explored induction cookers. It is an efficient tool to use in making beer and deserves more attention.

Drew Jackson • *Mendocino, California*

contributors

Gordon Strong is President Emeritus and the 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.

Gordon does double duty in this issue with his regular "Style Profile" column on American porter on page 22 as well as sharing the history and brewing techniques for Catharina sour, the fruited sour style out of Brazil, starting on page 40.

Dr. Brad Smith is the author of BeerSmith homebrewing software, as well as host of the BeerSmith Podcast, blog, and forum. Brad has written over 500 articles on brewing, published over 260 podcast episodes, and also hosts the BeerSmithRecipes.com website featuring 1.6 million beer recipes. Brad is a retired Air Force Colonel, and holds a PhD in computer engineering.

Beginning on page 26, Brad explains the causes of beer haze and techniques to avoid or clear up an unwanted haze.

Wes Hagen is a consulting winemaker and wine sales specialist for LXV Wine in Paso Robles, California, and Native9 Wines in Santa Maria, California. Wes has worn a lot of hats in the wine business: Winemaker and Vineyard Manager at Clos Pepe Vineyards for 20 years, Winemaker and Brand Ambassador for Miller Family/Bien Nacido for nearly a decade, AVA Petitioner with 4 AVAs submitted and approved, and writing for *WineMaker*, *Somm Journal*, *Burgundy Report*, *LA Times Magazine*, and other publications. He has written the "Backyard Vines" column for *BYO*'s sister publication *WineMaker* for over two decades. Follow Wes on social media: Wes Hagen on Facebook, @weshagen on Twitter, and @wes_hagen on Instagram.

In addition to making wine, Wes is a craft beer nerd with an appreciation for beers of all styles. In this issue, Wes shares how homebrewers can make their own wine at home, with a homebrew twist, starting on page 48.

MAIL

YEAST STARTERS AND PITCH RATES

I have a couple of questions about your otherwise enjoyable, informative, and well-designed *Big Book of Homebrewing* (updated ed. 2022).

1. Pg. 106: This is the first time I have seen yeast cell recommendations expressed in cells per milliliter rather than per batch quantities (like 5-gallons/19-L). How is the "per mL" expression useful to a homebrewer when each time we have to multiply by 18,927 to get the quantity of cells per 5-gallon (19-L) batch?

2. I'm curious why, when two of the photos on pg. 112 show flasks on stir plates, you do not say a word about the use of stir plates in the captions or in the main text.

3. I'm not clear on the procedure for increasing a yeast starter size by stepping up the starter. Do you decant the spent wort off the yeast layer each time you add fresh wort?

4. Pg. 98: What is the "beer volcano" of which Matt Brynildson speaks?

Thomas Wood • *via email*

Thanks for the questions. Recipe Editor Dave Green responds: "1. Cell counts expressed per mL is the general way brewers can speak about proper pitch rates whether they are a homebrewer brewing 1-gallon (4-L) batches or a brewery brewing a 50-barrel batch. 'What's your pitch rate?' the homebrewer might ask. 'We always pitch our ales at 7.5 million cells/mL,' they may say. It's an easy way to talk pitch rates universally. If you want to get more specific, then it's # yeast cells/mL/ °Plato. But when you look at most yeast pitch calculators, this will be one variable they will ask for: https://www.whitelabs.com/news-update-detail?id=70

2. The benefits of a stir plate are debatable. A lot of folks argue that they are an unnecessary added element and that shaking your starter a few times is just as beneficial. While the photo shoot included the stir plate, we don't feel it's necessary for homebrewers to utilize them.

3. Whenever I step up a yeast starter I decant most of the liquid, leaving just a little to swirl the yeast back into suspension. I've done this when culturing yeast from a bottle of beer, which means you're starting with a very small amount of yeast. The rule of thumb is never to increase by more than 10x the volume of wort. Say you start with 50 mL. Next step might be 250 mL and the next 1.5 L. I've never needed to step up when pitching a packet of commercial yeast, but if going from a homebrew-size yeast packet to professional-sized pitch rates, then stepping up would be required.

4. Try dumping salt into a freshly cracked beer . . . you'll see. The same thing can happen when you add dry hop additions to beer super saturated with CO_2 from fermentation. The results cannot only be extremely messy, but dangerous on a professional brewing level." BYO


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BEGINNER'S BLOCK

BY DAVE GREEN

ATTENUATION & FINISHING GRAVITY

It's a satisfying feeling when your beer has finished fermenting and you pour a sample into a hydrometer test jar, drop the hydrometer in, give it a spin, and watch it land on the exact finishing gravity you had anticipated. But there are a number of factors that control how the beer got there and most can be manipulated by the brewer in order to adjust where it lands, as well as mess it up. Each of these factors, when summed together, control the beer's attenuation.

WHAT IS ATTENUATION?

In the physics world attenuation has to do with a general reduction of something, like electric power or force due to resistance. In the brewing world, it's related to the reduction of sugar levels from active fermentation as yeast convert it to ethyl alcohol and carbon dioxide. This leads to a diminishing density that we often measure as either specific gravity or Plato (Plato is more commonly used in the professional brewing world). The greater the attenuation the more sugars are consumed, resulting in a lower final gravity and higher alcohol level.

MEASURING FOR GRAVITY

A float hydrometer is one of the most common tools in a homebrewer's kit. It is going to be the easiest and most accurate way to measure the finishing gravity of your beer. If you have opted for a refractometer, while they are great at measuring starting gravity, ethanol has a greater effect on its accuracy. Calculators have been developed to sidestep this shortcoming, but is an extra hassle compared to the ease of a hydrometer.

If the beer is carbonated, then you will want to leave the sample out overnight or pour the beer back and forth between two containers to allow it to de-gas before getting the reading. Dissolved CO_2 will lift the float hydrometer, providing an inaccurate result.

CALCULATING ATTENUATION

To obtain the attenuation level of a beer you need both the starting and finishing gravity readings. What we homebrewers care most about is apparent attenuation (real attenuation requires laboratory testing). To calculate percent apparent attenuation, start by changing the specific gravity (SG) to gravity points (GP) . . . that means 1.042 SG is 42 GP, 1.012 SG is 12 GP. Subtract the finishing gravity points from the starting gravity points, divide by starting gravity points, then multiply by 100. Apparent attenuation for a standard ale or lager generally falls between 65–80%, but there are plenty of exceptions to this and manufacturers will provide a range for each strain.

TAKING CONTROL

One of the easiest ways homebrewers can adjust their expected final gravity and attenuation is through their yeast selection. Some yeast strains are well known for tearing through the carbohydrates the brewer provides, creating a lower finishing gravity given the same starting wort. These strains may be a great choice to balance an otherwise high-finishing gravity beer or if a slightly drier finish is desired. Other strains, most notably ones that struggle to or can't ferment the sugar maltotriose, will leave a higher gravity beer. These may be the yeast of choice for lower alcohol beers, providing more mouthfeel to the beer.

Controlling the finishing gravity through grain and/or sugar selection is also a common lever brewers pull. More specialty grains like dextrin and caramel malts as well as roasted grains will leave the brewer with a higher gravity beer. On the other side of the coin, corn and table sugars are commonly used to create a higher alcohol beer without increasing the final gravity due to the ease of fermentation by yeast. This will create a higher apparent attenuation. Maltodextrin and lactose are two sugars that yeast cannot ferment, which allow the brewer to create more mouthfeel, increase final gravity, and lower apparent attenuation.

All-grain brewers have an added lever they can pull in the form of mash temperature. Mashing on the higher side of typical single infusion mash range will provide a higher finishing gravity and less attenuation by decreasing wort fermentability. Lower-temperature single infusion mashes, step mashes, and decoction mashes are typically ways all-grain brewers will lower expected finishing gravity and more attenuation by increasing wort fermentability.

Also, there are many ways brewers can negatively impact attenuation and these can sometimes lead to off-flavors. Fermenting too cold may cause the yeast to flocculate (clump together) and fall out of solution too soon, leaving an under-attenuated and unstable beer. Try to stay within the yeast strain's suggested fermentation temperature range per the manufacturer. Other ways things can go wrong is not providing the yeast the proper nutrients they need, pitching far too few yeast cells, and having an uncalibrated mash thermometer.

WHY DO WE CARE?

Measuring the starting and finishing gravity of each and every batch should be a priority for all homebrewers. This allows you to track your alcohol level, which may be important if you're looking to fall within range for style or you have friends over that are driving.

Tracking apparent attenuation is more about meeting your expectations as a brewer. The better you're able to predict outcomes from various tweakings, the more you'll grow in the hobby.

BYO READER RECIPE

GABE JACKSON, THE BEVERAGE PEOPLE
SANTA ROSA, CALIFORNIA

HOP WATER

(16 oz./475 mL)

This recipe makes a delicious and refreshing non-alcoholic, hop-focused soda to complement your beers and other drinks at home. Some specialty ingredients are required while others are optional. If you like the recipe and have a draft setup, this can easily be scaled to a 5-gallon (19-L) Corny keg-sized batch to enjoy anytime.

INGREDIENTS

16 oz. (475 mL) cup full of ice
1–2 tsp. simple syrup
2 drops distilled essential hop oil
2 drops mango flavoring (optional)
~8 oz. (240 mL) sparkling water

STEP BY STEP

Fill cup with ice and add the syrup, hop oil, and mango flavoring (if using). Top off the glass with the sparkling water and stir to mix the flavors thoroughly. This provides a total of about 30–35 calories.

(5 GALLONS/19 L)

To scale up to Corny keg-sized batch, start with filtered or reverse osmosis water and fill keg to near the top. Add 1⅓ cups (320 mL) simple syrup, 1 Tbsp. citric acid, 6–7 mL essential hop oil, 6–7 mL mango flavoring (optional). If you use reverse osmosis water, consider adding ½ tsp. of gypsum or calcium chloride, or both. Top up with more water to fill the keg. Place on pressure to carbonate to 4–5 volumes CO_2.

WHAT'S NEW

NEW CELLARSCIENCE® YEAST STRAINS

Four new dried yeast strains from CellarScience® are now available: Hazy, Baja, Monk, and Saison. These new strains are available in both 12-g sachets or 500-g bricks. Hazy is meant for use in hazy-style IPAs but also perfectly suitable for more restrained English-style beers such as a bitter. Baja is best utilized for clean, Mexican-style lagers and cold IPAs. Monk is an ale strain of Belgian descent with strong attenuation capacity and will impart fruity esters and a restrained phenolic profile. Saison is best suited for farmhouse-style beers with some fruit and citrus character as well as spicy phenolics. All yeast strains can be direct pitched, but CellarScience® recommends rehydration when wort has a higher starting gravity. Learn more at: https://www.morebeer.com/category/cellarscience.html

LISS BEER GAS CARTRIDGES

Beer gas is now available in safe and practical cartridges without threads for homebrewers throughout the world. Liss Manufacturing now produces small, portable beer gas cartridges that, in combination with a regulator, can connect to the gas-in post on a Corny keg. One cartridge contains 21 mL mixed gas of 70% nitrogen (N_2) and 30% CO_2, which can provide the cascading pour for rich and creamy beers such as stouts and porters. Must be used in conjunction with a beer gas regulator that handles higher pressure ratings when compared to standard CO_2 regulators. Food-safe and TÜV-certified. Currently being sold as a box of 10 beer gas cartridges. https://brewshop.no/produkt/fat-co2/fat-og-co2/beer-gas-patroner-uten-gjenger-21ml-10-stk


Photo courtesy of Shutterstock.com

THE PARENT OF LAGER YEAST FOUND IN IRELAND

The origin story of the strain of yeast brewers use to produce lager beers, *Saccharomyces pastorianus,* has long been shrouded in mystery. Scientists have been slowly lifting the covers of the mystery through a series of discoveries. The first was that *Saccharomyces pastorianus* is actually a hybridized strain of two parent yeast: *Saccharomyces cerevisiae* and a yet to be discovered yeast strain.

This unknown strain was discovered in 2011 when scientists isolated *Saccharomyces eubayanus* growing in the remote forests of Patagonia in South America. This yeast has since been found in other far reaching places like New Zealand, China, North America, and Tibet. Yet the answer as to how *S. eubayanus* turned up in the Bavarian region of southern Germany in the 13th century to hybridize with *S. cerevisiae* had eluded scientists.

Thanks to a group of researchers at Ireland's University College Dublin, *S. eubayanus* was isolated on their college campus in two different sites. Not only that, but genetic testing showed their yeast is closely related to the one that crossed with *S. cerevisiae* to create *S. pastorianus*. The new theory is that *S. eubayanus* is indeed found in Bavaria, at least at that point in time, and is either no longer extant to that region or that it has simply eluded modern Bavarian yeast hunters up to this point. https://academic.oup.com/femsyr/article/22/1/foac053/6874782

Upcoming Events

2023 WineMaker International Amateur WINE COMPETITION

MARCH 17, 2023

Entry Deadline For the WineMaker International Amateur Wine Competition

Enter your wines, meads, and ciders to compete for gold, silver, and bronze medals in 50 categories awarded by a panel of experienced wine, mead, and cider judges. You can gain international recognition for your skills and get valuable feedback on your wines, meads, and ciders from the competition's judging panel. https://winemakermag.com/competition

Brew Your Own BOOT CAMP

MARCH 31, 2023

Water: BYO Beer Ingredient Boot Camp with John Palmer

Water is a critical brewing ingredient and yet is one of the least understood. John Palmer, who wrote the definitive book on the subject, *Water: A Comprehensive Guide for Brewers*, will take the mystery out of your approach to handling water in your brewery. https://byo.com/bootcamps/

APRIL 28, 2023

Malt: BYO Beer Ingredient Boot Camp with Ashton Lewis

Malt is often overshadowed by other brewing ingredients, but it is truly the backbone of beer. Learn how to better use malt in your brewing and how to best brew malt-forward beers with *BYO*'s Technical Editor Ashton Lewis. https://byo.com/bootcamps/

BYO REPLICATOR

BY DAVE CLARK

DEAR REPLICATOR, My favorite beer style is Märzen, often called an Oktoberfest. A unique take on this style comes from California brewer Firestone Walker who adds its own character to its Märzen by lagering the beer in oak barrels. I'd like to replicate this recipe if you can help me out. Cheers!

Bradley Walker
Cartersville, Georgia

Märzen is the German word for March, the month that this unique beer style was traditionally brewed to be served that following fall season. Brewed originally for the marriage of King Ludwig and thereafter for the annual Oktoberfest celebration, the terms Märzen, Oktoberfest, and festbier are often interchangeable. Taking a cue from Old World brewing tradition, Firestone Walker Brewing Co., of Paso Robles, California, began brewing a festbier of their own around the turn of the 21st century to satisfy patrons at their own autumnal celebrations.

BUILDING WITH WOOD

What separated Firestone Walker from most breweries very early on was their unique method of fermenting their signature Double Barrel Ale. Instead of using traditional stainless steel vessels, Firestone Walker employed wood barrels for fermentation — an idea called the Burton Union, adapted from an English brewery using the same practice.

Firestone Walker would go on to employ the use of wood in many facets of the brewing program, including its world-class barrel aging program, producing the award-winning industry standards such as Parabola, Stickee Monkee, Helldorado, and Sucaba, among others.

The always adventurous Brewmaster Matt Brynildson took the use of wood, specifically oak, to a new level when the brewery first brewed its own take on a German classic — a festbier.

Oaktoberfest is brewed and fermented traditionally, then barrel lagered in oak barrels resulting in a mellow and Old-World lagering profile. The goal is not to add a lot of wood character, but just enough to boost the complexity of the beer. Not just any wood barrel will do, Brynildson and his team look for a very specific quality to impart the essence they seek.

"Early on, when we first started brewing our ode to Oktoberfest, we decided to put a Firestone twist on the brew and incorporated oak into the process," said Brynildson. "This was very natural for us and we first used Firestone Union oak barrels to lager and serve our beer at our first Oktoberfest celebrations on the Central Coast."

"After trying a number of different barrel types we settled on two- and three-year-old French oak wine barrels sourced from a very detail-oriented winery that treats the barrels as a brewer would," said Brynildson.

Oaktoberfest has been part of the Firestone Walker lineup for about 20 years, but was originally a small volume beer brewed for Oktoberfest celebrations in and around the Paso brewery. The beer's popularity has grown over the years and is now the brewery's autumn seasonal offering.

BREWING OAKTOBERFEST

Drinkability is key when it comes to Oktoberfest and festbier styles. The style has more malt character and flavor compared to typical helles, but is built for sessionability. The goal is to be flavorful and malty, but well attenuated. Festbier shouldn't be sweet or caramel-malt focused nor should it be hop-forward in bitterness or aromatics. A subtle, round, toasty malt character is balanced by a restrained hopping program focused on German aroma varieties resulting in a very subtle noble hop character.

"It's a special occasion beer that should have wide appeal," said Brynildson. "I also believe that it doesn't need to be overly strong in ABV. I prefer these beers to be on the lower side of the style, again for drinkability."

A cornerstone of Oaktoberfest is Vienna malt. It's about 38% of the malt bill, creating the magic in terms of malt flavor and the beautiful color of the beer. German Tradition is the preferred hop choice for its subtle aromatic and flavor notes. Cara-type malts are kept to a minimum, with most of the color and flavor coming from Vienna or Munich malt.

When brewing Oaktoberfest at home, don't over hop these beers, keep the hops on the hot side and don't use flashy, fruity American hops. Make sure to keep it clean and well lagered. Drinkability is key.

"Once we get through primary fermentation and have cooled the beer down to lagering temperature, we transfer it to the oak barrels and store them in our coldest cooler space (37 °F /3 °C) for two weeks, then carefully transfer the beer back to a well-purged stainless lagering vessel," Brynildson said. "The time of lagering in oak is determined by taste. We do a portion of the beer in oak and leave some beer to lager in stainless."

If you don't happen to have a French oak barrel laying around, add French oak chips during the last few days of lagering so you can impart subtle oak character without it becoming overwhelming.

ENJOYING OAKTOBERFEST

Oaktoberfest pairs well with typical Bavarian fare such as schweinshaxe, bratwurst, chicken roasted on the spit, kartoffelkloesse, sauerkraut, and, of course, large German-style pretzels. A one-liter stein is the perfect festival serving vessel for your festbier.

While today you don't have to brew a Märzen in March, extended lagering time can help your beer develop the rich character and drinkability of the original German classics.

FIRESTONE WALKER BREWING CO.'S OAKTOBERFEST CLONE

(5 gallons/19 L, all-grain)
OG = 1.048 FG = 1.008
IBU = 20 SRM = 7 ABV = 5.2%

An homage to a classic festbier utilizing all German ingredients with a Firestone Walker twist, lagering in oak barrels.

INGREDIENTS

3.8 lbs. (1.7 kg) Pilsner malt
3.8 lbs. (1.7 kg) Vienna malt
1.6 lbs. (0.73 kg) Munich malt
0.45 lb. (204 g) CaraHell® malt
0.45 lb. (204 g) CaraRed® malt
2.5 AAU German Tradition hops (80 min.) (0.4 oz/11 g at 6.3% alpha acids)
1.9 AAU Spalter Select hops (30 min.) (0.45 oz./13 g at 4.2% alpha acids)
1.3 AAU Spalter Select hops (15 min.) (0.3 oz./9 g at 4.2% alpha acids)
0.3 oz. (9 g) German Tradition hops (0 min.)
1 oz. (28 g) medium-toast French oak chips
SafLager W-34/70, Wyeast 2124 (Bohemian Lager), or White Labs WLP830 (German Lager) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Mill grains and mash at 145 °F (63 °C) for 60 minutes. If possible, ramp to 152 °F (67 °C) for an additional 30 minutes. Take an iodine test to confirm conversion. Mash out at 168 °F (76 °C). Vorlauf until runnings are clear, then collect into the kettle. Sparge and top up as necessary to get about 6.5 gallons (24.6 L) of wort — or more, depending on your evaporation rate. Boil for 80 minutes, adding hops according to the schedule.

After the boil, chill the wort to 48 °F (9 °C). Aerate wort thoroughly and pitch yeast. Top up with water if below 5.25 gallons (20 L). Ferment at 52 °F (11 °C). Increase fermentation temperature to 55 °F (13 °C) two-thirds of the way through fermentation for a diacetyl rest. Cold crash once fermentation is complete and diacetyl is clear.

When cold, or after a period of lagering in the primary vessel, transfer to another vessel and lager in a barrel, on oak chips, or oak spirals. When finished lagering, carbonate to 2.75 v/v and enjoy. **Note:** Duration in barrel or on wood chips/spirals depends on the strength of the wood, since you just want subtle wood character, not a full on barrel-aged beer. Taste regularly.

FIRESTONE WALKER BREWING CO.'S OAKTOBERFEST CLONE

(5 gallons/19 L, extract with grains)
OG = 1.048 FG = 1.008
IBU = 20 SRM = 7 ABV = 5.2%

INGREDIENTS

3.5 lbs. (1.6 kg) Pilsen dried malt extract
1.5 lbs. (0.68 kg) Munich dried malt extract
0.45 lb. (204 g) CaraHell® malt
0.45 lb. (204 g) CaraRed® malt
2.5 AAU German Tradition hops (80 min.) (0.4 oz/11 g at 6.3% alpha acids)
1.9 AAU Spalter Select hops (30 min.) (0.45 oz./13 g at 4.2% alpha acids)
1.3 AAU Spalter Select hops (15 min.) (0.3 oz./9 g at 4.2% alpha acids)
0.3 oz. (9 g) German Tradition hops (0 min.)
1 oz. (28 g) medium-toast French oak chips
SafLager W-34/70, Wyeast 2124 (Bohemian Lager), or White Labs WLP830 (German Lager) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Raise 3 gallons (11 L) water to around 152 °F (67 °C) to steep caramel grains. Exact temperature isn't important since you are not mashing anything, just steeping. Place the CaraHell® and CaraRed® in a muslin bag and steep for ten minutes. Remove grain, letting liquid drain back into the kettle without squeezing bag to avoid extracting tannins.

Meanwhile, pre-boil and chill 3.5 gallons (13.2 L) of water to use for topping up later.

Raise the temperature of your pot to near, but not quite, boiling. Add half of your total extract. (Add half now, half later to keep hop extraction in check.) It doesn't matter how you divide the extract as long as it's half of the total extract volume. Pour in extract and stir continuously to avoid clumping. Boil for 80 minutes, adding hops as indicated. With ten minutes remaining in the boil, take the pot off the heat source and slowly stir in the remaining malt extract, being careful to avoid boilover.

After the boil follow the steps found in the all-grain recipes for fermentation and packaging.

TIPS FOR SUCCESS:

Use caution and a light hand when it comes to the amount of time aging on oak. Second-use oak is preferred if it is clean of microbes. Sanitize with hot water if second-use. Oak character should be subtle. Avoid over aging and extraction of tannins.

Weyermann is a great source for the base malt, but other maltsters can deliver a fine version of the beer. Any variation/manufacturer of the classic Weihenstephan lager yeast strain will work great. BYO

BY ASHTON LEWIS

WATER WAYS

Also: Fermenting seltzers and all-in-one brew systems

Q IN THE JANUARY-FEBRUARY 2023 ISSUE OF *BYO*, YOU REFERENCE YOUR WATER TOOL. CAN YOU PLEASE SHED SOME LIGHT ON THAT?

FRANK LONG
COOPERSTOWN, NEW YORK

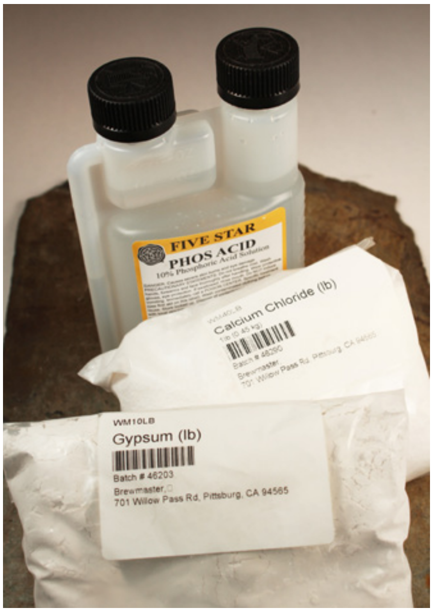
A Me and my big fingers! Did I type some words about my water tool? While it's tempting to geek out with water math, I'll try to keep this answer informative without jumping down the drain. In my opinion, the first step in assessing brewing water is the calculation of residual alkalinity using Kolbach's method from 1951. While it's nice to understand the units behind the calculation, it's not required. Residual alkalinity (RA) = (bicarbonate concentration [mg/L] x 0.046) – (calcium concentration [mg/L] x 0.04) – (magnesium concentration [mg/L] x 0.033). For the sake of discussion, assume we have a water report for our local water and know we have 76-ppm (same as mg/L) calcium, 18-ppm magnesium, and 295-ppm total alkalinity as $CaCO_3$.

We have everything we need to calculate RA, except we need to convert 295-ppm total alkalinity as $CaCO_3$ to ppm HCO_3^- by multiplying 295 by 1.22. RA = (295 x 1.22 x 0.046) – (76 x 0.04) – (18 x 0.033) = 12.9 °dH (that's German degrees of hardness, another term that is nice to know about but not required to use the math). Because RA is positive, we know we have alkaline water that will increase mash pH over a standard mash test performed using distilled water. When RA is negative, mash pH is lower than the standard mash. The other thing RA gives us is a magnitude of change; (+) 10 °dH corresponds to an increase in mash pH of ~0.3 and (-) 10 °dH corresponds to a reduction in mash of ~0.3. Looks like our water is pretty darn alkaline and is predicted to drive our mash pH up by about 0.4 pH units! Now what? This is where my water tool helps provide solutions.

There are a few approaches to using this type of water: 1) brew a beer using acidic specialty malts (like roasted or caramel malts) to balance the alkalinity of the water; 2) add calcium and/or magnesium salts to reduce RA; 3) dilute RA with reverse osmosis (RO) water; 4) add an acidulant (usually lactic acid, phosphoric acid, or acid malt); and/or 5) remove alkalinity by boiling and/or treating with calcium hydroxide. These methods, except for the last, are all easy to use for brewers of a wide range of brew sizes, including us homebrewers. And as is the case with many a brewing solution, simultaneously using more than one method is totally cool.

So, that tool you're asking about combines the approaches listed above, except for alkalinity removal, into an easy-to-use calculator ultimately designed to predict mash pH based on water RA, which we have just calculated, and grist bill. Although mash pH is the process variable most brewers focus on when adjusting brewing water, water components unrelated to pH are also a big deal because they affect beer flavor. John Palmer refers to these components as seasoning, which is really a great analogy. Chloride, sulfate, and sodium targets are entered along with targets for calcium, magnesium, and bicarbonate. The calculations predict mash pH based on the target water profile and grist bill, as well as providing a "water recipe" to use for the brew. When the target concentration

In my opinion, the first step in assessing brewing water is the calculation of residual alkalinity using Kolbach's method from 1951.



A quality, high-accuracy scale, a water report, and a well-built water calculator are good things to have on hand if you plan to tweak your water.

of any ion is less than the concentration in the water being treated, RO dilution water volume is calculated.

In addition to knowing the RA of the untreated water, some grist bill basics are needed. This is where mash pH prediction becomes approximate. While the standard malt analytics used to prepare a certificate of analysis (COA) for base malts includes wort pH, special malt data do not. But we do have rules of thumb for how special ingredients like crystal, light-roasted, dark-roasted, and acidulated grains affect mash pH. For each percent of these grain types, pH is reduced by 0.025 (crystal), 0.002 (Munich), 0.03 (light-roasted), 0.05 (dark-roasted), and 0.1 (acidulated) pH units. For example, a mash made up of 95% Pilsner malt with a wort pH of 5.8 (this is from the malt COA), 5% crystal malt, and water with RA = 0 (same as distilled water used for lab testing), will have a mash pH of about 5.68 (5.8 - (5 x 0.025)). The source of this information is from Siebel Institute of Technology's lectures about brewing water and residual alkalinity and provides the practical brewer with estimates.

Let's assume we are brewing a beer with the water loosely defined above, do not want to add any brewing salts, liquid acids, or RO water, and want the mash pH to be about 5.5. To crunch the numbers, the only two things to consider are RA (12.9 °dH in our assumed water) and grist composition. The water RA tells us our mash pH is going to be pushed up about 0.4 pH units (12.9 °dH / 0.3 pH units per °dH = 0.43) from the lab wort pH (5.8 gets bumped to 6.2), so this brew will either require a big dose of specialty malts with color because light-colored special malts are not very acidic, or we can add acidulated malt to help bring the mash pH into balance. One solution that works out is using 40% base malt, 50% Munich malt, 5% light-roasted malt, and 5% acidulated malt. That grist bill could be a dunkel. Not a bad beer to brew using my example water that just happens to match a reference for Munich water.

But what about brewing a Pilsner with this same water? A great start to this problem is to reduce the very high RA. Calcium additions are an option, but the best water profiles for Pilsner beers have a neutral RA and are relatively low in total dissolved solids (TDS is the sum of all water ions). Adding more salts to the base would simply drive TDS up. The best solutions are either diluting with RO or removing alkalinity. Alkalinity removal is a literal science project and not simple without the requisite set-up, so I am not going to that well.

Diluting with RO water is simple, but target ion concentrations are first required for the calculation. In example 1 below, the calcium target was set to 50 ppm (down from 76) and the bicarbonate target was set to 100 ppm (down from 360). The water tool does the rest, providing base water and RO water volumes, along with required salt additions, options for acid additives, and the profile of the adjusted water. Note that there is still some residual alkalinity because I set the target bicarbonate level down to 100 ppm. The summary below includes a good dose of acid to bring the mash pH down to the target of 5.45.

Using the same water with 12.9 °dH, let's pivot into IPA territory. Now, we want to know more about water than simply the ions driving pH because IPA water typically has much more "seasoning" than Pilsner water. Per Kunze, Munich well water (source not stated) contains little sulfate or chloride; 10 and 2 ppm respectively. Let's assume our IPA is brewed using 90% pale ale malt with a lab wort pH of 5.7, 5% wheat malt for added foam stability, and 5% light crystal malt for color. This grist and water combination will yield a higher mash pH than our target of 5.4 because of the high RA.

As high TDS waters are common for classic ales and because our base water has very little sulfate or chloride, a good approach to this beer is to reduce RA by adding a combination of calcium sulfate, calcium chloride, and/or magnesium sulfate. The choice of salts depends on what we want in our profile. The water recipe below is one of many possibilities. The combination of grist bill and water salt additions gets us really close to our target mash pH, while providing a similar adjusted water profile to the mineral-rich waters used in classic ales. In example 2 found below, the predicted mash pH (not shown) is still a bit higher than the target and my water tool suggests the addition of a bit of acid to correct.

Example 1

Based upon the data below about what you want to do with water and the grist bill for this beer, the salt additions to the right are suggested. The water volume also includes a diluent suggestion if the plan is to dial back any ion(s) present in your base water.

Suggested acidulated malt, lactic acid, and phosphoric acid dose rates are also shown to the right to help achieve the your mash goals. The ~Mash pH is a prediction based on grist composition, water chemistry profile, and one of the acid additions (all equivalent).

This is a Summary of Your Water "Recipe"			Adjusted Profile		Suggested Acid Additives (Choose One)	
Base Water	111.1 liters	0.9 BBL	Ca^{+2}	50 ppm	% Acidulated Malt	4.43%
RO Water	288.9 liters	2.5 BBL	Na^{+}	0 ppm	88% Lactic Acid	2.9 g/kg grist
$CaSO_4$	26 g	0.91 oz.	Mg^{+2}	10 ppm	75% Phosphoric Acid	3.3 g/kg grist
$CaCl_2$	15 g	0.54 oz.	SO_4^{-}	59 ppm	~Mash pH Based on Water and Acid Corrections (these values should all be the same)	
NaCl	0 g	0.00 oz.	Cl^{-}	13 ppm		
$MgSO_4$	21 g	0.72 oz.	HCO_3^{-}	100 ppm	~ Mash pH with Acidulated Malt	5.45
$NaHCO_3$	0 g	0.00 oz.	Cl⁻:SO4-	0.2 : 1	~ Mash pH with Lactic Acid	5.45
Total Water	400 liters	3.4 BBL	RA	2.3 °dH	~ Mash pH with Phosphoric Acid	5.45

Example 2

Based upon the data below about what you want to do with water and the grist bill for this beer, the salt additions to the right are suggested. The water volume also includes a diluent suggestion if the plan is to dial back any ion(s) present in your base water.

Suggested acidulated malt, lactic acid, and phosphoric acid dose rates are also shown to the right to help achieve the your mash goals. The ~Mash pH is a prediction based on grist composition, water chemistry profile, and one of the acid additions (all equivalent).

This is a Summary of Your Water "Recipe"			Adjusted Profile		Suggested Acid Additives (Choose One)	
Base Water	40.0 liters	0.3 BBL	Ca^{+2}	275 ppm	% Acidulated Malt	0.83%
RO Water	0.0 liters	0.0 BBL	Na^{+}	20 ppm	88% Lactic Acid	0.5 g/kg grist
$CaSO_4$	13 g	0.45 oz.	Mg^{+2}	60 ppm	75% Phosphoric Acid	0.6 g/kg grist
$CaCl_2$	14 g	0.49 oz.	SO_4^{-}	356 ppm	~Mash pH Based on Water and Acid Corrections (these values should all be the same)	
NaCl	1 g	0.04 oz.	Cl^{-}	131 ppm		
$MgSO_4$	17 g	0.61 oz.	HCO_3^{-}	360 ppm	~ Mash pH with Acidulated Malt	5.60
$NaHCO_3$	0 g	0.00 oz.	Cl⁻:SO4-	0.4 : 1	~ Mash pH with Lactic Acid	5.60
Total Water	40 liters	0.3 BBL	RA	3.6 °dH	~ Mash pH with Phosphoric Acid	5.60

Q JUST WHEN IT SEEMED THAT SELTZERS WERE GOING BYE BYE, I HAVE RECENTLY BEEN RUNNING INTO SELTZERS AT TAPROOM BREWERIES THAT I REALLY LIKE. MY FAVORITES ARE THOSE WITH ROBUST FLAVORS AND COLORS FROM ADDITIONS OF FRUIT, HERBS, AND FLOWERS. ANY TIPS ON GIVING IT A GO AT HOME?

SKIP JONES
GAINESVILLE, FLORIDA

A Thanks for the fun question, Skip! Now that seltzers have been around for a couple of years, brewers have figured out that the best way to make clean bases is to pitch a mixture of nutrient and yeast into whatever sugar substrate is chosen, oxygenate at much higher levels than typically used for brewery fermentations, ferment in a temperature range for the chosen yeast to minimize sulfur and ester production, and then clarify by fining and/or filtration. Today, it's easy to find yeast/nutrient blends, seltzer-specific nutrients, and yeast strains identified to work well for seltzers on the market. Check out the answer to Joshua Greenberg's "Wizard" question in the December 2020 issue of *BYO* for a nice review about the basics of nutrients.

OK, onto your specific question; tips for seltzer? For starters, I would peek at what commercial producers are doing, but not worry about emulating their model for production. And that model is producing a range of packaged seltzers. I'll get back to this in a moment. My first tip is to master producing a neutral base and coming to grips on what the neutral base represents to the seltzer master. The seltzer neutral base is not really a playground for exploration because the base is a clean source of ethanol sans distillation, and that's about it. The commercial seltzer master produces these seltzer bases by clean fermentation of a sugar water solution instead of distillation largely because of tax law. It's also easier to simply produce a clean base by fermentation, perform a few bits of post-fermentation magic, then package.

Things are different at home. For starters, there is nothing preventing homebrewers from making a diluted alcohol solution using vodka and water, then adding flavors to produce a quick and easy seltzer. In fact, if all you want to do is make a tasty and easy seltzer, this method is the ticket. But it doesn't check that home-fermented box that most of us desire. The other key difference between commercially and home-produced seltzers is packaging. The commercial group wants to sell cans of all sorts of seltzer products. A big chunk of homebrewers love skipping the small pack and sticking with kegs.

I think your creativity should be focused on what happens to a neutral seltzer after successfully filling a keg with clean and clear seltzer. Instead of producing one batch of seltzer at a time like you do with beer, focus on producing tinctures, syrups, shrubs, etc. that you will add to your clean seltzer. Not much different to how Berliner weisse is tweaked upon serving or how Torani syrups are used to produce Italian-style sodas by dosing into sparkling water. This is where homebrewers have a clear advantage over commercial producers. No branding, no special packages, and no fancy tap handles mean that you can convert your clean seltzer into a huge range of different products right when you pour a glass.

The creative part of this process is making the special sauces used to deliver the complexity of flavor and color you desire. This may not seem like the most groundbreaking bit of advice, but I think it's solid, and I am sticking to it!

Q I AM AN ALL-GRAIN BREWER WHO HAS TYPICALLY USED A COOLER MASH TUN. I RECENTLY BOUGHT AN ANVIL FOUNDRY SYSTEM, BUT HAVE NOT BREWED WITH IT YET. ANY ADVICE FOR MY FIRST BREW DAY WITH IT? FOR EXAMPLE, THINGS TO KNOW THAT MIGHT NOT BE MENTIONED IN THE MANUAL?

RAY MURPHY
CHEEKTOWAGA, NEW YORK

A The Anvil Foundry is one of several mash-boil combination systems on the market using a removable cylinder with perforated bottom section to contain the mash. In contrast to the old school mash tun cooler design, these all-in-one (AIO) systems allow for step mashing using an electric heater element installed in the bottom of the kettle and a recirculation pump to flow heated wort onto a diffusion plate positioned above the mash. This allows uniform mash heating for step mashes as well as a handy way to prevent mash temperature from cooling during infusion mashes because, unlike coolers converted into mash tuns, these kits are not insulated (although removable insulation jackets are available).

I too switched from an old school cooler system to an AIO design two years ago and had my concerns. The biggest difference from my perspective is how wort collection is accomplished and controlled. Whether brewing small batches at home or large batches in a commercial brewery, using wort separation devices such as mash tuns, lauter tuns, Strainmasters, and mash filters, brewers can take samples of wort any time during wort collection and evaluate the color, clarity, and density. This is where AIO designs are most different than other brewing systems.

Instead of wort flowing out of one vessel, like your cooler *cum* mash tun, into another where sampling is easy, wort collection in AIO systems is accomplished by lifting the mash container/basket within the AIO mash tun/kettle and rotating to align support clips above a support ring. This allows wort to simply drain from the mash basket directly into the kettle. Pretty snazzy! And, just like with any other wort separation method, sparge water can be added to the top of the mash to rinse wort from the sponge-like grain bed.

In my opinion, losing the ability to take wort samples during collection is the biggest sacrifice when transitioning from mash tun brewing to AIO brewing. It's not the end of the world, but for cranky old dudes like me who like to monitor wort clarity and, more critically, wort gravity and pH, getting used to blindly collecting wort is weird. And it also makes gravity control more challenging because there is no way to determine when it's time to stop sparging based on wort density flowing into the kettle, the only option is to sparge with a set volume of sparge water.

My advice for first brews on any new brewing system is to minimize the number of things to worry about. This starts with the grist bill; choose a recipe with no more than about four malt types and skip flaked adjuncts and sticky stuff like rye for a future brew. When it comes to expected grain yield, don't shoot for the moon by fine milling; start out with a coarse grist aimed at brewing ease over efficiency. If you typically use single-temperature mashing in your mash tun cooler, use a single temperature in your new AIO system. And if you have a regular recipe that runs like clockwork, brew that beer instead of something new and different.

The one piece of advice I wish I had followed when first using my AIO system was not to sparge. I still have a hard time suggesting not to sparge because . . . well, just because, dammit, that's how brewers do brewing! Aside from some loss of extract and brewing tradition, skipping the sparge makes hitting the wort gravity target much easier because the wort density produced during mashing is the same as the pre-boil gravity and removes uncertainty that is inherent with sparging. The easiest way to control pre-boil gravity in no-sparge brewing is by varying the ratio of water-to-malt used in the mash. To calculate the volume of water required for some target, pre-boil gravity from an all-malt mash, use the following equation:

Liquor-to-Grist Ratio (wt/wt) = 3 x 20 °Plato ÷ (Pre-Boil Gravity).

If our target pre-boil gravity is 12 °Plato (1.048 SG), for example, the equation above indicates that the ratio of water-to-grist in our mash should be 5. And if our recipe calls for 8.25 lbs. (3.75 kg) of malt, we need to use 41.25 lbs. (18.75 kg) of water in the mash.

This general rule works because most base malts and lighter colored special malts contain about 80% soluble solids, 1 part malt plus 3 parts water equates to 25% of malt by weight, and a quarter of 80% is 20% or 20 °Plato. Math validation aside, no-sparge mashing makes the target gravity a bit easier to hit. Outside of sparging, all other process steps are similar with AIO systems and your first brew should be a familiar walk in the park! BYO

STYLE PROFILE

BY GORDON STRONG

AMERICAN PORTER

A robust dark brown ale

Sometimes called robust porter, it is often stronger, hoppier, and darker than its English cousin . . .

AMERICAN PORTER BY THE NUMBERS	
OG:	1.050–1.070
FG:	1.012–1.018
SRM:	22–40
IBU:	25–50
ABV:	4.8–6.5%

Photo by Charles A. Parker/Images Plus

Porter is a beer style with a long and storied history that stretches back as far as the early 1700s in London. Highly popular and widely exported in the early 1800s, it fell out of favor in the late 1800s before disappearing around the time of the Second World War. Guinness kept their version in Ireland until 1973, but it was later rediscovered in the modern craft era in both the U.K. and the U.S. The popularity of porter spawned several variations both historically (such as the stout family of styles, Baltic porter, pre-Prohibition porter) and in modern times (English and American porters, plus its use as a base style in experimental beers).

American porter is the style name given to a variation of porter typically found in the U.S. during the craft era. Sometimes called robust porter, it is often stronger, hoppier, and darker than its English cousin (or is it father?). While names like American porter and robust porter are given to these beers by beer geeks, commercial products are much more likely to just be called porter. We use the more precise names when differentiating beers for competition purposes.

American porter is style 20A in the Beer Judge Certification Program (BJCP) Beer Style Guidelines, grouped together with American stout and imperial stout in the American Porter and Stout style category. These beers of varying strength are grouped together due to their flavor profiles, most notably their roast-forward balance.

HISTORY

Entire books have been written about porter, so I won't get into the rise of the original style in England. But, suffice to say that as the British brewing industry was impacted by wars, tax policy, and consumer demand, products in the marketplace caused gravities to be lowered in almost every style to the point where it was hard to differentiate between once dissimilar styles. Porter was basically crowded out by dry stout and dark mild.

In Michael Jackson's *New World Guide to Beer* (1988), he laments that "the search for the authentic porter is almost [. . .] hopeless" and that it had "largely vanished between the two world wars." He called it "the most elusive of styles" and a "fading recollection" and then explained how it led to dark beers being made around the world. Yet, in between editions of Jackson's books (1977 and 1988), he added the note that it was revived in 1978–1979 at two British breweries at the peak of interest in real ale. In the original edition, he simply noted that it was no longer brewed in England or Ireland, and that it was "lost, though not forgotten."

By 1997 in Michael Jackson's *Beer Companion,* he writes that porter began to be made again in London in 1984 and 12 years later in Dublin. He also began to write about "scores of new-generation porters in the United States" (as a contrast to the older Yuengling Porter, an example of pre-Prohibition porter), and cites examples from Catamount, Sierra Nevada, Boulevard, Great Lakes, and Summit. He did not really separate the variations, just remarked how the style was reintroduced and was gaining in popularity with a new generation of brewers. At the time, Jackson was calling it plain porter to differentiate it from more historical versions.

Terry Foster, writing in the classic style series book *Porter,* said in 1992 that "many of the new American porters use aroma hops" and goes on to note how the American Homebrewers Association styles for competition differentiated between a robust porter that used black malt, a brown porter that used chocolate malt, and a dry stout that used roasted barley. While he said he preferred to think of the style as having a continuum of roasted flavors, he does pinpoint when the differentiation came into use.

Personally, I look at the introduction of Anchor Porter in 1974 as the start of porters in the modern craft era. Certainly the commercial beers cited by Jackson helped fuel the growth of the style, but I also think his influential writings had an impact on brewers on both sides of the Atlantic in rediscovering and redefining a once-dead style.

SENSORY PROFILE

Historically, porter is a dark brown beer, not a black beer. In my mind, this is one aspect that helps differentiate it from stouts. When Jackson described them in 1988, he said beyond saying they were dark beers with a roasty palate, there was little agreement. Perhaps because he was trying to reconcile the various changes over time with a style that no longer existed. But clearly the style can be defined now by its modern examples.

American porter is a darker, stronger, hoppier version of a porter. It is malty, bitter, and somewhat hoppy but the hops are often balanced rather than prominent. Chocolate, caramel, and fruity flavors are often part of the profile, but the style is fairly broad and open to interpretation by brewers. In general, if a brewery offers both a porter and a stout, the porter will be lighter-bodied and lower-strength, but this comparison breaks down when considering products from different breweries. So, I tend to think of "something less than a stout" as an upper bound for the style.

The roast profile of the beer is moderate, with a chocolate character and sometimes a light coffee or burnt accent. The sweetness level and body can vary, but is usually restrained. Some fruity notes are welcome but as with many American ales, the fermentation profile can be neutral. The American impact on the style is the level of hopping, both in bitterness and in late hops. Bitterness can be balanced to prominent, but this character changes depending on the maltiness and sweetness of the beer. Late hops are variable, with low to high intensities possible.

If it seems I'm being wishy-washy

AMERICAN PORTER

(5 gallons/19 L, all-grain)
OG = 1.058 FG = 1.014
IBU = 39 SRM = 41
ABV = 5.8%

INGREDIENTS

9 lbs. (4.1 kg) U.S. 2-row pale malt
1 lb. (454 g) Maris Otter pale ale malt
1 lb. (454 g) U.K. crystal 77 malt
1 lb. (454 g) U.K. chocolate malt
6 oz. (170 g) U.K. black malt
8 AAU Northern Brewer hops (60 min.) (1 oz./28 g at 8% alpha acids)
1 oz. (28 g) Northern Brewer hops (5 min.)
0.5 oz. (14 g) Cascade hops (0 min.)
0.5 oz. (14 g) Sterling hops (0 min.)
Wyeast 1272 (American Ale II), White Labs WLP051 (California V), or Mangrove Jack's M36 (Liberty Bell Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Make a 1 qt./1 L starter ahead of time if using a liquid yeast strain. This recipe uses reverse osmosis (RO) water. Adjust all brewing water to a pH of 5.5 using phosphoric acid. Add 1 tsp. of calcium chloride to the mash.

This recipe uses an infusion mash. Use enough water to have a moderately thick mash (~1.5 qts./lb.). Mash in the pale malts at 154 °F (68 °C) and hold for 60 minutes. Add the crystal malt and the two dark grains, stir, begin recirculating. Raise the mash temperature to 169 °F (76 °C) for mashout and recirculate for 15 minutes.

Sparge slowly and collect 6.5 gallons (24.5 L) of wort. Bring wort up to a boil and boil for a total of 90 minutes, adding hops at the times indicated in the recipe.

Chill the wort to 66 °F (19 °C), pitch the yeast, and aerate if using a liquid strain. Ferment at 66–68 °F (19–20 °C) until complete.

Rack the beer, prime and bottle condition, or keg and force carbonate to 2.4 v/v.

AMERICAN PORTER

(5 gallons/19 L, extract with grains)
OG = 1.058 FG = 1.014
IBU = 39 SRM = 41
ABV = 5.8%

INGREDIENTS

6.6 lbs. (3 kg) light liquid malt extract
1 lb. (454 g) U.K. crystal 77 malt
1 lb. (454 g) U.K. chocolate malt
6 oz. (170 g) U.K. black malt
8 AAU Northern Brewer hops (60 min.) (1 oz./28 g at 8% alpha acids)
1 oz. (28 g) Northern Brewer hops (5 min.)
0.5 oz. (14 g) Cascade hops (0 min.)
0.5 oz. (14 g) Sterling hops (0 min.)
Wyeast 1272 (American Ale II), White Labs WLP051 (California V), or Mangrove Jack's M36 (Liberty Bell Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Make a 1 qt./1 L starter ahead of time if using a liquid yeast strain. Start off with 6.5 gallons (24.5 L) of water (reverse osmosis if possible) in the brew kettle; heat to 158 °F (70 °C).

Turn off the heat. Add the crystal malt and two dark grains in a mesh bag and steep for 30 minutes. Remove and rinse grains gently. Allow the liquid to drip back into the kettle.

Add the malt extract and stir thoroughly to dissolve completely making sure no clumps are at the bottom. Turn the heat back on and bring to a boil.

Boil the wort for 60 minutes, adding the first hops at the beginning of the boil, the second addition with 5 minutes remaining, the final addition after turning off the heat.

Chill the wort to 66 °F (19 °C), pitch the yeast, and aerate if using a liquid strain. Ferment at 66–68 °F (19–20 °C) until complete.

Rack the beer, prime and bottle condition, or keg and force carbonate to 2.4 v/v.

> **Prominent esters aren't an objective, but having some in the mix is allowable.**

on defining specifics, it's because the style is broad. The beer is fairly well-balanced, but with a roasty accent. The roasted accents shouldn't come across as acrid, burnt, sharp, or harsh. It generally isn't sweet or full-bodied, but some supporting caramel or toffee notes are not out of place. The interplay of late hops and dark malts shouldn't clash, particularly if it gives a citrusy or sour impression. The beer itself shouldn't get too strong in alcohol or hops, or it may stray into the black IPA range.

BREWING INGREDIENTS AND METHODS

Since the style is broad, the methods and ingredients can vary. However, the beer is traditionally a top-fermented, single-infusion beer made with British methods. The beer gets its American moniker primarily through the selection of American base malts, yeast, and hops, although hybrid American/English versions are possible.

The base malt is traditionally neutral, so a North American pale ale malt is most common. This will have a cleaner, less bready flavor than British pale ale malts. I think the more neutral base helps the darker malts come through more cleanly in the presentation. Speaking of which, any mix of chocolate malt, black malt, and roasted barley is fair game. Past guidance of "chocolate means brown porter, black means robust porter, and roasted barley means stout" are too simplistic. Blend a mix of dark malts and grains to get the finished profile you want. Crystal malts are often used to add residual sweetness, as well as caramel and dark fruit flavors. Just be careful about using too much since these grains can also give excessive body to the beer.

The bitterness level for this style can vary widely, but be careful about the combination of strongly bitter and strongly roasted, since this combination is typical of dry stouts. Late hops tend to be more traditional since modern versions often clash with dark malts. Terry Foster said traditionally that early craft versions used Northern Brewer, Goldings, Hallertauer, and Cascade. So I interpret that as saying that American, English, and German hops are all fine, as long as they don't clash with the dark malt. Another way of looking at it is that the late hops don't really define the style, so are open to interpretation by the brewer.

The yeast choice can be a neutral American ale strain or a somewhat fruity American or English strain. Prominent esters aren't an objective, but having some in the mix is allowable. I think a neutral lager yeast could be used as well, although it certainly isn't traditional. However, since this isn't a yeast-driven style, I think you have a free choice in selecting something that doesn't have a phenolic or overly identifiable character.

HOMEBREW EXAMPLE

My example is in the style of Anchor Porter, in that it is a balanced but bitter version that isn't high in alcohol. It retains the drinkability of the style, but also allows for some tweaking for personal preferences by the brewer.

I'm using a base of mostly North American 2-row malt with a little bit of Maris Otter to add a light breadiness. I want the base malt to be a clean flavor to allow the roast character to come through more. My choice of character malts reflects a British influence, and I prefer maltsters from the U.K. for my crystal, chocolate, and black malts. Personally, I like Crisp for the crystal malt and Fawcett for the chocolate malt because of the flavor profiles, but if you want to use crystal malt in the 60–80 °Lovibond range, you should get similar results. The type of chocolate malt should express a rich chocolate flavor without burnt notes. The black malt adds a roasty dryness, but note that I'm steeping the dark malts not mashing them, so that limits their harshness. I think in this style you want a little bit of that dark bite, but not too much.

A single-infusion mash is traditional, and I'll go a little high so the beer won't seem too thin, but this is largely because I'm not using any flaked adjuncts, dextrin malts, or other body builders. This is to keep the beer from seeming too stout-like. Note that I use my method of adding the crystal and dark malts at the end of the mash, and letting the recirculation during mash-out extract their color and flavor elements. Be sure to recirculate for at least 15 minutes and then sparge to extract their goodness. If you use another method of mashing and sparging, get at least 30 minutes of contact time with these grains.

The bitterness level is at the higher side, which also means that this beer should keep for awhile. Not everyone likes this bitterness level, so I have also brewed a similar recipe with IBUs in the high 20s for a more immediately drinkable beer for a wider audience. I'm using Northern Brewer hops as an homage to Anchor, and you can also go for a single-hop beer by using these same hops as your late hops. I add some Cascade and Sterling (Saaz-like) for interest as an aroma hop in the whirlpool (knockout additions) so I'm not really looking for flavor from these hops. You could also use those hops as dry hops instead, which will give a fresher hop experience.

The fermentation is with the ale strain from Anchor Brewing, which I use in a wide range of beers including IPAs. It gives a mostly clean but lightly fruity note that I think complements the style. The water treatment uses calcium chloride, which gives a softer finish. I try to avoid sharper sulfates that I think can accentuate the darker malts in a more negative way. The beer weighs in at 5.8% ABV, so it should be an above average strength but not to the point where you are getting noticeable alcohol.

Porter is meant as an everyday working-class beer, so it shouldn't seem like an extravagant or elaborate winter seasonal beer. Retaining the balance and drinkability while getting the delicious roasty flavors is the key to the style, with the American version also requiring the hops to not get out of balance. As this beer becomes harder to find in modern breweries, it's a great style for a homebrewer to embrace. BYO

Photo by Charles A. Parker/Images Plus

Clearing Things Up

by Brad Smith

Understanding hazes and how to clarify homebrew

Crystal clear beer is the goal for most beer styles, and commercial brewers go to great lengths to assure both clarity and stability in their finished beers. In fact, many consumers perceive hazy beer to be contaminated or of poor quality, and most beer judges are quick to mark down a hazy lager or clouded pale ale. Despite the rise of hazy IPAs, most beer lovers still treasure a crystal clear beer.

UNDERSTANDING HAZE AND MEASURING IT IN BEER

Haze itself comes from suspended particles within the beer that reflect light. These particles can come from a variety of sources including proteins, polyphenols/tannins, yeast cells, bacteria, foreign material, and even excessive finings. The most common forms of haze come from proteins, polyphenols, and yeast cells.

While many consumers think of hazy beer as contaminated or of poor quality, the particles that form haze are largely without flavor. So removing the cloudiness from a beer will not significantly change its flavor profile.

You can measure beer haze using a haze meter. These devices take a small sample of beer and shine light through it at a specific wavelength and then measure the intensity of light reflected off the particles. Haze is most often measured on EBC (European Brewery Convention) and NTU (Nephelometric Turbidity Unit) scales.

Since few homebrewers have access to a haze meter, we instead rely on our eyeballs. Pour your beer into a very clean glass and hold it up to the light. Is it crystal clear or is there some distortion or cloudiness? Also, does the cloudiness change as the beer gets warmer, which would be an indication of chill haze.

CHILL HAZE AND PERMANENT HAZE

Haze can manifest itself in two ways: Chill haze and permanent haze. Chill haze is a cloudiness that occurs when the beer is cold but slowly disappears as the beer is warmed up to room temperature. This happens because some haze-active proteins and polyphenols form weak bonds with one another at cold temperatures that result in visible haze, but these weak bonds dissolve at room temperature and the haze disappears.

The other type of haze is permanent haze, which is present and unchanged at all temperatures. It is very common for a chill haze to become a permanent haze over time, so we try to mitigate both types of haze when brewing and packaging our beer.

CAUSES OF HAZE IN BEER

The primary cause of haze is from proteins and polyphenols (tannins) that come from malts and hops. These two ingredients cause the vast majority of both chill haze and permanent haze problems in finished beer. Yeast can also affect the clarity of your beer, but yeast does tend to drop out of suspension as the beer ages.

Other causes of haze that are less common include:

- *Bacterial infection*, which can leave dead bacteria cells in the beer. This would be easy to detect as it would also sour the beer.
- *Damaged or overstressed yeast*, which can leave longer chains of carbs and proteins in the beer.
- *Calcium-deficient worts*, which lead to oxalates forming in the beer.
- *Wheat-derived adjuncts*, which add pentosans, as well as protein, causing haze.
- *Inadequately modified malts* leaving beta-glucans in the beer. This is uncommon with modern malts, which are all highly modified.
- *Lubricants, excessive finings, or other foreign material in the beer.*

With the exception of wheat, which will often create clarity issues for the homebrewer, the other causes above are uncommon at the homebrew level. Assuming you use fresh

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The most common forms of haze come from proteins, polyphenols, and yeast cells. While haze is acceptable in a few styles, it is way out of place and unappealing in most.

ingredients, follow good sanitation procedures, and follow good brewing practices, you should not have these issues in your finished beer.

YEAST CLARITY ISSUES IN BEER AND MITIGATION

Since yeast is the easiest clarity issue to manage, I will cover it first. The average yeast cell is 5–10 microns in size, which is certainly large enough to cause haze issues in your finished beer. After fermentation, your beer will be hazy because active yeast cells are in suspension.

Once fermentation is done, the yeast will flocculate, or fall out of suspension, and form a layer at the bottom of your fermentation vessel. Different yeast strains have different flocculation rates, which you can find on the yeast data sheet from the manufacturer. "High" flocculation yeasts will fall from suspension quickly while "low" flocculation yeasts can take weeks or even months to clear.

Most fermentation finings work well with yeast, so adding any common brewing fining after fermentation will increase the speed of flocculation. Cold crashing your beer will also make the yeast fall from suspension faster so that is another method to increase flocculation. Finally, filtering can remove all the yeast from the finished beer, so that is another method to consider.

Because yeast cells are relatively large, and can be removed by chilling, finings, and filtering as well as through time, they rarely cause a long-term clarity problem. They are primarily an issue in young beers, or for commercial brewers who need to get their product out the door as quickly as possible.

HAZE AND CHILL HAZE FROM PROTEINS AND POLYPHENOLS

Proteins and polyphenols are the centerpiece of most long-term clarity issues in beer, both for homebrewers and at the commercial level. Proteins are a natural component of malted barley. Wheat, oats, and other non-barley adjuncts also have high percentages of proteins, so you need to be careful when using large percentages of those adjuncts. However, proteins also play an important role in providing body to the beer and also promote head retention, so some protein is important for a balanced beer.

Polyphenols, also called tannins, are the other leading cause of haze. The majority of polyphenols come from malted barley, primarily the husks of the grain itself. These are extracted during mashing and present in all beers. Hops also account for about 20–30% of the polyphenols in beer and can be a larger contributor in very hoppy beers like IPAs.

The problem with chill haze is that these weak bonds are prone to polymerization, often aided by tiny amounts of oxygen and reactive metal ions in the finished beer. When this occurs, the chill haze may become a permanent haze. So our goal as brewers is to minimize both chill haze, metals, and oxygen in the finished beer to avoid the formation of permanent haze.

INGREDIENT SELECTION TO MINIMIZE HAZE

You can reduce the chance of haze from proteins in your beer by carefully selecting your malts. The protein percentage is included on the specification sheet from the maltster, so you can intentionally select lower protein malts if you are making a very light colored beer where clarity is important. Most maltsters have their specification sheets available online so it is simply a matter of looking up each grain and being judicious in selecting those with lower protein content.

Adjuncts like wheat and oats have very high percentages of proteins, so you need to minimize the use of these adjuncts if clarity is your primary goal. As with barley malts, most malt suppliers will publish the protein percentage for adjuncts, so you may want to select carefully or avoid certain adjuncts altogether if clarity is an important goal.

I mentioned earlier that hops account for up to 30% of the polyphenols in beer, and in some IPAs the percentage can be even higher. Hop polyphenols primarily come from the leaf. Less leaf material is used for a given bitterness or oil level when using high alpha/high oil hops. I personally don't consider polyphenols as a more important factor than flavor and aroma when selecting my hops, but it is something you might want to consider if making a very hoppy beer.

It might be best also to avoid overhopping your beer. Some brewers come out with IPAs in the 100+ IBU range when in practice our senses max out somewhere in the 60–80 IBU range, and anything beyond that is simply perceived as really bitter. Beyond that range you are really just adding vegetal material and flavors (i.e., polyphenols) to the beer and not increasing the perception of bitterness.

IMPROVING CLARITY IN THE MASH AND SPARGE

In addition to careful ingredient selection, there are several opportunities during the brewing process to enhance the clarity of your beer, starting with the mash.

We can start with the correct grain crush. The grains should be milled in a way that keeps most of the husks intact while crushing the interior of the kernel. These husks will form a nice filter bed when sparging, which will aid in extraction.

I have found if I over crush my grains, as I did recently with a new mill, it can lead to clarity issues in the wort and beer. The reason for this is that most of the tannins extracted from the grains come from the husk. If your grains are properly crushed, those husks form a filter bed and are largely left out of the wort itself. When the crush is too fine, bits of the husk can get into the wort and the boil, leading to excessive tannins being extracted and clarity problems.

The next item to consider is your mash pH, which should be adjusted with lactic or phosphoric acid if necessary to be in the 5.2–5.6 range during the main conversion step. While the mash pH does not directly impact the clarity of the beer, pH can impact clarity indirectly during the sparge in several ways.

The first is the potential for excessive tannin extraction. Tannins are a weak acid, but in the presence of high pH wort they can lose an additional proton and become negatively charged. When this happens the water is a great solvent and starts to pull tannins into the wort during the sparge. So the solubility of tannins increases with mash pH.

The pH threshold for sparging at the professional level is 6.0, so most pro brewers will stop sparging when the pH of the runnings exceeds 6.0. However, if you don't adjust your mash pH up front and start with a high mash pH of something like 5.8, you will quickly be in the danger zone during the lautering process as more and more slightly alkaline water increases the pH over time. So to avoid excessive tannins you do want to control your mash pH up front.

You can also reduce the pH of the runnings by treating your sparge water with a small amount of lactic acid. This will reduce the pH of the water as it is filtered through the grain bed. Because you don't need to offset the buffering capacity of the grain, less acid is needed than in the mash itself. There are a variety of calculators and brewing software that can aid you in estimating the correct

Photo by Charles A. Parker/Images Plus

Brewers often relate the importance of a proper grain crush to efficiency, however, over crushing grains may also lead to clarity issues in the wort and finished beer caused by additional tannin extraction from the finely ground husks. Pictured is a proper grain crush where most husks are cracked but largely intact.

amount of acid needed to buffer your sparge water.

A proper wort pH also aids in protein coagulation during the boil. Lower wort pH will aid in creating the hot break, which is the layer of protein that forms at the beginning of the boil. It also helps additional proteins coagulate and fall out during the boil.[1]

Another process factor to consider is the clarity of your mash runnings. A good rule of thumb is that you don't want to disturb the grain bed once you have started to sparge. If you have a recirculating pump you keep on during the mash, again try not to disturb the grain bed once it has been set up.

The husks from the grain should set up a nice filter bed with lots of channels in it so you get good extraction without pulling a large amount of grain or husk material into the wort. Stirring or disturbing your grain bed can lead to turbidity and cloudy wort, which will contain more tannins and have less clarity. Strive for clarity in the runnings.

IMPROVING CLARITY IN THE BOIL

You can also take steps to improve clarity in the boil. When the boil begins, the "hot break" forms at the top of the wort. It is an oily-looking layer you will see right as the boil starts. The hot break is a layer of coagulated proteins, so some brewers take the extra step of skimming those from the top of the wort to eliminate their presence in the beer.

Next you want to set up a strong rolling boil. A vigorous boil removes unwanted volatiles from the wort, but also aids in precipitating unwanted proteins and tannins. Ideally you want a boil that has constant motion and not just a few bubbles coming up from the bottom. If you want to take the extra step of measuring your boil-off you can monitor your volumes over time and calculate a boil-off rate and then adjust your heat source. For a homebrew system, most brewers target a boil-off rate of around 15% per hour.

A long boil (90 minutes is ideal) will also aid in the precipitation of proteins and tannins. A wort boiled for 90 minutes will certainly produce a clearer beer than one boiled for 30 minutes. A long boil has the side benefit of reducing off-flavors from volatiles like Dimethyl Sulfide (DMS) as well.

Another area for improvement is in reducing hot-side aeration. Hot-side aeration simply refers to introducing oxygen into the wort while the wort is hot, which can have adverse effects on the clarity and stability of the finished beer. While hot-side aeration is not a huge factor for most homebrewers, I do try to avoid splashing the wort or introducing oxygen during hot transfers when boiling.

You have the opportunity to introduce kettle finings near the end of the boil. The most commonly used kettle finings are Irish moss or Whirlfloc. Irish moss is actually a red seaweed called *Chondrus crispus* that contains an emulsifying agent called carrageenan that is widely used as a thickener for low-fat food products. Whirlfloc and similar kettle finings are also rich in kappa-carageenan, but are extracted from farm-raised *Euchema cottonii* primarily grown in the Philippines. Kappa-carageenan from both sources has a polarized charge that attracts proteins and tannins in the wort and creates larger molecules of sediment that then precipitate out of the wort.

Irish moss is basically the dried seaweed, while Whirlfloc has the same active carrageenan compound but in a tablet form. Both are added about

Photo by Charles A. Parker/Images Plus

A long and vigorous, rolling boil removes unwanted volatiles from the wort, but also aids in precipitating unwanted proteins and tannins.

15 minutes before the end of the boil, and quite often you can see the proteins coagulating at the top of the wort shortly after you add them.

AFTER BOILING: THE COLD BREAK

You should use a wort chiller of some kind to cool your wort as quickly as possible after boiling. The rapid drop in temperature will result in coagulation of proteins, hop polyphenols, tannins, bits of grain, and vegetal hop matter from the wort. This "cold break" (aided by the use of kettle finings) will form a substantial layer of sediment at the bottom of the boil kettle. It starts forming around 140 °F (60 °C) and continues to precipitate out as you chill the wort down to fermentation temperature.

An effective cold break promotes clarity but also aids in flavor stability in the finished beer. If you use an immersion chiller you have the added benefit of being able to leave a lot of the cold break in the boiler. Commercial systems use a whirlpool action in the boiler to leave much of the cold break behind before chilling and transferring to the fermenter. If you have a homebrew system with a simple plate chiller, you will end up with some break in the fermenter, but the break is unlikely to re-combine with the wort at fermentation temperatures. If you have a conical fermenter, you can draw the sediment off early in the fermentation.

LAGERING AND COLD CRASHING

Once fermentation is complete you may want to consider cold storing or cold crashing your beer. This is done by lowering the temperature to just above freezing. Cold crashing will quickly precipitate out the yeast from fermentation but also will remove many of the proteins and tannins remaining in the beer. Cold crashing is also a great way to prepare your beer for filtering.

If you can, age (lager) and store your beer cold as cycling beer between warm and cold will increase the chance of chill haze becoming a permanent haze (not to mention rapidly aging your beer).

FERMENTATION FININGS

A large number of finishing finings are available to the homebrewer to be added a few days before bottling or kegging your beer in order to allow the fining sufficient time to bond with the haze and drop out of solution. These all work in the same basic way. They are all positively charged molecules that attract charged proteins and tannins; forming larger particulates that then settle out of the beer. Here are some of the most widely available:

- **Unflavored Gelatin** – One of the cheapest effective finings, you can find unflavored gelatin near the "Jell-O" section in your local grocery store. Dissolve 5 oz. (140 g) gelatin in ~10 oz. (280 g) of hot water for every 5 gallons (19 L) of wort to reduce both proteins and tannins in your finished beer.
- **Polyclar (PVPP) Plastic** – Polyclar is a polymer-based powder that is positively charged and resembles protein. It can be found at most homebrew shops and 1 tablespoon for every 5 gallons (19 L) of beer is effective against polyphenols, proteins, and tannins.
- **Silica Gels** – These are sold under a number of brand names such as Britesorb and often used with wines. The gels are very effective at binding proteins and improving clarity. The typical dosing rate is 5–10 grams per 5 gallons (19 L) of beer, but read the directions on the package as some gels contain varying amounts of silica.
- **Silica Sols** – These compounds are a suspension of colloidal silica sold under different trade names such as Biofine Clear. Added late in the boil or during aging, silica sols absorb proteins to improve clarity. Read the directions from the manufacturer for dosing rates.
- **Isinglass** – This is piscine collagen that is derived from fish bladders. Isinglass has been used for a very long time by brewers and winemakers. It is effective at removing proteins and yeast cells, and also removes some lipids (oils), which will improve head retention.
- **Papain** – This is used extensively in winemaking. It has fallen out of favor for use in beer, however, as it negatively impacts foam stability.

FILTERING YOUR BEER

Filtering is widely used by commercial brewers where it is cost-prohibitive to allow beer to sit and clear for an extended period while taking up tank space, and removing the remaining yeast cells is often needed to prevent further fermentation in the bottle. Filtering is also an option at the homebrew level. Most of the larger homebrew suppliers offer filtering equipment, which most often is done while transferring between two kegs.

The best type of filter to use is a two-stage filter. Typically the beer is run through a 5-micron filter size to take out large particles. Many brewers stop there, but others who want to remove all the yeast and finer particles will do a two-stage filtration by then running the beer through a 1-micron or even 0.5-micron size filter.

Filtering should be done when the beer is cold as any chill haze molecular bonds are already formed, so the larger chill haze particles can be filtered. Filtering can remove all of the remaining yeast cells and virtually all of the visible haze in a beer.

SUMMARY

Clarity in beer starts with good ingredient selection. If you are making a particularly delicate lager, you should select malts with lower protein levels, and also hop appropriately. When brewing, mash and sparge in the 5.2–5.6 pH range and don't allow your sparge runnings to rise above 6.0 pH. Continue into a long, vigorous boil, and add boil finings such as Whirlfloc or Irish moss at the end of the boil. Chill your wort quickly to get a good cold break, and then pitch enough yeast and ferment properly. Add fermentation finings a few days before bottling or kegging your beer. Consider cold crashing your beer and store it cold, if possible. Finally, filtering is an option if you are striving for the highest levels of clarity. BYO

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TRADITIONAL GERMAN SOURS

Brew complex Berliner weisse & Gose the way the styles were intended

by Michael Tonsmeire

When I was getting ready to take the Beer Judge Certification Program (BJCP) test in 2007 I attended a pre-class run by my local homebrew club Brewers United for Real Potables (BURP). Each week the instructor would bring classic examples of the styles we were discussing for us to sample. One of the most memorable was an old bottle of Schultheiss Original Berliner Weisse. It was the last remaining Berliner weisse fermented with *Brettanomyces*. It was amazing how weird-citrusy-funky it was, yet bright and drinkable even at seven or eight years old!

These days it is difficult to buy a "plain" Berliner weisse or Gose in America. These two German relics have been relegated to the status of mere descriptors for a sour base ready for fruit, extracts, and other adjuncts . . . and the truth (in my opinion) is that is what the typical kettle soured versions deserve! These bland knock-offs are a shadow of the characterful historic styles. In Berlin even with assistance from a local, my wife Audrey was unable to get a glass of Berliner weisse without the neon-red raspberry syrup added.

Luckily, a handful of brewers in Germany, America, and elsewhere have revived the classic techniques. These can include mixed-fermentation, extended aging, no-boil, and bottle conditioning. The results are beers that shine on their own without the needed adornment of artificial syrups! The way the styles were intended.


Photo by Charles A. Parker/Images Plus

There are plenty of articles about creating kettle-soured Berliner weisse and Gose, as this is the most common method these days; however, this article is going to discuss the traditional brewing methods that will take a bit longer to produce. The extra time will be well worth it, as the differences between the two approaches and resulting beers are significant.

WORT PRODUCTION

One of the biggest issues with any low-gravity beer is a lack of base malt flavor. Not that Berliner weisse or Gose are known for rich or intense maltiness, but they shouldn't taste watered down. Start by selecting a high-quality characterful Pilsner malt. Weyermann Barke® Pilsner is especially flavorful with a grassy-fresh malt character that I really enjoy. Wheat malt is traditional for both styles as well and adds a fresh "bread dough" note. To enhance foam texture, consider 5–15% under-modified chit malt or Carafoam®, especially if you are using a highly modified Pilsner malt. That's it.

Mash to maximize fermentability: For a single infusion 146–148 °F (63–64 °C) or a step-mash 140–142 °F (60–61 °C) then 154–156 °F (68–69 °C). We'll be packaging this beer relatively quickly, so avoid creating dextrins that the *Brettanomyces* will ferment, generating additional carbonation. No need for a ferulic acid rest as we are not trying to maximize spicy 4VG (4-vinyl guaiacol) production, as we might in other German wheat beers. A protein rest is optional, depending on the modification of your malt and your feelings about clarity.

We'll rely on *Lactobacillus* for acidification, so I'd advise leaving hops out of the boil and mash entirely. Hops are antimicrobial, and *Lactobacillus* is the main "spoilage" microbe they inhibit. The typical 1–5 IBUs is below taste threshold and really won't provide a significant benefit for the beer. Hop acids become increasingly toxic to gram-positive bacteria as the pH drops. As a result, with 5 IBUs you may see the acidification halt before your desired pH is reached. If you brew these styles frequently with the same *Lactobacillus* strain you may be able to dial in a hop dose that stops the acidification at your desired level.

After running off the wort, bring it up to 180 °F (82 °C). This is hot enough to pasteurize the wort and denature enzymes, while cool enough to not drive excessive conversion of S-Methyl Methionine (SMM) to Dimethyl Sulfide (DMS). I find the "no-boil" process preserves a fresh doughy maltiness that I like in Berliner weisse, but not Gose. After holding for 10 minutes, cool to 68 °F (20 °C) for fermentation. If you use an immersion-chiller you can heat the wort up to a boil if you'd prefer. This is what I did for years without issues. I visited a brewery that tried this process (based on my recipe in *American Sour Beers*) on their commercial system. However, the hour the wort spent just below 212 °F (100 °C) for whirlpool, set-

Photo by Michael Tonsmeire

Traditional Berliner weisse and Gose are tremendously complex without the addition of fruit or syrups, however, they still make for a great base if you want to go the flavored route. Pictured are Sapwood Cellars' Little by Red (with himbeere/raspberry syrup*) and Little by Green (with waldmeister/woodruff syrup).*

tling, and running through their heat exchanger created an intense DMS character. They dumped the batch . . . and didn't blame me too much! For Gose or a crisper Berliner weisse perform a full 60-minute boil.

SEASONING

While Berliner weisse is un-spiced, Gose is defined by the addition of coriander seeds. Just like you don't see a recipe call for "hops," I won't call for just any coriander! The coriander you usually find in supermarkets has a citrusy-vegetal flavor that works perfectly for certain cuisines, but not beer. I prefer the flavor of the coriander from Indian markets. You can tell it visually by its rounder shape, think more *futbol* than football. The flavor is brighter, more like Fruit Loops® cereal. This is linalool, a common monoterpene alcohol also found in hops.

Linalool smells good, but certain yeast can convert it into beta-citronellol, which has a Sprite®-like lemon-lime aroma. This happens early in fermentation, so either add the coriander to the whirlpool, or directly to the fermenter (which I prefer).

Sodium is also a common feature of Gose. Adding table salt (sodium chloride) to the kettle is easy, but keep your addition to a minimum. It's easy to add more to taste along with the priming sugar, but almost impossible to remove!

FERMENTATION

Despite Gose and Berliner weisse clearly being wheat beers from Germany, I don't think yeast strains marketed as "German wheat beer" have a place. Traditionally, fermentation is cleaner without the banana (isoamyl acetate) or clove (4VG) notes of hefeweizen or dunkelweizen. If you want these flavors, that is up to you! I prefer either an American or German ale yeast, think Chico, Kölsch, or altbier. SafAle US-05 is my strain of choice because it is slightly fruity, attenuative, reliable, and not to mention, inexpensive!

While different *Lacto* strains create slightly different flavors, primarily what you are looking for is lactic acid. In general, I prefer using more aggressive isolates, because there are options for stopping acidification (we'll get into that in a bit). At Sapwood Cellars in Columbia, Maryland, we use Omega Yeast's Lacto Blend, but most *L. brevis* and *L. plantarum* isolates will get the job done. See my article with Matt Humbard in *BYO* "Brewing with *Lactobacillus*" for more on these at https://byo.com/article/brewing-with-lactobacillus/. While yeast lab cultures can work well, probiotics can be a more readily accessible and cost-effective option. You can also culture the strains in yogurt whey or other dairy ferments. On a commercial scale we save money by propagating a homebrew-size pack up to 1–2% of the batch volume 24 hours in advance of brewing to ensure a quick start.

I love the complexity that *Brettanomyces* brings to these styles. I prefer fruitier (tropical, lemon, stone fruit) notes with a little funky/earthy. A bottle I had years ago of Bayerischer Bahnhof's Berliner Style Weisse Brettanomyces Lambicus was a revelation. Highly acidic, with more funk than fruit. For our Berliner weisse at Sapwood Cellars, Little by Slowly, we sourced an isolate from Christophe Pinchon in France. He cultured it from an old bottle of Willner Brauerei's Berliner Weisse (which went out of business in 1990). The only drawback of that strain is that young it is especially "dilly," but given time it evolves into a beautiful "lemon-poppy" sort of aroma. We've had good luck with the lemony-mineral funk of The Yeast Bay's Mélange blend as well. For our most recent batch we raided our barrel cellars and pulled 5 gallons (19 L) from a fantastic golden sour with an apricot note that we pitched directly into the primary.

Monitor the pH after pitching the ale yeast, *Lactobacillus,* and *Brettanomyces*. Once the pH drops to your desired level you can inhibit the *Lactobacillus* by adding a small amount of hop extract. We use an aqueous 20% alpha hop extract from Hopsteiner that adds no perceived bitterness. An isomerized alpha acid like tetra or hexa can work just as well with a target of 5–7 IBUs. Isomerized hop extracts are available from homebrew shops online if you can't find them locally. As an added benefit, these hop compounds are foam-positive. A small dose of dry hops is another option, but may add an inappropriate hop aroma for the style.

Final pH will depend on your tastes, but that can be difficult to judge with the residual malt sweetness during fermentation. Coca-Cola® has a pH of 2.6–2.7 (thanks to phosphoric acid) but the sugar prevents it from tasting nearly as sour as a dry-finished Berliner weisse at a pH of 3.5. I prefer a finished pH of 3.2–3.4, more tart towards the high-end or more sharply acidic towards the low-end. You could go as high as 3.6 for very lightly acidic and 3.0 if you were planning to drink most of it blended or sweetened.

PACKAGING

High carbonation can make these beers difficult to serve on draft, so bottle conditioning is most common. Use heavy Belgian- or German-style bottles and aim for 3–3.5 volumes of CO_2. For each 0.001 SG the *Brett* ferments in the bottle expect another 0.5 volumes of carbonation.

At the brewery we naturally keg condition, allowing backup kegs to sit warm to get more interesting and funky as time passes. The added advantage of a keg is that they are easier to vent-down if the beer is becoming over-carbonated.

SERVING

These beers are delicious on their own, but they are also a fantastic base for additional flavors.

Especially if the beer ends up more acidic than you prefer, try dry hopping! This will raise the pH and add complementary flavors. I prefer citrusy and tropical varieties (pretty much anything you'd use in a hazy IPA works well here).

Fruit is an easy pairing — cherries, raspberries, apricots, etc. While you can add fresh fruit, we often use kegs of Little by Slowly to "rinse" the fruit leftover from barrel-aged sours. After having two or three oak barrels infuse on several hundred pounds of fruit there is still great flavor trapped

SAPWOOD CELLARS'
LITTLE BY SLOWLY CLONE

(5 gallons/19 L, all-grain)
OG = 1.034 FG = 1.004
IBU = 6 SRM = 3 ABV = 3.9%

This Berliner weisse is one of the most characterful sub-4% ABV beers I have brewed. It combines acidity, bread dough wheaty notes, lemony-hay funk, and high carbonation. It is bright and refreshing like lemon-seltzer when consumed fresh and cold, but it is almost lambic-like when given extended cellaring and served at cellar temperature. The beer's name is an oft-repeated line from Stephen King's 11/22/63, *and suggests the beer's small size and slower fermentation compared to "quick sours."*

INGREDIENTS

3.5 lbs. (1.6 kg) Pilsner malt
2.66 lbs. (1.2 kg) Weyermann wheat malt
0.9 lb. (0.4 kg) Best chit malt
88% lactic acid
1 mL HexaHop, TetraHop, or other isomerized alpha acid extract
Omega Yeast OYL-605 (Lacto) blend or *Lactobacillus* culture of your choice
Brettanomyces culture of your choice
SafAle US-05, Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
1–1.5 cups corn sugar (if priming)

STEP BY STEP

Mash at 148 °F (64 °C), adding calcium chloride to achieve 150 ppm chloride. Add lactic acid if needed to achieve a mash pH of 5.2 Collect wort and heat to 180 °F (82 °C) for 10 minutes. Add lactic acid (approximately 10–15 mL) to achieve a pH of 4.4. Chill to 68 °F (20 °C), aerate, and pitch an active starter of *Lactobacillus,* yeast, and *Brettanomyces.* Allow to sour to a pH of 3.3 (or as desired), approximately 12–48 hours. Add isomerized alpha acid extract to arrest acidification.

Continue to ferment at 68 °F (20 °C). Approximate fermentation time in primary is one month. Once the gravity stabilizes, chill to 55 °F (13 °C). Transfer to a purged keg or bottle priming in Champagne-style bottles for as much CO_2 as you are comfortable with (3–4 volumes).

Photo by Michael Tonsmeire

(5 gallons/19 L, extract only)
OG = 1.034 FG = 1.004
IBU = 6 SRM = 3 ABV = 3.9%

INGREDIENTS

4 lbs. (1.8 kg) weizen dried malt extract
88% lactic acid
1 mL HexaHop, TetraHop, or other isomerized alpha acid extract
Omega Yeast OYL-605 (Lacto) blend or *Lactobacillus* culture of your choice
Brettanomyces culture of your choice
SafAle US-05, Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
1–1.5 cups corn sugar (if priming)

STEP BY STEP

Starting with 5.25 gallons (20 L) water, heat to 180 °F (82 °C) then remove from heat. Stir in the malt extract until fully dissolved. Hold at this temperature for 10 minutes. Add lactic acid (approximately 10–15 mL) to achieve a pH of 4.4. Chill to 68 °F (20 °C), aerate, and pitch an active starter of *Lactobacillus,* yeast, and *Brettanomyces.* Allow to sour to a pH of 3.3 (or as desired), approximately 12–48 hours. Add isomerized alpha acid extract to arrest acidification. Continue to ferment at 68 °F (20 °C). Approximate fermentation time in primary is one month. Once the gravity stabilizes, chill to 55 °F (13 °C). Transfer to a purged keg or bottle priming in Champagne-style bottles for as much CO_2 as you are comfortable with (3–4 volumes).

Tips For Success:
If getting pre-isomerized hop product is not possible, the alternate method would be to hold off pitching the ale and *Brettanomyces* yeast strains until after the souring process is complete (pH ~3.3). Once soured, heat the wort back up to 180 °F (82 °C), add a little bit of hops, then hold for 15 minutes before chilling back to fermentation temperature. Once chilled, then add both the yeast strains and follow the instructions found in the step by step.

SAPWOOD CELLARS'
SALZIG CLONE

(5 gallons/19 L, all-grain)
OG = 1.044 FG = 1.006
IBU = 7 SRM = 3 ABV = 5%

The coriander in this Gose provides a beautiful lemon-lime citrusy flavor that only adds to the refreshing qualities of this session beer. Spelt provides additional protein that improves body and head retention, but wheat malt in its place would also make a fantastic beer. Salzig *means "salty" in German and rhymes with Leipzig, the town most associated with Gose.*

INGREDIENTS

5.25 lbs. (2.4 kg) Weyermann Barke® Pilsner malt
2.6 lbs. (1.2 kg) Weyermann spelt malt
1 lb. (0.45 kg) Best chit malt
0.5 oz. (14 g) Indian coriander
0.25 oz. (7 g) non-iodized salt
88% lactic acid
1 mL HexaHop, TetraHop, or other isomerized alpha acid extract
Omega Yeast OYL-605 (Lacto) blend or *Lactobacillus* culture of your choice
Brettanomyces culture of your choice
SafAle S-04, LalBrew Nottingham, or Imperial Yeast A01 (House) yeast
1–1.5 cups corn sugar (if priming)

STEP BY STEP

Mash at 148 °F (64 °C), adding 0.25 oz. of table salt and enough calcium chloride to achieve 150 ppm chloride. Add lactic acid if needed to achieve a mash pH of 5.2. Collect wort and boil for 60 minutes. Add crushed coriander and enough lactic acid (approximately 10–15 mL) to the fermenter to achieve a pH of 4.4. Chill to 68 °F (20 °C), aerate, and pitch an active starter of *Lactobacillus,* yeast, and *Brettanomyces.* Allow to sour to a pH of 3.3 (or as desired), approximately 12–48 hours. Add hop extract to arrest acidification. Continue to ferment at 68 °F (20 °C). Approximate fermentation time in primary is one month. Once the gravity stabilizes, chill to 55 °F (13 °C). Transfer to a purged keg or bottle prime in Champagne-style bottles for as much CO_2 as you are comfortable with (3–4 volumes). You can add additional salt as desired to taste along with the priming sugar.

(5 gallons/19 L, extract only)
OG = 1.044 FG = 1.006
IBU = 7 SRM = 3 ABV = 5%

INGREDIENTS

5 lbs. (2.3 kg) weizen dried malt extract
0.5 oz. (14 g) Indian coriander
0.25 oz. (7 g) non-iodized salt
88% lactic acid
1 mL HexaHop, TetraHop, or other isomerized alpha acid extract
Omega Yeast OYL-605 (Lacto) blend or *Lactobacillus* culture of your choice
Brettanomyces culture of your choice
SafAle S-04, LalBrew Nottingham, or Imperial Yeast A01 (House) yeast
1–1.5 cups corn sugar (if priming)

STEP BY STEP

Starting with 5.25 gallons (20 L) water, heat to 180 °F (82 °C) then remove from heat. Stir in the malt extract until fully dissolved. Hold at this temperature for 10 minutes. Add lactic acid (approximately 10–15 mL) to achieve a pH of 4.4. Chill to 68 °F (20 °C), aerate, and pitch an active starter of *Lactobacillus,* yeast, and *Brettanomyces.* Allow to sour to a pH of 3.3 (or as desired), approximately 12–48 hours. Add hop extract to arrest acidification. Continue to ferment at 68 °F (20 °C). Approximate fermentation time in primary is one month. Once the gravity stabilizes, chill to 55 °F (13 °C). Transfer to a purged keg or bottle priming in Champagne-style bottles for as much CO_2 as you are comfortable with (3–4 volumes). You can add additional salt as desired to taste along with the priming sugar.

Tips For Success:
If getting pre-isomerized hop product is not possible, the alternate method would be to hold off pitching the ale and *Brettanomyces* yeast strains until after the souring process is complete (pH ~3.3). Once soured, heat the wort back up to 180 °F (82 °C), add a little bit of hops, then hold for 15 minutes before chilling back to fermentation temperature. Once chilled, add both the yeast strains and follow the instructions found in the step by step.

Photo by Michael Tonsmeire

in the fruit. One or two kegs of Berliner weisse on this fruit for even a few hours will pick up great flavor and color. You can do this at home by racking 1 gallon (4 L) of fermented Berliner weisse into a carboy or bucket that previously held a 5-gallon (19-L) batch of heavily-fruited beer.

If you want to get even weirder, the brewers at The Establishment Brewing Company knock out their cooled wort right onto the fruit and yeast from a previous sour. They brew a delicious Gose called Little Wing on second-use plums. This allows for longer contact and a more unique character.

The addition of syrups to Berliner weisse in Germany is more an end-around the Reinheitsgebot than a real necessity. However, if you enjoy the sweet-sour balance, it is an easy option for serving one without the need for pasteurization. You can buy the two standards: *Himbeere* (raspberry) and waldmeister (woodruff) at German specialty markets or on the internet. Another option is to make your own! Juices, soda syrup recipes, and cocktail mixers are all fun options to zhuzh-up a glass of Berliner weisse for a party, sour-reluctant friend, or yourself! Cambridge Brewing Company had a delicious one with plums and ginger when I visited years ago.

I started this article by poking fun at fruit and adjuncts making the kettle-soured version interesting, but adjuncts can take an interesting Berliner weisse or Gose and make them even more interesting! Here are a few of my favorites that we've created over last four years at Sapwood Cellars:

Berliner Weisse Variations

Little by Citra – Dry hopped with 0.5 oz. of Citra® hops per gallon (3.7 g/L)
Little by Sushi – White miso paste (for salinity) and pickled ginger
Little by Lemonade – Olio sacrum (lemon-oil saturated sugar) and fresh lemon juice
Little by Foraged – Fresh staghorn sumac
Little by Salted Apricot – Salt-fermented apricots (inspired by *The Noma Guide to Fermentation*)
Little by Smoothly – Fresh pineapple puree, lime zest, and cream of coconut

Gose Variations

Guava Salzig – Pink guava puree
Cucumber Salzig – Fresh cucumber juice
Salzig & Tonic – Aged in a gin barrel and then infused with lime zest and cinchona bark BYO

Photo by Michael Tonsmeire

Guava Salzig is Sapwood Cellars' Gose with an addition of pink guava puree.


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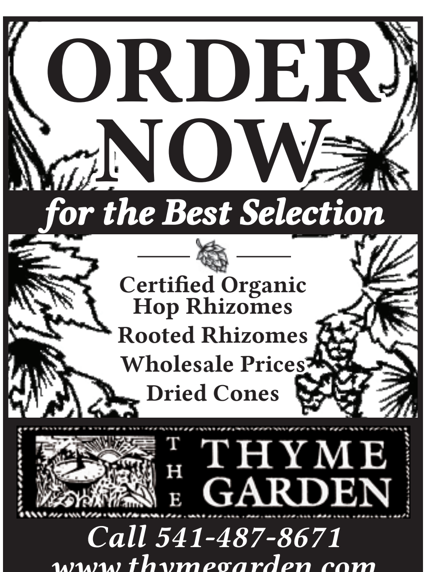
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Catharina Sour

Five years of order and progress

by Gordon Strong

Ordem e Progresso (Order and Progress) is the national motto of Brazil, and is the text on their famous green, yellow, and blue flag. I think that phrase also applies to how Brazil's internationally recognized beer style, Catharina sour, has evolved over the last several years. I've been a witness to this history since 2017 and would like to report on what I've seen and how it's currently made.

At its essence, Catharina sour is a fruited sour beer. It has a simple grist containing Pilsner malt and wheat malt, with a clean lactic sourness and a vibrant fresh fruit character. Light in body, high in carbonation, restrained in alcohol, and dry in the finish, the beer is super refreshing in the warm tropical climate of Brazil. The fruit itself is often tropical, but is really just that which is fresh, seasonal, and local in their country. I like to compare it to making fruit meads in the U.S. — when the good fruit is in season, back up the truck and load it up, because you're going to use a lot of it.

Photo courtesy of Shutterstock.com

Photo by Gordon Strong

A flight of Catharina sour entrants being judged at a recent Brazilian homebrew competition.

Catharina sours can have herbs and spices too, but only in support of the fruit that is always the primary sensory experience. The bitterness is kept purposefully low, below sensory thresholds, and late hops are not used. The sourness is clean, without funky or vinegary notes, and is mostly used to balance the fruit and malt flavors. The beer should not be heavy, sweet, or strong, as these would hurt its drinkability. The acidity should be pleasantly tart, not a strong, biting note – certainly less sour than most lambics and gueuzes.

The Beer Judge Certification Program (BJCP) Style Guidelines has Catharina sour in the local styles appendix as Style X4. It could be judged with Category 29 Fruit Beers, or with the 28C Wild Specialty Beer using the new 28D Straight Sour Beer as a base style. It should not be judged as a variation of Berliner weisse since those beers are lower in gravity and could contain *Brettanomyces*.

A BRIEF HISTORY

Catharina sour is an intentional style, in that it was purposefully created as a beer to showcase a national identity. Similar fruited sour beers from several Brazilian regions existed before the style was defined, but those beers were generally treated as unique examples. In 2015, craft brewers and homebrewers held a workshop to formally define the style in the Brazilian state of Santa Catarina, which is what gives the style its name. I encountered the style during a trip in 2017 where it was already gaining a foothold commercially and in competitions. A locally produced style description was being used at the time, before it was published by the BJCP as a provisional style.

In the 2021 BJCP Guidelines, I rewrote the style description based on my own research and tasting notes from several trips, as well as discussions with brewers producing the style. While the name is associated with one Brazilian state, the beer is made throughout the country. At multiple commercial and homebrew competitions I've attended in the last few years, Catharina sour is consistently one of the top 3 styles entered, right up there with IPA. So, this is not a curiosity, it is a mainstream style.

PRODUCING CATHARINA SOUR

For this article, I took a deep dive on production methods by interviewing and sampling beers from several experts. I spoke with Brazil's only gold medal winner in the American Homebrewers Association's National Homebrew Competition (NHC), Chico Milani from Florianópolis. I chatted with André Piol, a homebrewer from the state of Espírito Santo who won the gold medal at the Brazilian national homebrew championship this year. I brewed a collaboration batch with one of the best-known producers, Cervejeria UNIKA in Rancho Queimado, and had extensive discussions with their Head Production Brewer, Rudy Fávero. My thanks to all for their assistance.

Brewing Catharina sour is a multistep process. First, there is the wort production and lactic souring. Second, there is the fermentation. And finally, the fruit is added and fermentation completes. Attention to detail is needed at each step, and the conditions for moving from step-to-step are more based on pH and attenuation than a strict timeline.

Wort production is very simple. Target between 40 and 50% wheat malt, with the rest of the grist being European Pilsner malt. Chico, the NHC gold medal winner, also adds about 5% flaked oats. A single infusion mash from 150–154 °F (66–68 °C) is used for 50–60 minutes, with UNIKA preferring the higher temperature for a little extra body. The higher mash temperature and the use of oats are both techniques to reach the same objective of adding a little extra mouthfeel. The water used is relatively soft with light additions of gypsum and calcium chloride.

The mash pH is about 5.2–5.3, measured at room temperature, and the initial gravity of the wort is 1.048–1.050. Mash out at 172 °F (78 °C) and collect the wort. Boil for 10–15 minutes without adding any hops. Chill to 100–104 °F (38–40 °C). Lower the pH of the wort to 4.5 using lactic acid (this is a precaution against other bacteria taking root before the *Lacto* gets going, not part of the souring process). At this point, the *Lactobacillus* of choice is added and the temperature is maintained until the target pH is reached. UNIKA used a mix of *Lactobacillus casei* and *L. plantarum,* while Chico and André used *L. helveticus.* The temperature might need to be adjusted based on the strain of *Lacto* used. A good reference for various strains and sources of *Lacto* is the Milk the Funk wiki, milkthefunk.com.

I found it interesting that UNIKA pumped the wort back to the mash tun for the souring phase. They said their mash tun has more precise controls for maintaining a temperature than their kettle. The first phase ends when the target pH is reached, which is typically around 3.1. At the brewery, this takes about three days, which should be similar at home if the conditions are the same.

Phase 2 involves boiling and fermentation. UNIKA used about 6 IBUs of Hallertau Magnum as first wort hops, and Chico used about 7 IBUs of Hallertau Mittelfrüh at 20 minutes. Both used a 60-minute boil, and both chilled to 64 °F (18 °C) and pitched an American ale yeast strain (Saf-Ale US-05 or a comparable yeast). So, this step can be summarized as a light touch of German hops followed by a cool fermentation with a neutral ale yeast. Time spent in this phase can vary, but is usually around four days.

Phase 3 starts when the gravity has dropped and the beer is nearing completion (but is not yet at terminal gravity). UNIKA waits until the beer is around 1.020 and Chico waits until fermentation is 75% complete (a gravity of 1.018). At this time, the fruit of choice is added and fermentation is completed at 68–70 °F (20–21 °C). The time spent in this phase is between 4–6 days, typically, with a final gravity between 1.008–1.012 and a final pH of around 3.0–3.2, although the pH can depend on the fruit used. At the brewery, they cold crashed the beer to improve clarity by setting the tanks to 32 °F (0 °C).

When packaging, carbonate to around 3.5 volumes of CO_2 to give high carbonation. Commercial beer is typically kegged or canned, while Brazilian homebrew is usually bottled. Be sure to use heavy bottles that can handle higher carbonation. The beer is best enjoyed fresh.

The basic process before fruit is added is a fairly typical kettle sour procedure. I've described the common way that Brazilians make the beer, but it should be recognizable to Americans. The difference in this style is how the fruit is selected and used.

SELECTING THE FRUIT

Since fruit is the dominant character in the beer, choosing the right fruit and processing it is the creative part of the operation. When I did the collaboration with UNIKA, they wanted to use a Brazilian fruit called *araçá* that they grew at the brewery. They used nets to collect the ripe fruit as it fell from the small trees; it looked a little like a cherry and had a single pit, but the flavor was like a cross between guava and apple to me, plus it was tart and astringent. They had used this fruit in past years, but weren't satisfied with the results (the beer lacked complexity, and it seemed too tart).

I worked with them to consider alternatives and we settled on adding *maracujá* (passion fruit). My thought was that we could play on the guava-like flavor in the fruit by adding another fruit that also had a related flavor, plus more sweetness. I had also suggested playing on the apple flavors by adding cinnamon, or by using honey. The brewery had a good local source of fresh passion fruit, so that made the decision easier.

When Rudy tasted the finished

Photo by Gordon Strong

Cervejaria UNIKA in Rancho Queimado is one of the best-known breweries producing Catharina sours with various fruits, depending on what is ripe at the time.

Catharina Sour
with Cupuaçu and Pitaya

Recipe courtesy of **Chico Milani, ACervA Catarinense**

(5 gallons/19 L, all-grain)
OG = 1.050 FG = 1.008
IBU = 7 SRM = 3 ABV = 5.5%

Cupuaçu *(*Theobroma grandilorum*) is a Brazilian fruit with a flavor like banana, pear, pineapple, and chocolate that you may be able to source online. There is no direct substitute, but a blend of tropical fruit may be used.* Pitaya *is dragon fruit, and is used to provide color. The recipe uses the pulp of the fruit only.*

INGREDIENTS
5.25 lbs. (2.4 kg) Pilsner malt
4.25 lbs. (1.9 kg) wheat malt
8 oz. (227 g) flaked oats
4 oz. (113 g) acid malt
2.9 AAU Hallertauer hops (20 min.)
(0.7 oz./20 g at 4.1% alpha acids)
3.5 lbs. (1.6 kg) *cupuaçu* pulp
1.75 lbs. (0.79 kg) dragon fruit pulp
200 billion cells *Lactobacillus helveticus*
Wyeast 1056 (American Ale), White Labs WLP001
(California Ale), or SafAle US-05 yeast
⅞ cup corn sugar (if priming)

STEP BY STEP
This recipe uses reverse osmosis (RO) water. Add 0.5 tsp. calcium chloride and 0.5 tsp. calcium sulfate to the mash.

This recipe uses a kettle souring method. In 15 quarts (14 L) water, mash the grain at 150 °F (66 °C) for 60 minutes. Raise the mash to 172 °F (78 °C) and mash out for 10 minutes. Sparge slowly and collect 6.5 gallons (24.5 L) of wort. Boil for 10 minutes without hops. Cool to 100 °F (38 °C). Adjust the pH of the wort to 4.5 measured at room temperature using lactic acid. Pitch the *Lactobacillus*. Let it sour until a pH of 3.1–3.2 is reached (usually 2–3 days).

Bring to a boil. Boil for 60 minutes, adding hops with 20 minutes remaining in the boil. Cool to 61 °F (16 °C) and pitch the ale yeast. Ferment at 64 °F (18 °C).

Add the fruit when the gravity reaches 1.018, usually after 3 to 5 days. Do not wait for fermentation to slow down; fruit must be added at high kräusen. The fermentation temperature can rise as high as 70 °F (21 °C), allow to ferment to completion, about four days. Cold crash the beer and then rack off the fruit.

Prime and bottle condition, or keg and force carbonate to 2.6 v/v.

(5 gallons/19 L, extract only)
OG = 1.050 FG = 1.008
IBU = 7 SRM = 3 ABV = 5.5%

INGREDIENTS
5.8 lbs. (2.6 kg) dried wheat malt extract
(this is a blend of wheat and base malt)
2.9 AAU Hallertauer hops (20 min.)
(0.7 oz./20 g at 4.1% alpha acids)
3.5 lbs. (1.6 kg) *cupuaçu* pulp
1.75 lbs. (0.79 kg) dragon fruit pulp
200 billion cells *Lactobacillus helveticus*
Wyeast 1056 (American Ale), White Labs WLP001
(California Ale), or SafAle US-05 yeas
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 for 10 minutes without hops. Cool to 100 °F (38 °C). Adjust the pH of the wort to 4.5 measured at room temperature using lactic acid. Pitch the *Lactobacillus*. Let it sour until a pH of 3.1–3.2 is reached (usually 2–3 days).

Bring to a boil. Boil for 60 minutes, adding hops with 20 minutes remaining in the boil. Cool to 61 °F (16 °C) and pitch the ale yeast. Ferment at 64 °F (18 °C).

Add the fruit when the gravity reaches 1.018, usually 3–5 days. Do not wait for fermentation to slow; fruit must be added at high kräusen. The fermentation temperature can rise as high as 70 °F (21 °C), allow to ferment to completion, about four days. Cold crash the beer and rack off the fruit.

Prime and bottle condition, or keg and force carbonate to 2.6 v/v.

Cervejaria UNIKA's Wild Guava clone

Recipe courtesy of **Rudy Fávero, Cervejaria UNIKA**

(5 gallons/19 L, all-grain)
OG = 1.050 FG = 1.012
IBU = 6 SRM = 3 ABV = 5%

Araçá *is a Brazilian fruit with a flavor like guava and apple; guava is an acceptable substitute.* Maracujá *is passion fruit. The recipe uses the pulp of the fruit, with seeds, skins, and stems removed. The brewery uses* Lactobacillus *from an Italian pharmaceutical supplier, www.probiotical.com.*

INGREDIENTS

5.7 lbs. (2.6 kg) Pilsner malt
4.5 lbs. (2 kg) wheat malt
1.75 AAU Magnum hops (first wort hop)
(0.125 oz./3.5 g at 14% alpha acids)
10.1 lbs. (4.6 kg) araçá or guava pulp
1.8 lbs. (0.82 kg) passion fruit pulp
1.33 g *Lactobacillus plantarum*
0.66 g *Lactobacillus casei*
SafAle US-05, Wyeast 1056 (American Ale), or
White Labs WLP001 (California Ale) yeast
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. calcium sulfate 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 50 minutes. Raise the mash to 172 °F (78 °C) and mash out for 10 minutes. Sparge slowly and collect 6.5 gallons (24.5 L) of wort. Boil for 15 minutes without hops. Cool to 104 °F (40 °C). Adjust the pH of the wort to 4.5 measured at room temperature using lactic acid. Pitch the *Lactobacillus*. Let it sour until a pH of 3.1 or a stable pH is reached (usually 2–3 days).

Add the hops and bring to a boil. Boil for 60 minutes. Cool to 64 °F (18 °C) and pitch the ale yeast.

Add the fruit when the gravity reaches 1.020, usually 3–5 days. Do not wait for fermentation to slow down; fruit must be added at high kräusen. The fermentation temperature can rise as high as 68 °F (20 °C), allow to ferment to completion. Cold crash the beer and then rack off the fruit.

Prime and bottle condition, or keg and force carbonate to 2.6 v/v.

(5 gallons/19 L, extract only)
OG = 1.050 FG = 1.012
IBU = 6 SRM = 3 ABV = 5%

INGREDIENTS

5.8 lbs. (2.6 kg) dried wheat malt extract
(this is a blend of wheat and base malt)
1.75 AAU Magnum hops (first wort hop)
(0.125 oz./3.5 g at 14% alpha acids)
10.1 lbs. (4.6 kg) araçá or guava pulp
1.8 lbs. (0.82 kg) passion fruit pulp
1.33 g *Lactobacillus plantarum*
0.66 g *Lactobacillus casei*
SafAle US-05, Wyeast 1056 (American Ale), or
White Labs WLP001 (California Ale) yeast
⅞ cup corn sugar (if priming)

STEP BY STEP

Use 6.5 gallons (24.5 L) of water in the brew kettle and 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 for 15 minutes without hops. Cool to 104 °F (40 °C). Adjust the pH of the wort to 4.5 measured at room temperature using lactic acid. Pitch the *Lactobacillus*. Let it sour until a pH of 3.1 or a stable pH is reached (usually 2 or 3 days).

Add the hops and bring to a boil. Boil for 60 minutes. Cool to 64 °F (18 °C) and pitch the ale yeast.

Add the fruit when the gravity reaches 1.020, usually 3–5 days. Do not wait for fermentation to slow down; fruit must be added at high kräusen. The fermentation temperature can rise as high as 68 °F (20 °C), allow to ferment to completion. Cold crash the beer, rack off the fruit.

Prime and bottle condition, or keg and force carbonate to 2.6 v/v.

beer, he said it tasted like "wild guava" (like guava, but with a more complex note) — this was exactly what I was hoping for. And I thought he came up with a great name for the beer, so I suggested we call it that. The final gravity was a bit high but it was definitely not sweet. The acidity tends to cut through that higher gravity.

Most commercial Catharina sours tend to have either one or two fruits, and may sometimes have a secondary flavor from a spice or herb (or even something more unusual, like coffee). One thing I have observed is that the fruit is selected in season when it is fresh and ripe. It might be frozen after picking if trying to capture a sufficient quantity for brewing, but it is never a canned or processed product. The brewery typically washes and sorts the fruit, and uses a juicer or commercial de-pulping machine (*despulpadeira,* in Portuguese) to extract the fruit pulp while getting rid of skins, seeds, stems, and other waste. Homebrewers would follow this step manually, possibly using homemade machines or hand tools.

Sourcing seasonal fruit and processing it requires some effort, which is why I likened it to making fruit mead in North America. It's hard work, but it's what separates the best examples from the also-rans. Enthusiasts in Brazil reject any kind of cooked fruit character or over-ripe fruit flavor. Heating the fruit during canning or pasteurizing finished commercial beers can create a jammy fruit flavor that seems oxidized to consumers. If you can't get fresh seasonal fruit, try fresh frozen or aseptic processed fruit.

Balancing the fruit flavors while extracting the freshest flavor is what separates the absolute best examples from the great. I remember judging beers with *cajú* (cashew), *cupuaçu* (a type of cocoa), and *pitaya (*dragon fruit), and with strawberry and guava at events in the last year. The best examples are memorable and often have strong flavors. However, these winners also had the qualities of tasting like a super fresh, complex example of those fruits. I think finding the fruit at its peak of freshness and processing it right away is the key to capturing these flavors.

Chico and André both made beers with *cupuaçu* and dragon fruit. *Cupuaçu* is an interesting fruit. It's big like a coconut, but kind of elongated. It has a soft, custardy interior around large seeds, and has a tart, tropical flavor with hints of banana, pear, chocolate, and pineapple. You use the fleshy pulp around the seeds, but it has a texture like a cross between banana and packing peanuts. You have to use scissors to cut it off the seeds (Chico) or use a homemade mechanical device (André). The device was definitely a homebrew invention, since it almost looked like a chicken plucker.

Don't be put off if these fruits without English translations are unavailable to you. Brazilians also use berries (strawberries, blueberries, blackberries), citrus fruit (tangerines), and more common tropical fruit like mango, guava, and passion fruit. Dragon fruit shows up in recipes frequently to add a bright purple-red color. If you look through ethnic markets, or search the internet, you may be able to find more of these tropical or unusual fruits.

SELECTING THE *LACTO*

In the early days of the style, many brewers were using probiotic drinks that contained *Lactobacillus* for their souring potential. Since *Lactobacillus* is used in making yogurt, cheese, sourdough bread, and many other food products, it can be found in many forms. Probiotic supplements (pills) are another source of *Lactobacillus.* Recently, yeast suppliers are making pitchable *Lacto* for breweries. There are many different strains of *Lacto* available, and they can have different flavor profiles and brewing requirements (desired temperature and tolerance for hops). The main point is that the *Lacto* species aren't all the same (no surprise, just like strains of *Saccharomyces*) and you should be careful when substituting. You may need to do some tests to see what you prefer, and what works the best in your brewhouse. UNIKA blends their *Lacto,* so keep that in mind as an option. One thing that seems consistent, however, is that people pitch about 0.1 g of *Lacto* per liter of wort. So, scale your usage accordingly.

FINAL THOUGHTS

There are parts of making Catharina sour that seem fairly simple, such as the mashing and the fermenting. The critical control points to me are the handling of the *Lacto*, and the selection and timing of the fruit additions. Once you find a process you like, I think you can just change the fruit and optional spice additions from batch-to-batch. The grain, hops, yeast, water, and bacteria all remain constant, which should help you focus your attention on the primary flavor drivers of the style.

If you are new to kettle souring, just be sure you understand what measurements you will need to take so you have the proper equipment. Homebrewers often like to "fire and forget" their batches, but that really won't work with this style. You can't let processes run to completion and expect them to hold for extended times. You need to move on to the next steps, so be ready. It may be inconvenient to delay the next phases, but the conditions need to be right to move from one step to the next.

If you are curious, my tasting notes for Wild Guava were that it was a bright yellow color, wheat head, effervescent. Smells great, with a fresh, tropical, guava character but with an added great, wild, vegetal note. Light acidity on the nose, clean lactic. Tasted of a clean sourness, no bitterness or hops. Light grainy malt, but all about the fresh fruit and sourness. The fruit has a guava flavor but is more tart than the guava fruit. A light lemony sharpness accents the beer. Highly drinkable and refreshing.

I hope you give the style a try once you find suitable fruit and a good source of *Lactobacillus.* You may want to wait until you have a lot of fresh fruit in season, which is what the Brazilians do. We had to delay our collaboration brew until the fruit was ready, but that was a trade off I was happy to make. As a brewer, you want to put your beer first. BYO


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Winemaking for the Modern Homebrewer

Apply your brewing techniques to make wine

by Wes Hagen

So there's a rumor that you beer guys want to try making wine. That's a great idea. With an understanding of brewing, you've already got a leg up on somebody looking to make wine with no prior fermentation experience. In fact, that brewing knowledge you have may even give you some advantages to make totally unique, flavorful wines that even experienced winemakers have never dared to make. We're going to get into that subject — of how brewers are changing the wine game to create new styles of wine — later, but let me first introduce the art and science of making wine to you homebrewers who want to start at the beginning.

As a production winemaker for nearly three decades, I can state without hesitation that, in my opinion, beer is much more difficult to craft than wine. One rogue microbe can profane an entire tank of beer. Sanitation must be religious in brewing, while wine's low pH gives the liquid a built-in edge of microbial stability. A famous winemaker told me 20 years ago, "If it's clean enough to eat a sandwich off of, it's clean enough to make wine in."

In 2001, my wife and I enjoyed having two winemaking interns from the TUM Weihenstephan in Freising (Bavaria), Germany. The cleanliness of the stainless tanks we used and care they took to clean the crusher/destemmer and press every night were likely factors that made our 2001 vintage wines extraordinary — the Pinot Noir and Chardonnay produced are still drinking beautifully more than 20 years later. In other words, you have skills as a brewer that give you an advantage over us winemakers, who are a bit lazier on sanitation.

While some of the knowledge and equipment between these two hobbies will carry over, the two processes and approaches are quite different. Making beer is precise, recipe- and process-focused, and egalitarian: Most ingredients are available to all brewers for a level playing field. Winemakers are limited by the quality of the vineyards and grapes they use — wine is about preservation of ingredient quality through fermentation.

Of course, you could start with a wine kit. Similar to brewing with malt extract, wine kits can lead to great tasting wines and require less time and equipment. However, for this article, I'm going to be talking about making wine from grapes.

Let's jump into wine production basics and see what we can do to make some good wine.

• More than any other factor, the quality of a wine is dependent on the quality of the fruit crushed. Fresh, ripe, cold winegrapes prevent feral ferments and the production of volatile acidity (VA), which is the first step toward the wine becoming vinegar.

• Winegrapes (from the *Vitis vinifera* species) contain more fermentable sugar than any fruit on the planet, making it perfect for fermenting into wine without requiring added sugar.

• As grapes mature on the vine they gain sugar, which in the wine world is described as degrees Brix — a measurement of the percentage of fermentable sugar in the grape by weight (25 °Brix means 25% sugar in the grape, and that is very sweet), and lose acidity (acid goes down, pH goes up). Choosing a pick date is as important as choosing a beer style. Picking early makes a light, crisp wine (think Pilsner, Kölsch, or helles), while picking late makes a dense, jammy wine more like a fruited milkshake IPA or Belgian quad.

• Choosing a single grape (varietal wine), or a mix of varieties (blend) is akin to choosing the beer style as well. Learning to make single-varietal wines before playing with co-ferments and blends is preferable, in my experience.

• Getting the fruit at perfect ripeness, and with the clusters cool and sound are goals that can't be overstated. If picking yourself, try to pick in the morning or evening when the grapes are cool to reduce the potential for VA and spontaneous fermentation. Ripe winegrapes taste like candy to me — almost impossibly sweet for raw fruit. After 25+ harvests, my rule of thumb is that if I wonder if it's ready for harvest, it's not.

• For equipment to make wine from fresh grapes you will need a fermentation vessel with enough room for the wine to rise 20% during active fermentation, a crusher-destemmer that pulls the grapes from the stems while crushing them (you can get away with not having one, but that will dictate a lot of your wine's style), a wine press, some buckets, barrels, or aging vessels, a pH meter, hydrometer or refractometer to measure Brix, smaller vessels for extra/topping wine, and ways to move liquid from vessel-to-vessel. These are the absolute basics and it will be no surprise how many companies there are out there that want to sell you more winemaking equipment. My opinion: Save your money on the fancy toys and buy better fruit. As a homebrewer, you likely have some of this equipment already and the big-ticket items can likely be rented from your local winemaking shop.

• White grapes are usually pressed without destemming, as the stems open up juice channels and allow the wine to flow out of the press.

• Red grapes are generally destemmed and the grapes are crushed to make a "must" (comparable to wort) of skins and juice, and the fermentation occurs with skin contact and mixing (punching down) the fermenting skins/juice a few times a day to keep the skins that will rise to the top from drying out and letting microbes gain a foothold. Red ferments are commonly covered by a screen or a clean sheet to keep fruit flies and other insects out.

• Most winemakers prefer to allow their wines to ferment to dryness (usually described as less than 3 g/L of residual sugar), but brewers are likely to have a different view of sweetness in their beverages, and playing with residual sugar is another tool on your belt as brewer-turned-winemaker.

• Wine takes a few days to a few weeks to ferment to dryness, with temperature playing an important role. Winemakers control and limit the heat produced in fermentation, believing that white wine fermented cool retains better aroma, and red wines fermented below 90 °F (32 °C) may show more subtle fruit and spice, as well as more roundness/completeness.

• Wines age. Most commercial red wines are aged for about a year in barrel, with new oak barrels giving quite a lot of toasty/roasty bouquet and flavor, while older oak barrels (as long as they are clean and well kept) still allow small amounts of oxygen into the wine and help tame the tannins in reds and broaden the palate for whites. You can also age the wine in glass, plastic, etc., and many home winemakers use oak chips, cubes, spirals, or staves to give the wine the oak flavor they seek — similar to those homebrewed oak-aged stouts.

• Keep your aging vessels (carboys, barrels, tanks, jugs) fully topped-up to minimize oxidation and VA.

• Learn to recognize when a wine is stable and bottle-ready. To avoid refermentation in bottle, make sure the wine is finished fermenting and dry, and also finished malolactic fermentation (when used), which is a bacterial process that uses *Oenococcus oeni* to convert malic acid (bright, citrus/apple flavor) to lactic acid (smooth, round, potentially buttery in whites). Adding sulfur dioxide (SO_2) in the form of potassium metabisulfite after malolactic (ML) is critical for a modern, quality wine, and since SO_2 is more efficient at lower pH/higher acid, we describe microbial stability at 0.8% molecular stability. It's easy to find charts of parts-per-million needed in various pH wines to achieve stability and calculators for adding various powders/solutions of sulfite. The two recipes on pages 51–52 will provide further guidance on the basic winemaking procedure.

BUT, I'M A HOMEBREWER

Now comes the twist of this article, and the part where traditionally trained winegrowers and winemakers start feeling a little sheepish: Get creative.

A new trend has emerged in recent years as some established brewers are branching out and creating

These are basic 5-gallon (19-L) recipes for a white (Sauvignon Blanc) and red (Pinot Noir, on page 52) wines. Ingredients can be scaled up or down if you secure more or less grapes and want to change the batch size. Target chemistry is my own and can be tweaked for style.

SAUVIGNON BLANC INSTRUCTIONS

100 lbs. (45 kg) Sauvignon Blanc grapes. Target chemistry: 22–24 °Brix, 3.2–3.5 pH, 5–8 g/L titratable acidity.

Press the fruit fresh and cool (I like to press below 65 °F/ 18 °C). Yield should be between 6–7 gallons (23–27 L) depending on the press. Pressing harder produces higher pH and some bitter compounds as seeds/stems start to break.

Juice can go into a small tank or vessel to settle overnight, rack clean juice to ferment, or you can 'press dirty' straight into your fermenter.

Stir in one gram per gallon of Fermaid-K yeast nutrient. I would also recommend 1 g of potassium metabisulfite (KMBS) into the main juice ferment, which should give you about 20–30 ppm free SO_2 that will knock down feral yeast and keep the juice clean and fresh as the yeast wakes up.

For aromatic whites, I like to use the yeast QA23. It produces great aroma, and has low H_2S production. **Follow the manufacturer's instructions to rehydrate the yeast,** and do consider adding some nutrient product like GO-FERM.

When adding the yeast to the prepared juice, I pour the yeast very slowly into a thick film on the surface of the juice. We don't want to mix it in for a few days, let it develop a robust community on the top of the vessel so it is not shocked into the low pH must. Expect the wine to start audibly bubbling and fermenting within 24–48 hours. If there are not signs of an active fermentation after 2–3 days, you may need to take a juice sample to the lab and figure out what's going wrong.

Taste the wine as it ferments, and also test it. When fermentation is complete (it should have less than 0.5% residual sugar), rack off the sediment and transfer to an aging vessel. There are a number of wine test kits and small-scale lab equipment available from homebrew retailers that will come in handy when making wine.

Sauvignon Blanc isn't normally aged or taken through malolactic fermentation (MLF). So once the wine is dry and you're happy with the flavors, (sooner the better) add SO_2 to 0.8% molecular. (A 5-gallon/19-L carboy at 3.4 pH would require 1 g of KMBS to hit about 30 ppm or 0.8 molecular SO_2. Molecular SO_2 is a sliding scale with pH, as less SO_2 is needed at low pH, more SO_2 at high pH.) Because you will likely bottle without the wine going through MLF, a full dose of potassium sorbate to the wine lot is recommended to keep the wine from refermenting in the bottle.

Bottle it! You can buy bottling units, but hoses and gravity works just as well in wine as it does with homebrew. The quality of your cork is critical — buy an unopened package of corks — and you'll need a floor corker. These are available at your local homebrew/home winemaking retailer.

Rest it! The wine will likely taste great for a few days, but then closes down for a few weeks to a few months. Three to four months is usually plenty of time after bottling to start drinking the stuff like it's going out of style.

Photo courtesy of Shutterstock.com

PINOT NOIR INSTRUCTIONS

100 lbs. (45 kg) Pinot Noir grapes. Target chemistry: 24–26 °Brix, 3.3–3.6 pH, 5–6 g/L titratable acidity.

Crush/destem the fruit fresh. At small quantities, this job can be done with your hands, but much larger and you will want to buy, borrow, or rent a crusher/destemmer to more easily remove the berries from the stems. Move the grapes directly into the fermentation vessel with at least 8–10 inches (20–25 cm) of extra room for the fermentation to expand and be stirred. As the fermenter fills, sprinkle SO_2 (1 g KMBS) in the must and stir. Chill the must down to at least 60 °F (16 °C) or as low as 45 °F (7 °C) for a cold soak, which can be done in a temperature-controlled space or by adding frozen bottles of water to the must.

Cold soak the fruit at least two days if possible. Punch down the cap, mixing the juice and skins to a uniform mixture a few times a day, being sure to never allow the cap to dry out or get funky (keeping it wet will keep the bad bugs at bay). Allow the freshly crushed and chilled grape must to sit for a day or two, or three, as they begin to absorb color and flavor from the skins. Once you see some bubbles actively forming on the edges of the fermenter (native ferment has started), it's time to add your Fermaid-K (1 gram per gallon), punch the cap down, mixing the must to a uniform consistency, and then add commercial yeast (RC-212 is my suggestion), rehydrated to instructions, in the corner of the fermenter, allowing it to create a robust population. Once the area where the yeast was pitched begins rising from active ferment, punch the yeast "corner" into the rest of the must. Active fermentation should begin throughout the vessel within 12 hours. If the ferment stalls or fails, research restarting wine ferments, and consider a more aggressive yeast strain.


Photo courtesy of Shutterstock.com

Once fermentation is complete (0 °Brix or lower), press into a barrel or aging vessel. Wine that flows freely out of the press (without pressure) is called free run and considered the highest quality. The harder you press a wine, the more bitterness can be created from seeds, so I like to press soft and multiple times to get the best yield and quality. Fill the fermenter as high as possible to limit air space and, if using a barrel, top up once a week for the first couple months, and then every couple weeks afterwards to make up for wine lost to the barrel until bottling. If using glass or plastic fermenters, add oak chips, cubes, staves, or other oak alternatives. I'd strongly recommend French oak for Pinot Noir, at a medium toast.

Add a malolactic bacteria and test for malolactic fermentation (MLF) completion. You can send it to a lab or order a chromatography kit to do this at home.

Once MLF is complete, keep the wine at 0.8 free SO_2 stability until bottling, checking and bumping the SO_2 every few months. At 3.5–3.6 pH, that's about 40 ppm free SO_2 in the wine. Also, when I add KMBS to a wine, I first mix it completely into distilled water in glass labware.

Bottle it! Follow the same instructions as bottling the white. **What about fining or filtration?** As long as you've done a good job racking the clean wine off the lees (sediment) a few times, the wine can likely be bottled and enjoyed non-fined or filtered. It's a long, complicated subject, which I'll leave to your research.

Rest it! As stated in the Sauvignon Blanc recipe, "bottle shock" is a real phenomenon, so expect your wine to be ready for drinking a few months after bottling, and showing its full array of aroma and flavor after 3–6 months of cellaring.

wine labels. Odell Brewing in Fort Collins, Colorado; Foam Brewers in Burlington, Vermont; Wicked Weed and Burial Brewing, both of Asheville, North Carolina; among them. Patrick Rue, who founded The Bruery in Placentia, California, left the brewing world after a decade of tremendous success to start a new venture. In 2019 he opened his own winery in Napa Valley, Erosion, which has since added small batch beer production to its lineup as well.

While commercial wine production was new to Rue and many other brewers who have taken this route, the creative spirit that craft beer is known for and techniques learned in a brewery never really left. This philosophy brought over from the brewing world is putting a new spin on wine.

"When a brewer becomes a winemaker . . . there's less of a sense of tradition or 'that's the way it's always been done.' For me, the most common area where I can impact flavor is by incorporating ingredients that fall outside of typical wine ingredients," says Rue. "Brewers have a lot of control when it comes to making beer ranging from raw material selection to process decisions. As a result, brewers tend to think of how to express certain flavors in the beers they make. Winemakers, on the other hand, tend to have less control. The grapes they have are of a certain varietal, from a certain area, and the weather is going to do what it's going to do."

Beyond adding unique ingredients, another area homebrewers may have an advantage to making wine comes from their experience in regards to intervention, a term winemakers often proudly state they like to minimalize. Whereas winemakers often follow the same recipe and technique year after year and "let the grapes' expression shine," brewers are more apt to continuously adjust a recipe until it hits all of the marks the brewer is shooting for.

"Many brewers focus on refining a recipe by tweaking techniques and elements in their brew; one thing many winemakers can learn from. Small refinements can go a long way," says Don Schroeder, the Winemaker at Sea-Smoke Cellars in the Santa Rita Hills of California.

These refinements may come in the form of the type of oak used, additives and enzymes, aging durations, yeast strains, and so much more. Instead of sticking to one way of doing things, the brewer-turned-winemaker is always tinkering with recipes

LET'S GET CRAZY

What are some of these ingredients brewers-turned-winemakers are using in their wines? The list Rue has executed at Erosion is already long enough to make the traditional winemaker a little queasy, and it likely is just the beginning for the winery that has been in business just a few years.

"A few examples that are top of mind are dry hopping a white wine, adding sour cherries to a Chardonnay to make it a 'rosé' of sorts, adding cacao and vanilla beans to a Merlot, aging late-harvest Sauvignon Blanc in spirit barrels. I've enjoyed the results, they've all contributed something unique while preserving the flavor of the base wine."

Again, these are non-traditional, but as an experienced homebrewer it shouldn't be too hard to envision the impact they bring to wine.

"It takes some effort to have a traditional wine drinker come to terms with what we're doing, but craft beer drinkers understand the concept without much further explanation," Rue says.

A traditional winemaker himself, Schroeder is also a craft beer aficionado. From the outside, he appreciates some of these new techniques winemakers are experimenting with. "One brewing technique being used in winemaking that I am really enjoying is dry hopping dry white wines. If done right it can add some lovely complexity to an affordable white."

If you consider dry hopping a white wine, a good starting point would be hop varieties described as "vinous." A few notable examples include Nelson Sauvin™ from New Zealand, Hallertau Blanc from Germany, and Astra™ from Australia; however, other hop descriptors such as peach, pineapple, melon, lemon, and lime may also be good complements to a crisp white wine. Small dry hop additions for a few days is all that is needed, but some trial and error to dial in the right amount for your taste is to be expected.

Whether it is an addition of hops, cocoa nibs, vanilla beans, spirit-soaked oak chips, or any other new brewer-inspired addition; this is a great time to split that batch of wine you are making into smaller 1-gallon (4-L) trials.

Want to get even crazier? How about *Brettanomyces*? As a winemaker, the thought of introducing the "spoilage" yeast into a winemaking space is almost unthinkable. Of course, many breweries intentionally inoculate their beer with *Brett* (it is worth mentioning, that most of these either intentionally sour all of their beers or have separate brewing spaces for these *Brett* beers so as not to infect their clean styles).

Wicked Weed started an offshoot wine label named Vidl in 2019 that is run by the head blender of the brewery's sour beer program. Some of the beers Wicked Weed is best known for are wild fermentations. As such, it shouldn't come as a huge surprise that all of Vidl's wines are also spontaneously fermented. None of their wines receive sulfite, fining agents, or anything else. Natural wine, if you will. Sourcing grapes from the same region as their hops — Washington State's Yakima Valley, the wines are intended to express the terroir of the region. And, yes, this includes *Brett* in some examples.

As a longtime winemaker who follows a much more traditional approach to my own commercial production, I can also share an admiration for those who are changing the game. And I will offer this promise: I'll keep my mind open to new styles of beer, wine, and hybrids of the two. And if this article leads you to make some wine, funky, fresh, or somewhere in the middle, do send me a bottle so we can taste it together and chat about your craft.

Oh, and to all you brewers — thanks for beer. I drink a lot of it, I just wish I was talented enough to make the stuff.

BY DREW BEECHUM & DENNY CONN

A MATTER OF TIME

A simple guide to hop charges

Traditionally, hop usage was to generate a supporting bitterness to cut through residual malt sweetness, adding a pleasing, subtle aroma to the beer. The other purpose was as an anti-spoilage agent. Compounds in hops slow the growth of *Lactobacillus*, arguably the most aggressive spoilage mechanism, which actually explains hops' rise to the throne of beer additives. It's way more cost effective to be able to sell palatable beer for longer after all.

When we normally talk bitterness in beer, people wave around the IBU (International Bitterness Unit) as the holy sacrosanct measure of bitterness. You see it in every recipe calculator and beer menu boards. But the IBU isn't the end-all and be-all, in fact it's a terribly wibbly idea to begin with.

First, the IBU is supposedly a measurement of dissolved isomerized alpha acids, the potent bittering compound generated by boiling hops in wort. How much of your hops' natural alpha acid content has been flipped to a water-soluble, bitter molecule; iso-alpha acids. Technically, it's a measure of absorption of light at a specific wavelength, but for most of us it's the number spewed out of a complex equation that our brewing software runs.

But the actual creation of isomerized alpha acids — often called hop utilization — in your wort is a nightmare to correctly predict and fraught with multiple variables. Those include, but are not limited to: Kettle geometry, type of hop product (pellet, cone, extract, etc.), wort pH, wort gravity, and hop storage conditions (how old are your hops, how have they been stored, how were they packaged — alpha acid numbers are not always correct).

As homebrewers, our actual knowledge of what we're generating in the kettle is practically limited. That's not to say that the IBU calculation is completely useless, but understand that the important measure is what you taste, not what some number indicates. Learn what XX IBUs tastes like to you (Sierra Nevada Pale Ale is pretty spot on to 35 IBUs, for instance) and then learn what that IBU level (calculated) looks like in your brewery. Work relative to that.

As for the calculation, remember that the most used homebrew formula for hop bitterness, the Tinseth formula, was developed by Glenn Tinseth using freshly analyzed whole leaf hops on his homebrew system. The equation was fit to the data he collected. In other words, it works absolutely perfectly for a homebrew rig that no longer exists with hops long since used!

The question of perceivable bitterness is also colored by the fact that many compounds beyond isomerized alpha acids taste bitter. Be aware that hops contribute other compounds that affect our perception of bitterness, but don't change the measurable IBU level one tiny little bit.

But, the actual creation of isomerized alpha acids — often called hop utilization — in your wort is a nightmare to correctly predict and fraught with multiple variables.

Photo courtesy of Shutterstock.com

HOPS IN THE KETTLE

Chuck them in and let them roll — that's all you need to do with your hops, right? Mostly. With increased use of hops, particularly in whirlpool (post-boil) stages, brewers have pursued the removal of extraneous matter by resorting to a number of in-kettle straining setups to prevent hop matter from leaving the boil vessel. Denny and Drew both rely on the strainers built into their Grainfather kettles.

Some brewers will use filters around any output tubes/spigots and others will constrain the hops themselves. The two most common being hop bags (mesh bags that you add your hops to before tossing into the kettle) and hop spiders (think a mesh basket that hangs into the boil). Concerns abound about the impact that the restricted movement of the hop material can have on isomerization. (And there's plenty of evidence that shows it can lower the amount of generated IBUs.) Our word of advice if you use these methods — don't stuff your bags full or your hops won't get entirely wetted (particularly true when dry hopping) and don't sweat the change. Again, learn how your beer tastes and adjust from there.

Bittering Charge — It does what it says. This is the charge where you generate bitterness most efficiently since isomerization is greatly impacted by time above the isomerization threshold (~170 °F/77 °C). The more time, the more bitterness generated (to a point — there is a threshold of diminishing returns and overunity in hops is as fantastical as in motion). Once you cross 90 minutes, you're not gaining enough to make the extra energy use worthwhile. In fact, older studies demonstrated that boiling hops for over 120 minutes can lead to undesirable flavors.

Traditional timings for a bittering addition lie between 60–90 minutes. (Ranges are "ish" because time is a loose construct of minds desperate to control an unraveling universe.)

Brewers will typically offer the advice that hop variety in your bittering charge doesn't matter because you're boiling off your aromas and flavors. We'd still advise care when selecting a hop since you usually want to reduce vegetative matter in the kettle (leafy flavors and wort absorption) by using a high-alpha variety. Drew tends to use a lot of Magnum and Warrior, for instance. We'd even argue that hop variety can still impact flavor perception and that's why we're both fans of using a bittering charge of Chinook in a classic West Coast IPA to provide an extra bite.

Bittering additions can vary between less than a quarter of an ounce (7 g) — Drew's Mild can use as little as an eighth of an ounce (3.5 g) depending on the hop choice — to a couple of ounces (~60 g) for your beers that need a bold, bitter bite.

Flavor Charge — This 20–35 minute charge is arguably the most controversial and least used. The intention "blow off the aroma and generate some bitterness while preserving flavor" firmly lies astride the usual path of hop perception modern brewers crave.

Our advice — unless you have a real reason to need this addition, or you just want to be ultra traditional, you can safely skip the flavor charge for the . . .

Aroma Charge — This is where things get exciting and make the craft beer lover and hop head perk up. 10 minutes and below are the land of all the aromas and flavors and less bitterness production (although not none). This is where we start to see the loading in of your more exotic varieties – things of rarer availability or strange experimental numbers. The idea is to start dissolving oils and making them available in the near future to your nose. If you add them at the boil's end and proceed directly to chilling, you've added them as "flameout" or "knockout" hops.

A couple of ounces (50–100 g) per five gallons (19 L) can perk up and load a beer with all the smells, but . . .

Whirlpool Charge — A funny thing happened on the way to the IPA party and brewers began trying to fill their beers with as much flavor and aroma with less bitterness. (The super bitter IPAs of the Aughts turned off a lot of potential IPA drinkers). Since high-alpha hop varieties (the other trend has been increasing alpha acid content in hops) can generate loads of IBUs with a mere glance at a boil, brewers have increasingly reduced the amount of time in boil conditions they expose their hops to. The hope – less bitter, still brightly hoppy and aromatic beer.

To this end, and accelerated by the haze craze, a number of beers are produced with almost no hops added to the boil. Instead, they wait until the boil ends and add major charges (ounces and ounces) of the hops to wort fresh off the boil or purposely chilled (to ~170–180 °F/77–82 °C) and let the hops sit in a swirling mass of hot wort for 20–30 minutes. Since the wort is still above 170 °F (77 °C), you're still slowly generating IBUs (as are any previous kettle additions) while extracting aromatic compounds from the hops.

Drew likes to whirlpool for his IPAs and pale ales while getting his first beer of the brew day, while Denny has tried the technique many times and eschewed it in favor of . . .

HOPS IN THE FERMENTER

Simply put, dry hopping is the addition of hops to the beer during or after fermentation for several days to release aromatic compounds into the beer. When to add depends on the impact you want to have. You may have heard of "biotransformations" — that exposing hop compounds to actively fermenting yeast will cause various constituent oils to be transformed by yeast activity into compounds that smell and taste different. Example: The hop compound geraniol (flowery) can be enzymatically transformed into citronellol (citrus, fruity).

This is a very popular technique with hazy IPA production. Commercially, brewers are pushing the amount of time in contact with the yeast to shorter times (1–2 days prior to the beer being complete) to allow them to harvest cleaner yeast, so it doesn't take very long.

For more classic dry hopping, you wait until the beer is fully fermented and all yeast activity has ceased. Add the hops and let it sit for a period of time before serving. (In traditional cask service, the hops would be bunged into the cask and allowed to stay in contact until the cask was emptied. In keg practice, we typically remove the hops before kegging and serving).

Old school dry hop times were on the order of 7–14 days or longer, but studies show that dry hopping efficiency peters out (and starts re-absorbing oils/isomerized acids) after 2–3 days when using hop pellets. Temperature can also impact what flavors get extracted (35 °F/2 °C, for instance, favors the extraction of linalool).

Another old belief about dry hopping is that it adds no bitterness to the beer but this turns out to be less than true. Not only can you pick up astringency (a flavor often confused for bitterness) from the hop leaf material, you can also pick up bitterness from oxidized alpha acids called humulinones. They're mildly bitter but at the massive dry hop rates we see today, both the tannic astringency and contribution of things like humulinones adds up quickly.

One thing we haven't covered yet is how to choose the hops that you use and when you use them. We recommend starting with the Yakima Chief Hops "Survivable Compounds" guide available at yakimachief.com

BY FEDERICO TONDINI

NOVEL YEASTS

And where to find them

To say the least, it's been an interesting period of experimentation in the brewing world the last decade or so. Most brewers have been awed by the evolution of hops in that time, but nothing is changing quite as rapidly as the microorganisms that we are inoculating in our wort and beer. Our choice of *Lacto* and *Brett* has grown a lot as well as brewer's yeast strains through lab techniques like genetic modification and hybrids. Lesser-known organisms like *Lachancea* are being developed for brewers as well. And yet I will argue that there is still a lot more diversity out there to explore for those willing to search.

For thousands of years, beer and all the fermented foods collectively have played a vital role in the development of human civilization. During this time, *Saccharomyces cerevisiae* co-evolved with human activity in many civilizations throughout the world, becoming the workhorse for the production of alcoholic beverages. The switch between artisanal scale to a more industrial brewing regime with all its process optimizations was triggered by the discovery made by the French scientist Louis Pasteur, who demonstrated that the transformation of malt sugar into ethanol (alcohol) and CO_2 was due to the activity of a microorganism.

That was followed by Emil Christian Hansen who, in 1883, brewed the first single yeast isolate beer. Thenceforth, spontaneous fermentations and their complex microbiomes were replaced by *S. cerevisiae* for "ales" and *S. pastorianus* for "lagers," for their more reliable and reproducible products, resulting nowadays in only a few strains used in beer production that have low genetic diversity among themselves. However, with the recent emergence of craft brewing and the increasing demand for novel beer styles, diversification is becoming increasingly important. Yeast has room for bringing innovation due to its significant contribution in shaping beer's aroma profile.

Other fermented foods could also serve as a target for novel yeast isolations, such as fermented dairy, coffee, or cocoa beans.

Photo by Charles A. Parker/Images Plus

Isolating your own wild strains of yeast is a hobby in itself and can yield complex beers when executed properly.

BIOPROSPECTING FOR BREWERS

Numerous studies have been done on the *S. cerevisiae* yeasts directly related to human-based activities, such as making bread and fermenting wine or sake. But only a small number of yeasts from these sources have shown promise in beer. Only other historically established old-style beers, like the traditional Norwegian kveik beer and the Finnish sahti beer, which both use juniper in place of or in addition to hops, or the Russian kvass, made with bread, have so far provided encouraging strains.

Broadening the perspective, one might also concentrate emphasis on less conventional fermentations, where native yeasts may have evaded some of the domestication processes and hence give a larger natural variety. Another idea is to look on other natural substrates/raw materials besides grains and grapes, such as the honey-based mead, in order to avoid selecting again and again yeasts that are comparable to what is presently in use.

There are still a lot of traditional drinks to discover, such as classic low-alcohol European drinks or fermented drinks made by Australian Aboriginal people (Mangaitch, Way-a-linah, and Kambuda). Around 3,500 different fermented foods and beverages were listed by G. Campbell-Platt's 1987 book *Fermented Foods of the World*, but there may be more than 5,000 different variations of these products consumed globally now.

The capability of yeasts from fermentations such as those that produce chicas, cachaça spirits, pulque, tequila, or sub-Saharan alcoholic beverages, to produce beer has not yet come to light. Other fermented foods could also serve as a target for novel yeast isolations, such as fermented dairy, coffee, or cocoa beans. In addition, industrial bioethanol production has been reported to be a rich source of *S. cerevisiae* strains, showing they harbor a potential for use in the brewing industry.

METHODS FOR ISOLATING YEASTS FROM THE WILD

Until recently, we had the wrong idea of the origin and evolution of *S. cerevisiae*: Because of its metabolism, it was initially thought that *S. cerevisiae* would mainly reside on the surface of fruits. But the truth is that its presence there is rather scarce. It was shown that yeast cells are most likely transferred to vineyards or orchards via insect vectors that feed off damaged fruits. The most common uncultivated habitat from which *Saccharomyces* species have been isolated is instead fluxes of oaks and other broad-leaved trees. And the most primitive *S. cerevisiae* populations to date were actually isolated from remote ancient forests in China.

There are two main challenges when it comes to isolating wild *S. cerevisiae* strains from these habitats: Choosing the right spot during sampling and avoiding isolating strains of the "common" genotypes. Following is a recipe originally proposed by Sniegowski et al. (2002) that allowed for the isolation of dozens of *S. cerevisiae* and *Saccharomyces paradoxus* strains from soil samples around oaks and the famous unknown parent of *Saccharomyces pastorianus*, the cryotolerant yeast *S. eubayanus*.

How to prepare 1 L of enrichment culture media for isolating yeast:

- 3 g yeast extract
- 3 g malt extract
- 5 g peptone
- 10 g sucrose
- 76 mL EtOH (ethanol)
- 1 mg chloramphenicol
- 1 mL of 1-M HCl (hydrochloric acid)

INSTRUCTIONS:

Stir the two extracts, peptone, and sucrose together in 1 L of water. Heat to a boil or in an Instant Pot for 5–15 minutes. After cooling, add the ethanol, chloramphenicol, and 1 molar hydrochloric acid. Sterilized 50 mL vials are good sized vessels to view activity. In as sterile a setting as possible, pour solution into vials, filling about halfway.

Temperate climate broad-leafed forests are probably going to be the best place to look, preferably around a stand of oak trees. Using a sterile scalpel or spatula, scrape some exudate material, bark, and soil samples from around the base of the trees into each vial. Cap your vials tightly, then incubate for approximately 10 days at 86 °F (30 °C) without shaking. Inspect regularly for signs of fermentative CO_2 production.

NEW CHALLENGES AND PERSPECTIVES

As conventional brewing yeasts have been evolving through processes of natural and artificial selection, they developed a high fermentation efficiency and quality, but at the cost of having limited potential for novel flavor profiles. To produce unconventional beers the brewers have to consider the properties of unconventional yeast coming from a natural and non-brewing environment. Common features of these new yeast isolates could create some issues: Poor flocculation, low attenuation, and high volatile phenol production can be addressed with a centrifuge, beer clarification additives, or changing mashing conditions to optimize the proportion of fermentable sugar or the level of ferulic acid (the precursor of the 4-vinylguaiacol off-flavor). With an innovative mindset and laboratory-based screenings, it's possible to go in pursuit of wild or nonconventional yeast strains possessing brewing-relevant characteristics.

The adaptability of yeasts is also evident in their genomics and as the number of published yeast genome sequences rapidly increases, another opportunity also arises for identifying in silico unique strains suitable for brewing. By looking at 1,011 *S. cerevisiae* strains described by Peter et al. (2018), available at https://www.yeastgenome.org/reference/S000216438, it is possible to rapidly screen thousands of strains. For brewing applications, this could involve looking for the presence of genes encoding functional maltose and maltotriose transporters or mutations in genes associated with the synthesis of aroma compounds. BYO

BY DOM GALLO

CLOSED-TRANSFER SYSTEM

Modifying a fermenter lid

This build essentially turns the fermenter into a modified bright tank with a low pressure rating.

Photos courtesy of Dom Gallo

As a homebrewer, my goal has always been quite straightforward: Make beers better than the ones I can buy. Though far easier said than done, this goal has always resonated with my competitive nature and desire to place my best efforts in all that I do. It has influenced me to research and learn as much as I can about this beautiful hobby and has motivated me to continuously improve from one batch to the next. This journey has led to concepts and practices that have changed my brewing forever: Fermentation control, water chemistry, and what I consider the most crucial for beer quality, the ability to minimize/eliminate oxygen contact post-fermentation.

When I started looking at ways to achieve that final concept, I decided it was time to upgrade my equipment to be able to put this practice into place. I quickly realized that stainless steel equipment with closed transfer capabilities was out of my comfortable price range and their PET counterparts were not much different than the PET FerMonster that I already owned. The big difference was the fact that they had liquid and gas connections for transfers. It was at that moment that I realized with a drill bit and a few parts I could convert my FerMonster to do the same thing. It didn't take long to put this idea to use.The next day, the modified FerMonster lid with closed transfer capabilities was born.

For this DIY project you are simply drilling a solid FerMonster (or similar large-mouth PET carboy) lid and fitting it with gas and liquid ball-lock posts. Then you are installing a floating dip tube (I recommend the one offered by Brew Products called the Clear Beer Draft System https://clearbeerdraughtsystem.com/), to the liquid bulkhead. This essentially turns the fermenter into a modified bright tank with a low pressure rating.

With this lid you are able to perform the following tasks that had eluded me before: Connect your fermenter to your gas supply during cold crashing, prevent oxygen contact during dry hopping, dry hop with positive pressure, use fermentation gas to fully purge serving kegs, and transfer from your fermenter to your serving kegs without worrying about your beer oxidizing.

When all of these minor tweaks are made to your beer, it will help you to maintain that hops-straight-out-of-the-bag character in hoppy beers, bold and complex profiles in malt-forward styles, and subtle nuances in your light ales and lagers.

The only real caveat with using this system is the possibility of having your regulator set too high. Just be sure to check before use each time. Most PET carboys are rated to 15 psi, but I don't go above 5 psi.

Tools and Materials

- FerMonster carboy with solid lid
- FerMonster carboy replacement lid o-ring
- Ball-lock post bulkhead — gas-in
- Ball-lock post bulkhead — bev-out
- $1/4$-in. barb x $1/4$-in. female threaded stainless barb
- $5/8$-in. O.D. x $7/16$-in. I.D. x $3/32$-in. o-ring
- Floating dip tube
- $1/2$-in. (13-mm) spade tipped drill bit (3-in./7.5-cm or longer)
- (2) Grooved joint pliers
- FerMonster lid opener

STEP BY STEP

1. MEASURE AND MARK POST HOLES

Have the top of the lid upright. Proper placement of the liquid and gas post is a crucial part of this build for it to function properly. Using a ruler and chalk/pencil find the center of the lid by drawing straight perpendicular lines–The intersection point will be the center. From the center, mark one post hole 1⅜ in. (35 mm) to the right and another post hole mark 1⅜ in. (35 mm) to the left of center. These marks should be 2¾ in. (70 mm) apart from each other.

2. DRILL THE HOLES

Using a power drill and a level surface, clamp or hold the lid down and with downward pressure, drill ½-in. (13 mm) holes on the marks you made for each post. (Make sure the drill is level.)

3. CONNECT THE POST TO THE LID.

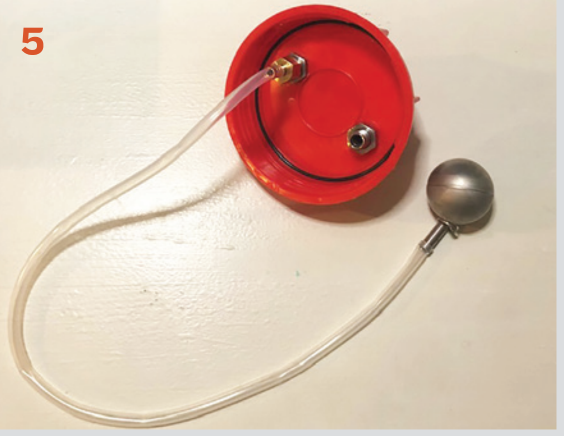
With the lid upright, connect both posts by unscrewing the hex nut and placing them through the lid, keeping the o-ring provided on the post on the top side of the lid. Then place one ⅝-in. O.D. x 7⁄16-in. I.D. x 3⁄32-in. o-ring on post from the underside of the lid. Once both o-rings are in place, reconnect the hex nuts to each post and tighten down. Do not overtighten the nut.

4. CONNECT THREADED BARB TO LIQUID POST

Before connecting the threaded barb, it is important to determine the liquid post (non-notched, the CO_2 post will be notched). Once the liquid post is identified, connect the threaded barb to the post and tighten it.

5. CONNECT FLOATING DIP TUBE TO LIQUID POST

Prior to attaching, soak the open end that is not attached to the floating apparatus in a cup of ~100 °F (38 °C) sanitizer solution for 20 seconds to make it more flexible. Then attach this end by pushing it entirely over the barb (you may need to twist it on). At this point your lid is complete.



6. WATER TEST

****DO NOT EXCEED 10 PSI — LID MAY CRACK****

Prior to use, you should perform a water test with the lid to check for functionality and leaks. Before starting the test, make sure the FerMonster carboy lid o-ring is properly in place or this will cause CO_2 leaks. Fill your fermenter half way with water and then tighten down the modified lid using your FerMonster carboy lid opener to tighten it onto the FerMonster (don't over tighten). Then set your CO_2 regulator to 5 psi and connect its gas line to your modified lid's CO_2 post (notched), checking for air leaks. Then connect a liquid ball-lock fitting attached to an appropriately sized open-ended hose that is placed into a sink or pail to check for water leaks. Once it passes these tests, you are ready to use it for your brews. BYO

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BY RYLEY HOUGLAND

BAD ART, GREAT TIMES

Beer goggles not required

"It used to be that people would come and sit, have a drink, and leave. Now they're up and moving, looking at art and experiencing the whole brewery."

- Derek Rayner, DB Co. Events Manager

Photo courtesy of Museum of Bad Art

The decor of a brewery taproom is an important part of its identity and the experience it provides to patrons. Some are akin to a sports bar, with plenty of TVs and pro team decorations. Others focus on the idea of beer itself, showing off their fermenters and lining the walls with beer-themed signs. Dorchester Brewing Company (DB Co.) in Dorchester, Massachusetts, has a little bit for everyone – especially those who like poorly-done portraits of Bob Marley or collections of eye-themed paintings.

Beginning in September 2022, DB Co. became the new host site of the Museum of Bad Art (MOBA), a Boston-based museum that showcases what they describe as "art too bad to be ignored." The new partnership let MOBA use DB Co.'s Dorchester taproom to display pieces from their collection, becoming their first permanent home in years.

"We had lost our old space in the Somerville Theater during the pandemic," said MOBA Permanent Acting Interim Executive Director Louis Sacco, "and we really wanted to find a new physical home to display our collection."

Sacco had a list of requirements for the ideal new space, wanting it to be accessible through public transit, open on the weekend, and most importantly, free of admission for the public. After getting in contact with management at DB Co., MOBA had found a new home that fit the bill.

DB Co. was founded in 2016 and functions as a partner brewing facility with a public taproom that serves both in-house and partner beers. A brewery that puts emphasis on community and fun, Dorchester seemed like a natural match for MOBA. As for what DB Co. gets out of their partnership, the taproom's new decor has helped add to the brewery's social environment.

"The art definitely becomes a conversation piece for a lot of our customers," said DB Co. Events Manager Derek Rayner. "It used to be that people would come and sit, have a drink, and leave. Now they're up and moving, looking at art and experiencing the whole brewery."

Having such a large space lends itself to being able to host more MOBA events as well. In February, MOBA hosted the first of what they hope to be many curator talks at the taproom, allowing those who run the museum to talk about how they find, choose, and analyze the art in their collection.

The art itself is often worthy of such discussion, with museum curators putting together collections that include pieces such as "Ferret in a Brothel" and a portrait of Jackie Kennedy flirting with George Washington, among a host of other questionable artistic expressions. That questionability is exactly what piques most visitors' interest, and what MOBA has been built on from the beginning. The museum got its start in the mid-90s, when Co-Founder Scott Wilson, an antique collector, came across a poorly-done painting in an ornate frame he planned on using. Rather than throwing out the painting, he was convinced to keep it, and he and friend Jerry Reilly began a small collection. After hosting a party at Reilly's to showcase the art, the idea of turning it into a legitimate museum was born, which to this day has the same purpose as always.

"We emphasize that we never say anything bad about the artists," said Sacco. "Our mission is to celebrate the artists and art that otherwise would never get talked about."

Now, nearly 30 years later, MOBA may be as close to its roots as ever — with the drinks and conversations being enjoyed at DB Co. being akin to those in Reilly's basement years before.