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SEPTEMBER 2022, VOL.28, NO.5

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SEPTEMBER 2022, VOL. 28 NO.5

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Brew Your Own
THE HOW-TO HOMEBREW BEER MAGAZINE

departments

where to find it

RECIPE INDEX

RECIPE STANDARDIZATION

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

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

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

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

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

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Cover Photo:
Charles A. Parker/Images Plus

Q Checking in your brewing logs, what style(s) of beer do you find you brew most often?

I like to think of myself as a diverse brewer, but there is no doubt that IPAs rule my fermenters. I would say upwards of 50% of my brew days are on IPAs, but it's the style that gets poured most at my home bar. What's ironic is that it took me several years of actively homebrewing before my first attempt at one (inspired by the September 2004 issue of *BYO*).

That's easy… IPA, specifically West Coast IPA. No hazies here! My wife loves 70+ IBU IPA, as do I, so it works for both of us. Clear, crisp, and a firm bitterness. Hops change every time depending on what's in the freezer. Leaning toward firm bitterness with a slightly fruity finish these days. My other most often brewed styles are German Pils and Belgian tripel.

I have a preference for dark beers and English styles so I like to brew ales, porters, and stouts. However, I still have to accommodate guests that don't like dark beer, and they seem to prefer my Belgian wit.

Volume 28, Number 5: September 2022

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Break Out of A Brewing Rut
It is easy to get into a homebrewing zone and turn on the autopilot switch. If the time ever comes where brewing begins to feel monotonous or like a chore, use these 11 tips to bring the excitement back into brewing. https://byo.com/article/break-brewing-rut/

MEMBERS ONLY

Helles and Kölsch: Germany's Session Beers
Though helles is a typical Bavarian lager and Kölsch a typical Rhenish ale, in many ways these two German brews are very similar . . . except of course for the yeast. Get some pointers and recipes for brewing these two classic German session beers. https://byo.com/article/helles-and-kolsch-techniques/

Yeast Selection For Your Cider
When you decide to ferment your apples (or apple juice) to make hard cider you are faced with more choices than ever before. Explore the world of yeast possibilities before you ferment your next batch of cider. https://byo.com/article/yeast-selection-for-cider/

MEMBERS ONLY

Kimchi
The national dish of South Korea, kimchi is most often fermented cabbage and has been gaining popularity worldwide. Get pointers and a recipe to ferment your own batch of this spicy and savory food. https://byo.com/article/kimchi/

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MAIL

COMPARING IBU CALCULATION METHODS

I have a question regarding the article, "A Modern Method for Calculating IBUs" by John-Paul Hosom from the July-August 2022 issue. I use BrewMate software, so the IBUs are calculated via Tinseth or Rager methods (or an average of both). From Chart 2, comparing measured vs. predicted IBUs, the predicted IBUs are greater than measured in every case for those two methods (Tinseth/Rager). Neither of those methods have any IBU contribution from post-boil hop additions (or dry hopping for that matter). I would have thought these methods would underpredict IBUs given that they do not have any IBUs from post-boil additions. Personally, I feel my IPAs and pale ales have more bitterness than indicated by the brewing software. This effect seems to have increased as many of the beers I have made recently have increased post-boil hop additions. I thought this extra bitterness was from post-boil hop additions. Is this all a difference in "perceived" bitterness versus actual bitterness? I'm puzzled.

John Tripp • *via email*

Story author John-Paul Hosom responds: "Predicting IBUs is really difficult because of all of the different factors that affect the measured value. You're right that any post-boil hop additions will increase the IBUs, and by not taking that into account the Tinseth and Rager methods will underpredict IBUs, everything else being equal. However, there are other factors that may cause those methods to overpredict IBUs, depending on your brewing techniques. If you add over 200 ppm of alpha acids to your wort (or about 1.5 oz./42 g) of hops with 10% alpha acids in 5.5 gallons (21 L) of wort, that may exceed the solubility of alpha acids, reducing IBUs. Or, if you lower the pH of your mash or wort, that will reduce the IBUs in your beer. Because the Tinseth and Rager formulas don't account for hopping rate or pH, they can overestimate IBUs for beers with high hopping rates or pH adjustment.

"It might help to look at an example, such as the IPA in the test data of Chart 2, with 70 measured IBUs. The SMPH model, accounting for all known factors, predicts 71 IBUs. If we don't apply the alpha acid solubility limit, then it predicts 84 IBUs. If, on top of that, we don't apply adjustments based on wort pH, then it predicts 106 IBUs. If we don't model alpha acid loss during hop storage or IBU

contributors

Stephen Stanley's first homebrewing challenge was to reproduce Weltenburger Kloster Barock Dunkel after a trip to Germany. He's still working on it ten years later. He is a founding member and Education Chair of the Aurora City Brew Club in Aurora, Colorado. Steve is a Lean Six Sigma Black Belt, an engineer, and a process geek. His love is German beers, from the classic Pilsners to the sour wheat beers of northeastern Germany. A native Kentuckian, Stephen won a silver medal from the Great American Beer Festival for his Kentucky common with Wade Malsen, then Head Brewer of Ironworks Brewery.

Beginning on page 28, Stephen runs through possible scenarios that can throw off a brew day and how to recover from them.

Derek Dellinger is a writer and brewer living in New York's Hudson Valley. Previously the Head Brewer for Kent Falls Brewing in Kent, Connecticut, Derek now works as a consultant to breweries and cideries in the region. His first book, *The Fermented Man*, explored the concept of living entirely off of fermented food and drink. Both with Kent Falls and elsewhere, Derek has brewed with many unique ingredients and written about those experiences. Previous topics he has written about in *BYO* include brewing with mushrooms, maple syrup, and creating grape/beer hybrids.

Beginning on page 34, Derek explores the wild world of fermented foods, which pair perfectly with homebrew!

Aaron Hyde began homebrewing in 1996 with his father in the kitchen. As the owner and operator of Brewstock Homebrew Supply in New Orleans, he sold home fermentation products, helping many get their start in the hobbies. He also provided educational classes on brewing and winemaking to those in the community. After five years he moved on to work for Briess Malt & Ingredients where he was a Sales Manager selling into homebrewing stores as well as craft breweries and distilleries. He currently manages global product strategy for Bevie, providing high-quality equipment and ingredients to homebrewers and distillers across the globe. In 2021 he authored *How to Distill* for the hobby distiller and he manages the website www.howtodistill.com, which provides supplementary information and support to the book. He has also been a past "Techniques" columnist for *BYO* in addition to writing many feature stories.

Starting on page 40, Aaron offers his advice in this issue's cover story on designing homebrew recipes, explaining why the craft requires input from both the left and right side of the brain.

THE BIG BOOK IS BACK

Get Your *BYO Big Book of Homebrewing* Today!

Homebrewers around the world have turned to the experts at *Brew Your Own* magazine for more than two decades. Now, the editors known for publishing the best information on making incredible beer at home have updated their brewing bible. In this edition, you'll find:

- **More to learn: All-new information on creating mouthwatering hazy IPAs, pastry stouts, and kettle sours.**
- **New recipes to brew: Find 25 new clone recipes from popular craft brewers, including Bierstadt, Trillium, Bell's, and Allagash.**
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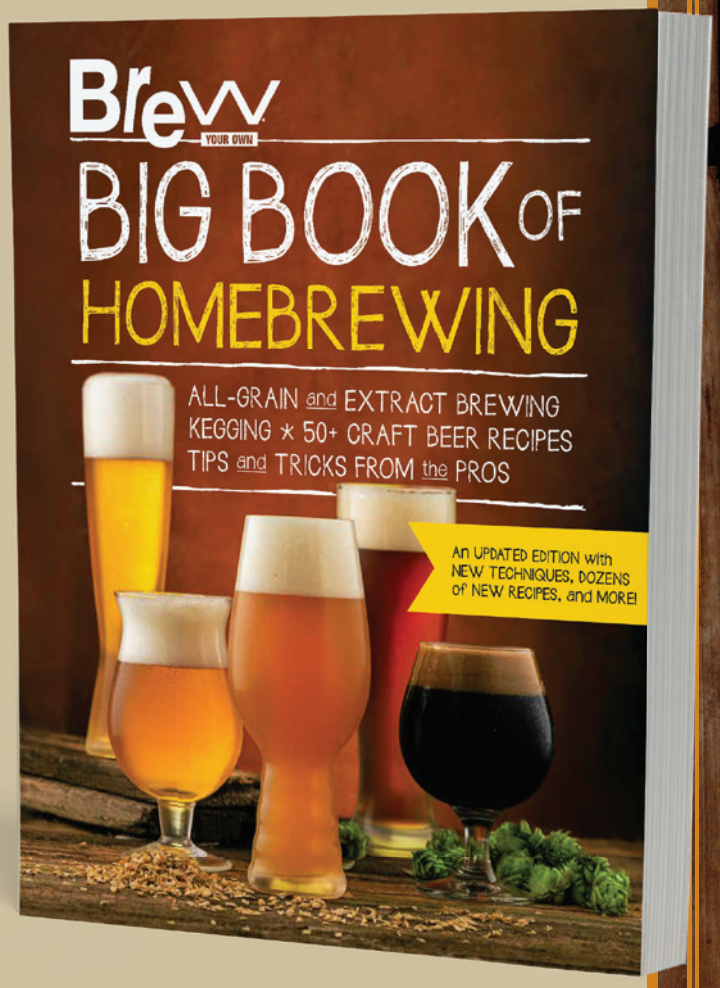

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Brew YOUR OWN — THE HOW-TO HOMEBREW BEER MAGAZINE

MAIL

decreases over time (18 days until kegging), then it predicts 137 IBUs, or nearly double the measured value. Since these factors are not accounted for in the two other models, they may overpredict IBUs. This beer had a 4.5-oz. (128-g) hop addition at flameout and a brief 2-minute hopstand. The SMPH model estimates that these late-hop additions contributed only 5 IBUs. A 20-minute hopstand would have meant a contribution of 10 IBUs from the flameout hops, according to the model (using the solubility limit). In short, while post-boil hop additions will increase the IBUs, other factors can have a much larger impact.

"Additionally, Prof. Tinseth recently informed me that the samples he measured were of wort, not beer. He explained that he was more concerned with predicting bitterness in a consistent way, not necessarily with a precise and accurate prediction of measured IBUs. Fermentation will lower the IBU value, and this may also explain why the Tinseth (and possibly Rager) models overpredict. (In retrospect, he was correct that the utilization function can be modeled as a first-order reaction. This was a major advancement in obtaining more consistent results, compared with the S-shaped utilization function from the Rager formula.)

"The extra bitterness that you taste is probably, as you think, from your post-boil hop additions, since both the bitterness and IBUs will increase with more and/or longer additions. It is easier to compare two beers in terms of relative bitterness than it is to estimate the bitterness level without any reference point. To calibrate your perceptions of bitterness with IBUs, I recommend sending off your own beers to be tested. That way, the IBU values you learn from are independent of any formula or commercial beer (where the IBU printed on the label might have been from a much fresher sample).

"I use and recommend Oregon BrewLab for IBUs and other measurements. OBL charges $20 for IBU analysis: https://oregonbrewlab.com/

"I've also used AAR Lab, but not for IBUs. I'll still recommend them. They're located in Michigan. They charge $20 for standard turnaround or more for expedited analysis (in my opinion standard turnaround would be fine): https://www.aarlab.com/

"White Labs in California charges $41: https://www.whitelabs.com/lab-services-product-detail?id=66&type=PRODUCT

"I just found QC2, which is in Maine. They charge $35: https://qc2.beer/products/ibu?variant=40355330130100

"There are places outside the U.S. that I'm not as familiar with."

WRITE TO *BYO*

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

BEGINNER'S BLOCK

BY DAVE GREEN

THE BASICS OF SOUR BEER

I penned a story for *Brew Your Own* that ran in the October 2008 issue titled "Sour Mashing Techniques." Reading it brings a chuckle to me as I recall some of the beers I brewed using sour mashing. From a Guinness Extra Stout clone that turned out really good to a funky Kentucky common, that was borderline drinkable. It's amazing how far the brewing community has come in terms of sour beer production in that time. Kettle souring has probably been the biggest change, but the more recent focus on acid-producing yeast strains has been exciting in its potential. It's been a boon for fans of sour beer and I'm sure we'll see continued development in this arena.

THE MANY WAYS TO SOUR

I divide the methods to produce sour beers into five main categories: Traditional souring, direct acid additions, sour mashing, kettle souring, and utilizing acid-producing yeast. I'll give a brief introduction to each as well as pros and cons.

Traditional souring requires the most patience and can also be by far the most rewarding . . . think lambics, gueuze, and Flanders red. If you can get your hands on a neutral oak barrel, traditional sour beer production should be your goal (in my humble opinion, of course). This technique employs souring organisms such as *Lactobacillus* and *Pediococcus*, introduced sometime early in the fermentation cycle, to bring the tartness. Over time these critters, along with other microorganisms, will introduce acids and many flavor-active compounds that can either bring great complexity to the beer . . . or bring it to ruin. Diligence is required to make sure bacteria like *Acetobacter* doesn't turn your beer into malt vinegar. For more on these styles and techniques, visit https://byo.com/article/return-of-a-classic-sour-ale/

Direct acid additions are good for a mildly sour beer. Adding lactic or phosphoric acid to the beer or acidulated malts to your grain bill will drop the pH and may be all that is needed for a beer like a Gose. But you would not want to produce a beer like a lambic by simply adding some acid.

Sour mashing is now an all-but-defunct technique of crafting sour beers but a well-known practice in whiskey production. The basics are that you perform a normal mash, then cool down to around 110 °F (43 °C) and add some fresh grain to provide souring organisms that are naturally found on the husks. Over the course of several days the wort sours with the grains. One of the biggest problems with this technique is that clean-souring bacteria aren't the only microorganisms found on grains. Brewers can help out by a direct acid addition after cooling to give the beneficial souring organisms a head start. Usually I like to acidify to about a pH of 4.5, but I know some brewers go a bit lower.

What I found is that there is a time and place for sour mashing since it does add some complexity and character to the final beer, more than kettle sours. Using a small percentage of the total mash in a sour mash, starting a few days prior to brew day, and performing it in a highly controlled environment like an Erlenmeyer flask, provides the most likely scenario for success. If interested on reading more, visit https://byo.com/article/sour-mashing/

Kettle souring is fairly similar to sour mashing, the biggest difference being that brewers are separating the wort from the grains, and usually boiling, prior to inoculating with the souring organisms. This allows for a clean souring process. After separating the wort from the grain, often an acid such as phosphoric or lactic is added to drop pH levels just like in sour mashing. This discourages many potential spoilage bacteria from gaining a foothold. A pure culture of *Lactobacillus* is often then inoculated in the wort and held at a recommended temperature for one to two days. After the incubation period the wort is typically brought to a boil to kill the bacteria and a bit of hops is often added. Next a brewer's yeast is pitched. Unfortunately, this pasteurization process will drive off many volatile compounds created during the souring process that would have positively impacted the beer.

Please note that kettle souring should not be performed in an aluminum pot. Stainless steel and glass are the best for this purpose. For more on this, including a DIY kettle-souring fermenter, check out https://byo.com/article/the-lacto-lounge/

Acid-producing yeast strains are a fairly new focus in the beer world. There are now several strains available to brewers that can be a natural, hybridized, or bioengineered strain that produces acid as a fermentation by-product. Some strains, most notably the natural ones, should be sequentially inoculated with brewer's yeast . . . in other words, add the acid-producing yeast first, then a few days later add a brewer's yeast. One of the major advantages of this form of acid production is that brewers are not boiling the beer after acid production and therefore not losing aromatics that could positively contribute to the final beer. For more on these strains, visit https://byo.com/article/alternative-souring-methods-acid-producing-yeast-strains/

Once the beer has been properly soured then the fun can really begin. Fruit and spice additions are not only traditional but have gained steam in terms of popularity in recent years. Where you go is up to you.

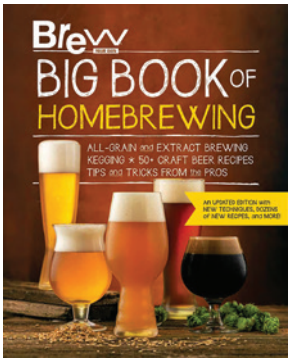
ACIDULATED MALTS

Acidulated malt was originally created for German brewers who were looking for ways to naturally acidify their mash but without breaking Reinheitsgebot laws. This class of malts is known as sauermalz or simply acid malt and is an easy addition for brewers looking to drop the pH of their mash. Generally they are produced by spraying or soaking the post-germination malt with a soured wort providing it with lactic acid.

How much to add can be highly dependent upon the water chemistry of your brewing water, most notably your carbonate levels, and the grain bill. But generally brewers will add between 1–10% of acidulated malt into their grain bill and it's especially useful when brewing many paler beers like Pilsners or pale ales. According to the maltster Weyermann, a 1% addition of their acidulated malt drops mash pH by 0.1. Our own rough estimate, is that 4 oz. (113 g) of acidulated malt is equivalent to using ½ tsp. of 88% lactic acid in your mash.

Brewers don't want to add too much or the drop in pH will negatively impact the enzymes found in the mash. Also, it is very rare to see its use when brewing any darker style of beer since roasted and crystal grains have a lower pH compared to base grains. A good brewing water calculator will help guide you as to when and if acidulated malts could be useful.

WHAT'S NEW



THE BIG BOOK OF HOMEBREWING

This updated version of the *Big Book of Homebrewing* comes with over 50 craft beer clone recipes and expanded sections on hopping techniques, brew-in-a-bag, as well as kettle souring. Half of the recipes found in this edition were not in the original *Big Book*, including recipes covering hazy IPAs, pastry stout, and sours and from breweries like Bierstadt, Trillium, Bell's, and Allagash. https://byo.com/product/brew-your-own-big-book-of-homebrewing/

BLICHMANN ENGINEERING'S AROMANATOR™

Looking for a way to add your hops to your fermenter without adding unwanted oxygen? If you have a conical, The Aromanator™ could be your solution. Use this accessory to dry hop through any 1.5-in. tri-clamp port. It comes with a keg post to purge oxygen from the vessel and a 2-in. butterfly valve to seal your wort before hop addition. It can fit upwards of 9 oz. (250 g) of hops at a time. https://www.blichmannengineering.com/aromanator.html

KETTLE REDI®

BarthHaas announced the release of their newest product, Kettle Redi®. This product provides light stability, smooth bittering, and hop aroma characteristics to beer while offering microbiological protection during the brewing process. It is a 100% hop-derived product with no special dosing requirements. The absence of vegetative matter reduces wort losses and increases brewing yields. In addition, due to its standardized high-alpha-acid concentration in a light-stable molecule, Kettle Redi® gives the light stability and bitterness characteristics desired for all traditional beers. https://www.barthhaas.com/en/product/kettle-redir

Photo courtesy of Shutterstock.com

LAGERS IMPROVE MEN'S GUT MICROBIOTA

A recently released study showed that consuming one beer with dinner improved participants' intestinal chemistry and biology. Participants were allowed to choose either one non-alcoholic or regular lager with dinner for four weeks. Scientists found improvements with both groups. What they uncovered was a more diverse set of microbiota in the men's gut as well as increased levels of a key enzyme found in there. People with improved intestinal bacteria have been shown to have lower risks of many chronic diseases like heart disease and diabetes. https://pubs.acs.org/doi/10.1021/acs.jafc.2c00587

Upcoming Events

NEW ENGLAND HOMEBREWERS JAMBOREE

September 9 & 10, 2022

Celebrating its 25th year, the New England Homebrewers Jamboree returns to the Tamworth Camping Area in Tamworth, New Hampshire. Attendees can camp both nights, one night, or just obtain day passes. http://www.homebrewersjamboree.com/

BREWSTOCK HOMEBREW FEST

September 17, 2022

The inaugural event will take place at the Deutsches Haus on Bayou St John in New Orleans, Louisiana, from 11 a.m.–7 p.m. Registration is free and three guests are allowed for homebrewers that bring at least 5 gal. (19 L) of beer. Otherwise, tickets are $50 and there is unlimited sampling of homebrew for attendees. https://brewstock.com/festival/

BYO REPLICATOR

BY DAVE CLARK

DEAR REPLICATOR, While visiting Atlanta, I had the pleasure of enjoying a delicious, true-to-style London porter from New Realm Brewing Company. I'd like to replicate this beer at home. Can you help me figure out how to do this? Cheers!

Mike Ott
Palm Harbor, Florida

The seed was planted for a "new realm" in the beer world in 2015 when businessmen Carey Falcone and Bob Powers were putting together a business plan to create a state-of-the-art new brewery in the beer-friendly destination town of Asheville, North Carolina. Falcone and Powers were scouring the region for the right location — and the right brewmaster — searching at length for the perfect spot. A resident of Atlanta, Georgia, Falcone stumbled upon the ideal brewery location, located not in Asheville but right in his hometown. The partners pivoted, and the brewery-to-be had a new home in the "Peach State." Now, all they needed was a notable brewmaster willing to call Atlanta home.

Enter Mitch Steele; a person who was happy with the California lifestyle and with his position of Brewmaster of the renowned Stone Brewing Co. based in Escondido, California. Having spent a decade there and another previously at Anheuser-Busch, Steele was open to the idea of creating a brewing concept of his own. As Falcone and Powers pushed, full creative control and brewery equity was too hard for Steele to ignore. Falcone and Powers flew Steele out to check out the property they were considering. After sharing each others' vision for what this new brewing concept might look like, excitement built and New Realm was born.

ENTER NEW REALM

The brewery came together purposefully and brewing commenced in late 2017. New Realm Brewing officially opened its doors in January 2018. It didn't take long to catch on.

"About 8 months into our stint in Atlanta, we realized we were going to be out of capacity before too long," said Steele. "We need to start thinking about a production brewery."

When those discussions began, Green Flash Brewing Co.'s Virginia Beach, Virginia brewery went into foreclosure and the fledgling brewery's brain trust bid on the property and won. New Realm had a new production brewery. With the larger size and scale, it didn't take long for Virginia Beach to become the company's biggest market.

Much of the production brewing moved to Virginia while Atlanta became the center for innovation. The Atlanta brewery now brews all the one-off beers and brewpub exclusives (along with some core beers) while the Virginia Beach location handles the majority of the large-scale brewing for distribution.

The amazing part of the story is that Steele accomplished all of this as a commuter until May 2019, flying cross country regularly for three years until moving he and his family to Atlanta, where he oversees the entire brewing operation, while also heading the innovation brewery.

The organization grew in 2021 by acquiring an out of business distillery/restaurant in Savannah, Georgia. Shortly thereafter, the company took over the lease of a seven-barrel brewpub in Charleston, South Carolina. A fifth location, in Greenville, South Carolina is slated to open December 2022, on Main Street, across the street from a minor league baseball field.

In a few short years, the brewery began to amass some prestigious wins in competition, including awards for its Euphonia Pilsner, El Juicy Cabre, Maibock, and a beer called Southern Tee, a kettle-soured ale made with lemon juice and tea; an alcoholic "Arnold Palmer," so to speak. While not yet entered in competition, the English Porter has become a brewpub favorite, as well as a favorite of the brew team.

ENGLISH PORTER

While with Stone, Steele traveled frequently to England. During his travels he got well acquainted with the fine beer found in the famed Fuller's pubs around the country. A favorite was Fuller's London Porter, a classic, highly drinkable brown porter rich in flavor. Steele and his brew team created their interpretation of this classic porter, which quickly became a fan favorite.

Using 100% British ingredients, English Porter features a base of Maris Otter malt, with additions of chocolate malt, medium crystal (50L), and the signature malt for the beer: Simpsons Brown Malt.

"Simpsons is my maltster of choice when it comes to British malts. I have a personal relationship with the Simpsons," said Steele. "The flavor profile produced from Simpsons Brown Malt is key to producing a great English Porter in my opinion."

East Kent Golding hops and British ale yeast (SafAle S-04 dry yeast is his preference) round out the recipe.

"As a brewpub exclusive, we don't brew enough to bring in liquid cultures and repitch them, so we started working with dry yeasts," said Steele. This particular yeast works really well, has a great ester profile, attenuates fairly well, and settles out nicely."

This 6% ABV, 34 IBU brown porter is cooled to 68 °F (20 °C) for pitching, then allowed to free rise to 72 °F (22 °C) to produce a proper ester profile. For New Realm, the process takes 19 days from brew day to keg day, but a homebrewer can brew their own with a similar result in about two weeks.

NEW REALM BREWING COMPANY'S ENGLISH PORTER CLONE

(5 gallons/19 L, all-grain)
OG = 1.060 FG = 1.015
SRM = 35 IBU = 41 ABV = 6%

A deeper-colored London porter made from all English ingredients based in the tradition of the great English classics. Simpsons is New Realm's preferred maltster, if available.

INGREDIENTS

10 lbs. (4.5 kg) Maris Otter pale ale malt
1 lb. (454 g) brown or coffee malt (190 °L)
0.75 lb. (340 g) medium crystal malt (55 °L)
0.5 lb. (227 g) chocolate malt (450 °L)
7.1 AAU East Kent Goldings hops (60 min.) (1.5 oz./43 g at 4.75% alpha acids)
14.25 AAU East Kent Goldings (0 min.) (3 oz./85 g at 4.75% alpha acids)
SafAle S-04, White Labs WLP007 (Dry English Ale), Wyeast 1098 (British Ale), or equivalent yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Mash in with 3.4 gallons (13 L) of water. With the goal of creating a dextrinous wort, achieve a mash temperature of 155 °F (68 °C) and hold for 45 minutes or until converted. If brewing with reverse osmosis or other pure water, be sure to add the salts as indicated in the "Tips for Success" section at the end of this recipe. Upon completion of the mash, raise temperature to 168 °F (76 °C) for mash out, recirculate, and prepare for sparge.

With sparge water at 170 °F (77 °C) and as close to 5.2 pH as possible, collect about 6 gallons (23 L) of wort, adding hops at beginning of boil and at the end of boil. If you choose to add a clarifier such as Irish moss or Whirlfloc, do so with 10 minutes left in the boil. At completion of boil, begin whirlpool then add final hops. Let sit for about 20 minutes.

Upon completion of whirlpool, chill as quickly as possible to 68 °F (20 °C), pitch yeast, and aerate if using a liquid yeast strain. Allow the beer to free rise to 72 °F (22 °C) but no higher. Fermentation should be fully complete in two weeks. If you want to achieve further clarity, chill before kegging or bottling. Carbonate to 2.65 v/v or bottle condition.

NEW REALM BREWING COMPANY'S ENGLISH PORTER CLONE

(5 gallons/19 L, partial mash)
OG = 1.060 FG = 1.015
SRM = 35 IBU = 41 ABV = 6%

INGREDIENTS

6.6 lbs. (3 kg) Muntons Maris Otter liquid malt extract
1 lb. (454 g) Maris Otter pale ale malt
1 lb. (454 g) brown or coffee malt (190 °L)
0.75 lb. (340 g) medium crystal malt (55 °L)
0.5 lb. (227 g) chocolate malt (450 °L)
7.1 AAU East Kent Goldings hops (60 min.) (1.5 oz./43 g at 4.75% alpha acids)
14.25 AAU East Kent Goldings (0 min.) (3 oz./85 g at 4.75% alpha acids)
SafAle S-04, White Labs WLP007 (Dry English Ale), Wyeast 1098 (British Ale), or equivalent yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Using a muslin bag for easy removal of the grain, mash your pale ale and brown malts for 30 minutes in 3 gal. (11.4 L) of water at about 155 °F (68 °C). The goal is to break down any residual starch in the brown malt. Add the chocolate and crystal malts and allow to steep another 15 minutes.

When the mash is complete, remove the bag(s), draining the liquid without squeezing the bags. Raise temperature to near boiling and slowly stir in half of the malt extract. Return to the heat source and raise to boil. Boil for 60 minutes, adding bittering hops at the beginning, Whirlfloc/Irish moss (if desired) at 10 minutes remaining, and the rest of the extract with 5 minutes remaining. At completion of boil, whirlpool, adding final hops. Let sit for about 20 minutes.

Meanwhile, boil and chill about 2.5 gallons (9.5 L) of water so you can "top up" your fermenter later.

Upon completion of whirlpool, chill wort quickly to 68 °F (20 °C). Add pre-boiled and chilled water to top up to 5 gallons (19 L). (Ideally, your chilled water is also 68 °F/20 °C.) Pitch yeast and aerate if using a liquid yeast strain. Allow the beer to free rise to 72 °F (22.2 °C) but no higher. Fermentation should be fully complete in two weeks. If you want to achieve further clarity, chill before kegging or bottling. Carbonate to 2.65 v/v or bottle condition.

TIPS FOR SUCCESS:

For all-grain brewers wanting the most authentic replication as possible, it's important to mirror the water profile of the traditional London porters. This can be accomplished with the additions of ½ tsp. each of $CaSO_4$ and $CaCl_2$, a ¼ tsp. of $MgSO_4$, and just under 1 tsp. of $CaCO_3$ in the mash, with the same additions, minus the $CaCO_3$, in the kettle at start of boil.

Additionally, according to Steele, using Simpsons brand brown and chocolate malt is the preferred choice as this particular brand of malt delivers a unique flavor profile that is absolutely perfect for this beer style. BYO

BY DAWSON RASPUZZI

EXPLORING HARD CIDER VARIATIONS

Fruited, spiced, & hopped cider

After you've made a couple batches of hard cider it is fun to branch out to some more unique styles. In this column, we ask for advice from three cidermakers to make fruited (Incline Cider), spiced (Meriwether Cider), and hopped (Jason Phelps) hard cider.

I'd recommend homebrewers try co-fermenting as well as adding fruit post-fermentation. Experience the differences of working with the same fruit in different ways.

Jordan Zehner is a Co-Founder of Incline Cider Company in Tacoma, Washington. Since 2015, operating an independently owned, family-run cider company requires and allows Jordan to be a part of just about all business operations from product development, to marketing and design, to accounting. He focuses on creating unique yet approachable hard ciders.

For our fruited ciders we primarily use fruit juice as purees can be a bit harder to work with, needing some more attention on the filtration. For the majority of these ciders we add the fruit additions post-fermentation. I think the advantages of adding post-fermentation are the consistency it lends us for the end product and the ability to replicate a recipe. Co-fermenting apples with other fruits is a lot of fun — it is an additional world that is worth exploring, but, it also brings several new variables into the mix.

The ratio of apple-to-fruit depends on the end result you are looking for. Do you want to really sweeten something up or just add a touch of fruit flavor? Do you want to obtain color from your fruit addition? For most single-strength juices I'd say 5:1 apple-to-fruit is an easy place to start. Some juices will take a lot to shine through the cider and others just a touch. Just experiment and have fun with it.

We generally utilize a similar blend of apples to make most of our base ciders and do not tweak that apple mix to account for later fruit additions. This is part of keeping things consistent and of high quality for us. When sourcing apples I would suggest seeking out a place near you that offers fresh-pressed juice instead of getting too hung up on the variety. There is an enormous world of apples to explore but that would be my recommendation for a good jumping off place — something you can replicate and hopefully have some continued access to. I started making cider in Arizona and at the time finding fresh-pressed juice was gold — there was not easy, local access to any specific apple varieties.

We have a house yeast for most all of our ciders (including these fruited ciders) that we find accentuates our apple mix. However, for some smaller projects I enjoy experimenting with different yeast strains from the beer and wine worlds.

As homebrewers and cidermakers know, it is all about experimenting and finding out what works for your style. There is no right or wrong way to make a fruit cider. If I had the flexibility of a homebrewer making small batches I'd probably spend a little more time playing with co-fermentations and making some sour ciders with fruit additions. I'd recommend homebrewers try co-fermenting as well as adding fruit post-fermentation. Experience the differences of working with the same fruit in different ways. If you can get to a point where you are making a consistent apple cider, playing with different juice or puree post-fermentation additions are a great way to build out some recipes.

Working on a homebrew scale really provides an opportunity to source high-quality, single-strength juices without breaking the bank at most mainstream grocers. Aim for juices without additives or funky extras, as generally the shorter the ingredients list, the better. When you only need a gallon or so (4 L), even utilizing whole fruits and juicing them yourself with a hand press, blender, or juicer is a great option. If you can't find watermelon juice, just make your own!

Gig Leadbetter is an Owner and the Head Cidermaker for Meriwether Cider in Boise, Idaho, a family-run business that opened in 2015. Prior to that he was a wildland firefighter in Alaska and then a college professor for over two decades.

We make a lot of ciders with different spices and herbs in them. To get the most flavor out of the spices, 99% of the time we add them post-fermentation, however the approach varies depending on the specific spice. We use tinctures when the zest of a citrus fruit is used or when a dried herb/botanical is used in the flavoring. For fresh spices like hops, basil, etc. we dry hop where we let the spice sit in the cider in a mesh bag until the right flavor is obtained (let your palate be your guide).

These styles of cider can be dry or sweet. Personally, I'm more of a dry cider guy and love our hopped cider, which I think needs to be dry because it allows you the delight of hop flavor and aroma without the bitterness. Also that slight sweetness in the hops balances well with the dry cider. If I were to choose a sweeter cider it would be our grapefruit rosemary cider. The tartness and bitterness of the grapefruit zest tincture and juice is balanced by backsweetening with apple juice.

We don't do anything different with apple or yeast selection for these spiced ciders. We generally stick with a five-apple blend making sure the Granny Smith with its tartness dominates. This blend has worked very well for us but on occasion we use crabapple and foraged apple blends for experimentation. We've also tried small batches of New Town Pippins and Granny Smith as single varietals and it has worked well for us. Our house yeast is made for Champagne and/or white wine and is what we use in 95% of our ciders and then backsweeten post-fermentation. However, we have 5-gallon (19-L) carboys everywhere experimenting with new yeasts and apple juice combinations.

For homebrewers, my advice is if you're collecting apples around your neighborhood to crush and press, make sure you have a combination of apples that have tannins, tartness, and sweetness. Post-fermentation, make both orange and lemon zest tinctures (zest of a lemon and orange, add ~6 oz./177 mL of vodka to each, shake, and let sit for a day or five), filter the zests out, add enough sweet apple juice to balance and add each tincture slowly until it pleases your palate. It'll make a great summer cider!

Jason Phelps is a former professional cider and meadmaker at Ancient Fire Mead & Cider. He has been fermenting beverages of all kinds at home for the past two decades, including one of his favorites — hopped ciders.

For dry-hopped cider I generally add 0.25–0.5 oz. of hops per gallon of finished cider (2–4 g/L). I'll typically leave those in contact for three days, and if I want more hop character I'll dry hop a second time after removing the first addition. Any longer and I begin to pick up a grassy, herbal character and a building astringency. With the lighter profile, cider doesn't hide those characteristics the way beer can.

The hop character in ciders does fade like it does for beer, and while you can try to pack a lot into a hopped cider up front hoping to extend its life, the overwhelming character early on might not lead to a pleasant drink. A little bit of that early "green" burn that some really fresh IPAs are known for is OK, but you want to be able to drink a whole pint. Balancing this with drinking your hopped ciders early is the route to optimal success.

I have found that many hops have far too much character and can easily overpower a cider. One of my all-time favorites is Nelson Sauvin, which includes descriptors of white wine grapes, gooseberry, and passion fruit. These are all great matches for apple and the lightly floral aromas from the cider. I have also tried a few dual-purpose and some European hops that might not be thought of as aromatic powerhouses, but have very complementary features. Hallertauers, including my own backyard grown ones, have been the most reliable hops for me to get a subtle, pleasant hopping without any concerns that I'll have gone too far in 2–3 days.

One area I experimented with commercially was the use of hot-fermenting kveik yeasts like Hornindal and Voss to ferment ciders. What I was looking for was how that aromatic profile is different in the outcome overall, but I also wondered if that could lead to hop pairings that did not work as well with ciders fermented with traditional wine or ale yeasts. We dry-hopped one of these ciders with Mosaic® hops, and the combination of the earthy, fruity cider with the big hop aromas was delicious.

HELP ME, MR. WIZARD

BY ASHTON LEWIS

LOW-ALCOHOL BEER PRODUCTION

Also: Gravity drops and the effects of a cold-water extraction

Q I HAVE BEEN SEEING MORE NON-ALCOHOL AND LOW-ALCOHOL BEERS ON THE SHELVES ALONG WITH A GREAT SELECTION OF THE STYLES BEING BREWED. HOW ARE BREWERS MAKING THESE BEERS AND ARE THERE ANY NEW METHODS HOMEBREWERS MAY WANT TO GIVE A TRY?

NICK ARNOLD
DRY CREEK, ARIZONA

Beer distillation is much more advanced these days and current hardware combines low-temperature, vacuum distillation with aroma recovery to produce some really nice tasting beers.

Photo courtesy of Fermentis

One technique that can be employed to produce low-alcohol beers is using a yeast strain that is incapable of fermenting maltose or maltotriose.

A Before jumping into a review of some of the methods used to produce no- and low-alcohol beers, so-called NABLABs where NABs (non-alcohol beers) contain less than 0.5% ABV and LABs (low-alcohol beers) contain greater than 0.5% ABV, I want to provide a sort of spoiler alert; there are not a bunch of great methods for homebrewing NABLABs. However, because of the creativity of homebrewers, folks will likely come up with some great ways in the near future by riffing on newer commercial techniques to fill this void.

ALCOHOL REMOVAL

One common strategy used for decades in the production of NABLABs is removing alcohol from relatively normal beers. Because some aromas are lost in the process and the flavor balance of the beer changes, beers intended for alcohol removal are brewed with the end-goal in mind, hence the "relatively normal" description. The two most common ways to remove alcohol from beer are vacuum distillation and reverse osmosis (RO).

Most beer drinkers who have consumed a variety of NABLABs have probably come across beers with a cooked or burnt flavor. The early distillation methods used to produce NABLABs worked for alcohol removal, but many of these systems were a bit rough around the edges and made for some interesting flavors. Beer distillation is much more advanced these days and current hardware combines low-temperature, vacuum distillation with aroma recovery to produce some really nice tasting beers.

These systems feature a tall column filled with a cleanable packing material, a beer inlet and outlet circuit, and a gas stripping circuit. In simple terms, beer is pumped into the top of the column and allowed to flow down through the packing while an inert stripping gas is introduced into the bottom of the column and removed from the top along with the alcohol. The beer temperature in these systems is about 110 °F (43 °C) at 100 mbar (10% of atmospheric pressure). If you have sampled a wide selection of NABLABs from the market, chances are high that you have tasted brews made using this method.

Many brewers know about reverse osmosis water treatment, where nearly pure water flows across a membrane, leaving a concentrated retentate stream on the supply-side of the membrane and allowing for the removal of this concentrated water stream in the reject stream. The same basic technology can be used to remove alcohol and water from beer to produce NABLABs. When RO is used to dealcoholize beer, water is added back to balance the water removed with alcohol.

ARRESTED FERMENTATION

Some brewers figured a great way to make NABLABs is to greatly minimize ethanol production using various arrested fermentation strategies. Some of these beers are taken through an alcohol removal process, but are different from the "brew normal beer and remove the alcohol" strategy because of the very low alcohol levels produced by the method. One drawback to arrested fermentation is a worty note often associated with these beers. In my opinion, that critique is not a show-stopper because today's beer consumer has developed a more diverse palate and beer produced from arrested fermentation could easily be spiffed up by adding acids and flavors to make for some interesting interpretations of trending beer styles.

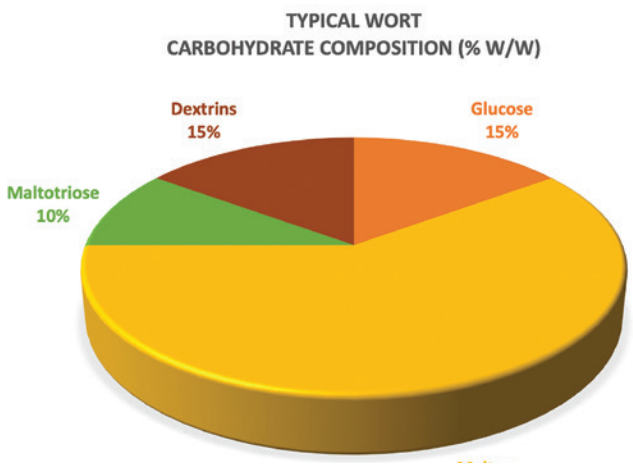
This is one method that could be performed at home because the principle is pretty simple; stop fermentation by rapidly chilling beer before much alcohol is produced, remove the yeast by centrifugation (not at home, of course) and/or filtration, and stabilize the product by pasteurization. The last step could be replaced by using a combination of sorbate and sulfite or the beer could be kept very cold in a keg and carefully monitored by frequent drinking to spot signs of any re-fermentation. If this method is used, do not attempt skipping the filtration step, keep all parts of the dispense system in the cooler, and DO NOT bottle these beers. A cobra-head faucet is the best choice here. And make sure the beer pH is below 4.6 to prevent the growth of *Clostridium botulinum* spores.

MALTOSE-NEGATIVE YEAST STRAINS

Some yeast strains are able to ferment glucose, but not maltose or maltotriose. These yeasts are known as maltose-negative strains and offer a relatively simple way of producing low-alcohol beers. Like beers produced using the arrested fermentation method, these brews contain fermentable sugars, and also are likely to require pH adjustment to bring beer pH below 4.6. The yeast companies selling maltose-negative yeast strains advise brewers to pasteurize these beers after packaging. Homebrewers are going to do what homebrewers do and give these strains a try by hitting up commercial brewers for yeast. Just keep your eyes open and DO NOT bottle beer containing fermentable sugars.

Let's take a break from the process and dig a bit deeper into the carbohydrate profile of wort. It goes without saying that there are multiple factors influencing carbohydrate profile, but we can look at values for typical wort produced without special malts or adjuncts using the standardized congress mash method. We can see from Figure 1 that typical wort contains about 15% glucose.

Figure 1



When maltose-negative yeast strains like *Saccharomyces cerevisiae* var. *chevalieri* are pitched into 12 °P (1.048 SG) wort, the maximum glucose they can consume is about 19 grams of glucose per liter of wort (1 liter x 0.12 kg extract/kg wort x 1.048 kg wort/liter x 0.15 kg glucose/kg wort x 1,000 grams/kg). When glucose is fermented, it is converted to ethanol (51% by weight) and carbon dioxide (49% by weight). In other words, maltose-negative yeast produce beer with about 1% ABV when the wort OG is 12 °P (1.048 SG). If the goal is beer with < 0.5% ABV, simply lowering the OG to 6 °P (1.036 SG) does the trick.

So, there you have it, Nick. Those are some of the most common methods to remove alcohol from beer. I am neither advocating nor opposing any of these methods for consideration at home. Just trying to answer your question in basic terms. But . . . if someone wants to play around with any of these commercial methods and report back about the results, we certainly would love to hear about the trials! And, for the record, be sure to measure the pH of any homebrewed NABLABs and adjust the pH below 4.6 if required. This is a critical pH in the world of food processing and distinguishes high-acid foods (pH<4.6) from low-acid food (pH>4.6). The other very important safety reminder is packaging; DO NOT bottle or can beers that contain fermentable sugars unless the beers are pasteurized in the package.

Q I'VE BEEN BREWING FOR 7 YEARS AND HAVE NOTICED A STRANGE TREND THAT NO ONE HAS BEEN ABLE TO EXPLAIN TO ME. I ALWAYS SEE A PRETTY SIGNIFICANT DROP IN GRAVITY BETWEEN ENDING MY BOIL AND TRANSFERRING THE COOLED BEER INTO THE PRIMARY. FOR INSTANCE IN THE LAST BEER I MADE, I CHECKED THE GRAVITY USING A REFRACTOMETER (SAMPLE COOLED TO APPROXIMATELY 70 °F/21 °C) ABOUT 5 MINUTES BEFORE FLAME OUT AND IT WAS 1.104 (MAKING A BIG BELGIAN STRONG). I COOLED WITH A COPPER COIL AND WHEN I SAMPLED THE BEER GOING INTO THE FERMENTER MY GRAVITY HAD DROPPED TO 1.088! THIS HAPPENS TO ME EVERY TIME. I TYPICALLY USE FINING AGENTS. DO I HAVE SUGARS DROPPING OUT DURING COLD BREAK?

MARK MATHEWS
LAPEER, MICHIGAN

HELP ME, MR. WIZARD

All I want to begin with a true confession about how I write this column. Using no special system, I select questions for discussion from those that are sent into *BYO*. The best questions are those with enough wiggle room to find some fun rabbit holes and angles. And most of the questions I select are answerable! I selected your question because it sparks my interest and have been sitting on this for a while hoping to come up with something really clever. But I haven't, and, in the process, I let your question get a bit long in the tooth before answering. Sorry for the delay! I will give you what I have.

For starters, I have never experienced gravity drops between kettle samples and fermenter samples. But have observed exactly the opposite, where the gravity goes up from kettle to fermenter, both in 5-gallon (19-L) and 500-gallon (19 hL) brew kettles. As crazy as it may sound, wort can stratify in brew kettles for a number of reasons, including how kettles are filled during wort collection, how solid and liquid sugars are sometimes added to the kettle towards the end of boiling, and how top-up water is sometimes added towards the end of the boil. All of these practices may result in heavier wort on the bottom of the kettle compared to the top of the kettle. Hmm, by simply writing this paragraph, I think I may have a plausible suggestion to explain why your observations are the opposite of mine. And without further ado, let's get into what may be happening.

Until about five minutes ago, the only explanation that made sense to me was a leak in your wort cooler that you never noticed. Most homebrewers don't run cooling water through an immersion chiller when not in use, making pinhole leaks difficult to spot. Another possibility is that you have a leaky connection on the water supply and are leaking water into the kettle from the connection. The latter is much less likely than the pinhole idea. Although this general idea may sound a bit farfetched, leaks in heat exchangers are a real concern for food and beverage producers because these tools can and do develop leaks. Flash pasteurizers used in the dairy industry are designed to ensure that pasteurized milk flows into the raw milk side of the heat regeneration section of the flash pasteurizer in the event of a leak. And differential pressure is monitored to make sure the raw pressure is never higher than the pasteurized pressure. My gut feeling, however, is that this is not your problem.

Your problem is probably related to your sampling method. Many brewers grab wort samples from the brew kettle using some sort of sampling device. Indeed, there are plenty of action shots of brewers grabbing wort samples from copper kettles with fancy looking tools because this part of the brewing process is important to all brewers. If wort gravity is not homogenous, this method usually pulls a lower gravity sample because the heavy stuff sinks. In your case, I am betting that you pull your sample from your kettle's outlet valve. And by doing so, your sample may be different than wort at the top of the kettle, thus explaining your issue. Next time you brew, drain some wort into a clean pot, pour the wort into the top of the kettle, and repeat a few times. If this solves your issue, let us know!

Q I'VE BEEN CONTEMPLATING BREWING A TABLE BEER AND WAS READING UP ON BYO.COM ABOUT IT. I WAS WONDERING IF AFTER A COLD-STEEP MASH CAN THOSE GRAINS BE MASHED AT TYPICAL SACCHARIFICATION REST FOR USE IN A SECOND BEER OR DOES THE COLD-STEEP ROB THE GRAIN'S ENZYMES? WOULD A DECOCTION MASH OF THOSE GRAINS BE USEFUL IF THE DIASTATIC POWER IS NOW LOWER?

ROYCE FAINA
PHILADELPHIA, PENNSYLVANIA

A Homebrewers are always pushing the envelope for cool ideas and this one is certainly doable. Let's start with a quick review of what happens in a cold mash. When milled grains, be they unmalted or malted, are mixed with ambient water, soluble carbohydrates, proteins, and enzymes are brought into solution. Although malt certificates of analyses (COAs) outside of the U.K. don't report cold water extract (CWE), this value is a handy index of modification. As malt modification increases, so does the solubility of extract in ambient water. The majority of CWE is carbohydrate, but soluble protein is also part of the equation.

In a typical hot mash, the extractables represented by CWE are almost immediately brought into solution, followed by gelatinized starch, then by fermentable sugars and dextrins that come from amylolytic activity during the mash. So-called cold mashes are relatively new to brewing and can be conducted over a range of temperatures and times. The commonality among these mashes is that very little amylase activity occurs; what is extracted is color and flavor, especially from specialty malts. Because CWE values from paler malts are typically around 20%, compared to about 80% for hot water extract (HWE) values, there is a lot of stuff remaining in malt following cold-steep extraction. Specialty malts have a wider range of CWE values, but the values are rarely reported because specialty malt COAs are usually limited to color, HWE, and moisture.

Assuming that the cold-steep method is being used to extract rich malt flavors to present a different flavor-profile in the finished beer, using hot sparge water or mashing the drained grains into a hot mash would defeat the purpose of the cold mash. One strategy to maximize the goods in the cold steep would be draining the wort for use in a cold-steeped beer, and then using the "spent grains" as a component for a second brew. Yes, enzymes are extracted in the cold-steep method, but if the spent grains are used as a component in the grist bill for a second brew you don't need to worry much about enzymes because more malt will be added. You could use infusion, step, or decoction mashing methods for the second brew, but if you are not using undermodified malt in the cold-steep mash, an infusion mash will work well for the majority of modern malts. BYO

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BY GORDON STRONG

VIENNA LAGER

Brew me, Amadeus

Although Mozart predates Vienna lager by about a half century, they both contribute to the imagery of elegance and culture of Vienna during the post-Renaissance times before the World Wars. Located in the eastern part of Austria on the Danube River near the border with the Czech Republic, Vienna is due east of Munich and southeast of Plzeň (Pilsen) – the three cities forming the golden triangle of lager development in central Europe in the mid-1800s. It was here that the quintessential amber lager was born.

As with many beer styles, it has had its ups and downs throughout its history. Once one of the major lager styles, it has all but died out in its homeland, or has changed into something nearly unrecognizable. Adapted to the new world by Austrian emigrants, it became popular in Mexico and the United States. While continuing to change in North America, it also regained traction as part of the general rediscovery of classic beer styles during the craft beer era.

Vienna lager is style 7A in the BJCP (Beer Judge Certification Program) Style Guidelines, and is in the Amber Bitter European Beer category along with altbier. This category is for balanced to bitter amber-colored German or Austrian beers and should not be taken to imply that the two styles are in any other way related. Vienna lager is a bottom-fermented, lagered beer with toasty malt flavor and clean hop bitterness in almost equal balance.

HISTORY

The origins of Vienna lager are fairly well-documented as styles go, although there seems to be a bit of speculation and inference involved. Anton Dreher was a Viennese brewer who studied with Gabriel Sedlmayr in Munich in the 1830s. They seem to have jointly discovered that yeast was the secret ingredient in monastic brewing at the time and began trying to use that in their beers. Sedlmayr at Spaten and Dreher at Schwechat introduced their amber lagers — Märzen and Vienna lager, respectively — in 1841. This is a year before golden lagers were first created in Pilsen.

In the early days, Sedlmayr focused on developing the Märzen and Oktoberfest process of brewing at the end of the season and lagering a beer over the summer to be served at a fall festival. This continued until the 1860s when refrigeration was introduced into the brewing process and the styles became practical to make year-round. Dreher began using refrigeration in 1868. Vienna lagers began to diverge from Märzen/Oktoberfest in that they became lower in gravity and were served as everyday beers, not higher-alcohol festival beers.

At the start of the 20th century, Vienna, Pilsner, and Munich beers were brewed on a regular basis, and with Dortmunder, were the most popular lager styles of the day. The effects of two World Wars did not help the beer. In 1948, de Clerck wrote that the beer was of inferior quality and had almost disappeared from the market. A far cry from the earlier "Viennese character" that was so praised for elegance and quality. Examples I remember trying in the 1990s, such as Gösser Dark, seemed excessively sweet and caramelly. Michael Jackson wrote in 1997 that when he first described the classic style in 1977, that Viennese brewers accused him of making up the style since it was so different from what they were then making.

While the style may be hard to find in Austria today, it did spawn a derivative in the neighboring Czech Republic – Czech amber lager. This version shows the Czech national character of brewing and is thus hoppier and often maltier. It has changed enough that it is a separate style, but it is a continental version that does show its roots.

Once one of the major lager styles, it has all but died out in its homeland, or has changed into something nearly unrecognizable.

VIENNA LAGER
BY THE NUMBERS

OG:	1.048–1.055
FG:	1.010–1.014
SRM:	9–15
IBU:	18–30
ABV:	4.7–5.5%

Photo courtesy of Shutterstock.com

The decline of the Austrian Empire caused some Viennese brewers to immigrate to the Americas in the late 19th and early 20th centuries. Santiago Graf was one of the first to arrive in Mexico, and began lager brewing in 1882 under the name Toluca y Mexico. Some brewers also settled in the U.S. Southwest. These brewers adapted their classic style to indigenous ingredients and helped introduce amber lagers to North America. Brewing was impacted by Prohibition in the U.S. and the Revolution in Mexico, which led to the rise of a pale, less flavorful style as the dominant lager.

The craft beer era helped reintroduce the style to American brewers and in other countries today inspired by craft. Michael Jackson's *World Guide to Beer* mentioned it in 1977 and sparked interest in the style in the 1980s. It fell somewhat out of favor in the 2000s as hoppy beers exploded, but saw an upswing in the late 2010s as specialty lager breweries became more popular.

Modern Mexican versions are likely somewhat lighter in body and palate than the originals, and many modern American amber lagers are surely inspired by these adaptations. Early attempts to categorize amber lagers often were hampered by trying to collect them all into one common style. Today, international amber lager better describes the lighter, less flavorful, or less bitter modern examples, while Vienna lager is reserved for the pre-World Wars style as rediscovered in the craft era.

SENSORY PROFILE

Vienna lager is a standard-strength, amber-colored, continental lager beer of around 5% ABV. It should not have an alcohol edge, or be as strong as a festbier or bockbier. The color can range from a light reddish-amber to a pale copper — basically, darker than gold and lighter than brown. Like most lagers, it should be bright and clear and have a large, persistent head — in this case, off-white in color. As an everyday beer, it should not be too heavy. A medium-light to medium body is appropriate, with moderate carbonation. As a lager, it should have a smooth mouthfeel.

The beer should have a nearly even balance between malt flavor and hop bitterness — neither should dominate.

VIENNA LAGER

(5 gallons/19 L, all-grain)
OG = 1.051 FG = 1.012
IBU = 19 SRM = 12
ABV = 5.2%

INGREDIENTS

3.5 lbs. (1.6 kg) Pilsner malt
4 lbs. (1.8 kg) Vienna malt
1.75 lbs. (794 g) dark Munich malt (9 °L)
1.5 lbs. (680 g) Caravienne malt (20 °L)
1 oz. (28 g) Carafa® Special III malt
5 AAU Styrian Golding hops (60 min.) (1 oz./28 g at 5% alpha acids)
1.5 AAU Saaz hops (10 min.) (0.5 oz./14 g at 3% alpha acids)
Wyeast 2124 (Bohemian Lager), White Labs WLP830 (German Lager), or SafLager W-34/70 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

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

This recipe uses a step mash. Use enough water to have a moderately thick mash (1.5 qts./lb. or 3.1 L/kg). Mash in the Pilsner, Vienna, and dark Munich malts at 131 °F (55 °C) and hold for 10 minutes. Raise the temperature to 146 °F (63 °C) and hold for 40 minutes. Raise the temperature to 158 °F (70 °C) and hold for 20 minutes.

Begin recirculating, add the Caravienne and Carafa® Special malts, raise the mash temperature to 169 °F (76 °C), and recirculate for 15 minutes.

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

Boil the wort for 90 minutes, adding hops at the times indicated in the recipe.

Chill the wort to 50 °F (10 °C), pitch the yeast, and ferment until complete. Rack to secondary and lager for 2 months at 32 °F (0 °C).

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

VIENNA LAGER

(5 gallons/19 L, extract with grains)
OG = 1.051 FG = 1.012
IBU = 19 SRM = 12
ABV = 5.2%

INGREDIENTS

3.3 lbs. (1.5 kg) light liquid malt extract
2.75 lbs. (1.25 kg) liquid Munich malt extract
1.5 lbs. (680 g) Caravienne malt (20 °L)
1 oz. (28 g) Carafa® Special III malt
5 AAU Styrian Golding hops (60 min.) (1 oz./28 g at 5% alpha acids)
1.5 AAU Saaz hops (10 min.) (0.5 oz./14 g 3% alpha acids)
Wyeast 2124 (Bohemian Lager), White Labs WLP830 (German Lager), or SafLager W-34/70 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

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

Turn off the heat. Add the Caravienne and Carafa® Special malts in a mesh bag and steep for 30 minutes. Remove and rinse grains gently.

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

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

Chill the wort to 50 °F (10 °C), pitch the yeast, and ferment until complete. Rack to secondary and lager for 2 months at 32 °F (0 °C).

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

TIPS FOR SUCCESS:

You really don't want any sharp edges, so resist the urge to make this style of beer too hoppy, bitter, or boozy. When it comes to fermentation, you don't want fruitiness or rough edges from a hasty fermentation and lagering. Slow and low is the goal to produce the elegance this beer deserves.

The malt is usually bready and toasty, but without sharp biscuity or heavily toasted flavors. It likewise should not display any roasted or burnt notes. Any caramel flavors are usually toffee-like and restrained. The beer should be malty but not sweet, and have a dry, well-attenuated finish. I think the best examples have a soft finish without any harsh or sharp bite. Bitterness levels are moderate, enough so that the finish does not seem sweet, but not enough that you think the aftertaste is hoppy.

Hop aroma and flavor are typically low and reflect the floral, spicy, or herbal noble-type hop varieties of continental Europe. The hop bitterness should be smooth, not harsh, and should complement the malt. The quality of the malt and hop flavors should seem high, with an elegant impression of the best flavors. No sharp edges, please. The fermentation should be clean, without esters and significant sulfur, and the beer should have a fresh character. Executed properly, this style is extremely drinkable.

BREWING INGREDIENTS AND METHODS

As a new brewer in the 1990s, I turned to the *Vienna, Märzen, Oktoberfest* style book by George and Laurie Fix for guidance. Unfortunately, their recipes were based on what ingredients were available in the early days of homebrewing, which weren't much. Fortunately, we (in the U.S., at least) now have access to a much broader selection that allows for more authentic flavors. The Fixes mention an elegant Viennese character to the beer, so high-quality ingredients are always most traditional.

Vienna malt (and Munich malt, in Munich) became the base for the new lager styles in the 1840s as the brewers sought to adapt what was making pale ale in the British Empire popular — lighter-colored, non-smoky, kilned malts. Vienna malt, a 2-row malt that falls between pale and Munich malt in terms of color, should make up a major portion of this style, although Pilsner and Munich malts are also common. I made a decocted version with 100% Vienna malt that approached a helles bock in flavor, so I tend to go for a varied malt grist to add a toastier flavor and to lighten the body.

Darker German Munich malts, in the 8–10 °L range, can be used to increase maltiness, but I would avoid malts that add a heavy toasted flavor, especially biscuity or nutty. Using some malts to increase the toffee or caramel flavors are OK, as long as they don't become sweet in the finish or dominant in the palate. The best examples show a rich, toasty maltiness with a slight caramel toffee flavor as an accent. Adaptations in the Americas might add adjuncts such as corn and dark malt for color, but these are not really authentic in the classic version.

Step-mashing to increase attenuation and lighten the body is preferred to a single infusion mash, which is not traditional. Decoction mashes can be employed, but I typically accomplish a similar effect by increasing the specialty malts a little bit. I find that step mashes give me the right combination of a malty palate and a dry finish that makes continental lagers so drinkable.

Noble-type hops are traditional in this central European style, and fit in with the elegant impression. Anton Dreher was said to prefer Saaz hops, and also Styrian Golding. I think Hallertauer or Tettnanger are also acceptable, as are modern substitutes. Freshness matters, so I would choose very fresh domestic hops over older, but more authentic imported ones. These types of lagers do not have a big late-hop character, so a moderate addition some time in the last 15 or 20 minutes should suffice, along with a single bittering addition.

Traditional German fermentation and lagering methods can be used. Select a clean German lager yeast that is a low sulfur producer, ferment around 50 °F (10 °C), and lager up to 8 weeks near 32 °F (0 °C). Avoid sulfates in the water. Carbonates are OK if used to balance the acidity in the malt, but I prefer to use relatively low-ion water.

HOMEBREW EXAMPLE

Use good-quality continental European malts for this recipe. I like using Best and Weyermann malts, but I'd be happy to use other German or Belgian maltsters. When I mention dark Munich malt, I really mean Weyermann Munich Type 2. Different maltsters can make this malt darker, so I'm talking about a malt of around 8–10 °L in color. I've seen North American malts twice as dark called "Dark Munich" but they have a completely different flavor profile, much too heavily toasted.

The caramel-type malt could be Caravienne, Cara 20, CaraRed®, CaraAmber®, or another European light-crystal malt of around 20–25 °L. The Carafa® malt is just for color and should not add flavor (I have found slightly darker examples often score better in competitions, as long as they don't have any roasted flavor). Notice that I add the crystal and dark malt during the vorlauf. These malts don't need to be mashed, so just make sure they are in the mash long enough to be thoroughly rinsed (30 minutes between the vorlauf and the sparge is fine).

I'm using a step infusion mash to help attenuate the beer a little more. A decoction mash could certainly be used, and would be appropriate. Just try to have the conversion temperatures at the same steps as in the infusion mash program. If you do select a decoction mash program, use either a single or double decoction, and eliminate the Carafa® Special malt from the recipe.

The hops are pretty straightforward for a continental lager. I'm going with the hops that were said to be Anton Dreher's favorites – Styrian Golding and Saaz. I think any noble-type hops could be substitutes for either bittering or flavor/aroma since this is not a heavily hopped style. I would just avoid any modern New World-type hops.

As an old school lager, an old school lager yeast is appropriate. The workhorse W34/70 yeast is great for malty styles without adding much additional flavor (or worse, sulfur). Wyeast 2124, White Labs WLP830, or the dry SafLager W-34/70 will all work. Ferment cool and lager it at least a month but preferably two. The water profile should be relatively neutral, again avoiding sulfur. If your water needs calcium, use calcium chloride to provide it.

Your goal here is a smooth, standard-strength malty beer with enough hop bitterness to match the malt. It should not be heavy on the palate or sweet in the finish, and if there is a light hop flavor, so much the better. Brewing this style properly can really be an exercise in restraint. BYO

Recovering from

BREW DAY MISHAPS

When to correct, recalculate, or bail on a batch

by Stephen Stanley

Someday, inevitably, something will go horribly wrong with your brew day. Not in the, "My burner set the house on fire" or "I have a kettle's worth of boiling sugar water flooding my floor" wrong. Although this sort of catastrophe can happen, your disaster is more likely to be something smaller. Think more, "Is my wort/beer ruined?" Some brew day errors can be fixed, some happy accidents result in new beer recipes, and some, well, some go down the drain.

This article will detail some of the problems that can arise during a brew day, some options to correct the problem, and whether the batch can be saved. However, before we get into the problems, let's rewind and discuss briefly what should have been done to prevent a problem in the first place. Each of the issues we will cover is preventable, and a few extra moments of planning and preparation is far easier than trying to fix a problem after it arises.

Photo by Charles A. Parker/Images Plus

The best way to avoid errors is to follow a consistent process. Until that process becomes second nature, use a checklist. If you are checking off each step as you do it, then you won't have to worry about these types of errors. That checklist should begin with things that must be looked at prior to the start of your brew day (ingredients on hand, propane tank full, available fermenter, etc.) and continue on through the brew day and end with cleanup. In addition to checklists; timers are your friend, preferably with loud alarms. Multiple kettle additions? Set a timer for each so you don't miss any! Need to get your sparge water to optimal temperature when the mash is over? Set an alarm for when you need to start heating it. Remember, prevention is always preferable to remediation.

Follow that previous advice, and the majority of mishaps that may come up during the brew day should be minimized. Still, issues may sometimes still arise, which is where the meat of this story takes hold.

Should something go wrong, it is helpful to have a "homebrew first aid kit" on hand. I list the contents of my first aid kit in the sidebar on this page. Next, let's review some potential brewing issues that may arise, ways they may be addressed, and impact it could have on the resulting beer.

YOUR BREW DAY FIRST AID KIT

Having the following items on hand can save a brew day:

1. Extra brewing liquor.
2. Dried or liquid malt extract, or other source of sugar.
3. Extra yeast, particularly a relatively neutral yeast strain. Dry yeast is ideal as it stores longer.
4. A supply of versatile, neutral bittering hops and perhaps a favorite flavor hop.
5. A supply of base malt such as brewer's malt, Pilsner, or pale ale.
6. Frozen water bottles, ice, or cold brewing liquor.
7. Basic tools such as a screwdriver, adjustable wrench, and rubber mallet.
8. Cleaning supplies, including a mop and a mop bucket.
9. Sanitizer concentrate or household bleach.
10. (If you use propane) an extra propane tank, a windbreak, or an alternate heat source.

YOU BOUGHT THE WRONG INGREDIENTS, OR THE HOMEBREW SHOP DIDN'T HAVE WHAT YOU NEEDED

Consider how much of a difference the ingredients you bought or that are available will make in your beer's outcome. If you bought American Pilsner malt instead of German, the difference will not affect your beer's drinkability. However, if you bought Munich malt instead of Pilsner and roll with the error, subbing Munich for Pilsner malt will significantly change your beer's color and flavor. Specialty malts, like roasted barley or chocolate malt, have even more of an impact on the beer's flavor. Your options, particularly if you crushed the malt at the store, are either brew the beer as-is, change course and brew a different beer that fits the ingredients you sourced, or replace the ingredients. If you kept the grains separate, you may be able to replace the incorrect malt with something closer that you have on hand or obtain the correct malts, keeping the incorrect ingredients for another brew. This is a good place to point out that, particularly if you brew regularly and have the space for it, having an inventory of different ingredients on hand, stored properly, is always a good idea.

YOU DID NOT COMPLETE SOME ASPECT OF BREW DAY PREPARATION

The severity of the problem depends on what you forgot to do. Forgetting to make a starter is one possibility. Key to solving it is to ensure you pitch enough yeast, either by delaying the brew day until you can make a starter or pitching multiple packages of yeast instead of a starter. If you use reverse osmosis (RO) water and didn't start collecting water early, it may take some time to collect the amount you need. You may consider diluting dechlorinated tap water with the RO water you have and recalculating the brewing salt additions. If you forgot to add salts or acids to your water, simply add them to the mash tun and stir. If you failed to calibrate an instrument such as a pH meter, calibrate it and repeat your measurement.

MASHING ERRORS

Most mash errors involve temperature or water volume. If your mash temperature is off, use your judgment: Will a degree or two of deviation from your planned mash temperature make a huge difference in your final beer? If you are trying to reproduce a beer for a competition, the small difference might be important. Before I could add heat directly to my mash, if my temperature was off by less than 2° F (1 °C), I didn't worry about it. Now, with a recirculating immersion mash system (RIMS), I get antsy over 0.5 °F (0.3 °C). Others don't sweat it if it is within 5 °F (2.5 °C) of your target. Everything is relative.

Focusing on the ratio of water-to-malt and the temperatures of these two components to avoid issues should be a part of your routine, and brewing software will get you the correct amounts. However, if you overlooked this step and have a mash that is too hot, then cooling your mash is easy. You can add cool water or ice (deduct the water from your sparge water to avoid producing too much wort or losing efficiency by leaving wort in the mash tun). Brewing software can calculate the amount of water needed at a given temperature to cool the mash, or you can guess how much water or ice to add, stir, then measure the mash temperature. An option that does not affect water volumes is to use frozen bottles of water to cool the mash. Throw them in and then take them out when you reach the temperature you desire.

Adding heat is more complex for

those using passive temperature systems such as a cooler converted to a mash-lauter tun. You may add hot water (deduct the amount from the sparge) or perform a single decoction by removing part of the mash, boiling it, and returning it to the mash tun. Your brewing software can calculate how much to decoct for a given temperature increase. A thin mash works fine for this purpose.

Incorrect measurement of water volumes can cause issues with mash thickness and temperature. Thickening a thin mash is generally unnecessary but an extremely thin mash may not convert well. Add hot or cold water if you need to adjust the mash temperature. Since incorrect water volume is a measurement error, you may not need to deduct the additional water from the sparge.

Many brewers predict and control mash pH to ensure repeatability, reliability, and good quality beer. Brewing software calculates the salt and acid additions for us based on our water report, water volume, and the grist information; and sometimes it goes wrong. Correction is relatively simple: If the pH is too high, add acid, if it is too low, add a base, if it's within +/- 0.1, smile and keep brewing. We can calculate the amount or we can add a milliliter or two of concentrated acid (or a gram or two of base), stir and re-measure the pH until close enough. Given the speed with which modern malts convert, guessing might be a better approach than the time it takes for calculation. Keep in mind that pH doesn't settle until late in the mash, so you may be chasing your tail if you try to correct it early in the mash. When mash pH is off, Denny Conn recommends recording it, continuing on the same path and making adjustments in the next brew day when corrections can more easily occur beforehand.

The worst error during mashing is a stuck mash. Highly adjunct-laden mashes can set up like a bowl of Cream of Wheat. Stuck mashes are best avoided by using rice hulls, a glucan rest, or beta glucanase. If your mash sticks, here are some things to try: Use a knife or the edge of a spoon to cut a crosshatch pattern in the surface of the grain bed. Backpressure from blowing into the run-off hose can sometimes free a mash. Heating the mash a few degrees may get things running, or stir the mash and vorlauf again. If you have rice hulls on hand, stir them into the mash to loosen it.

ERROR MADE MEASURING INGREDIENTS

Too little or too much water will lead to mash temperature errors, assuming the strike temperature is correct. If you incorrectly measured grain, the mash temperature could also be an indication, assuming you added the water at your intended strike temperature. Too much malt results in a higher original gravity (OG), too little, in a lower one. Correct high OG by diluting the wort with water, either in the mash tun, boil kettle, or even later. Sugars or dried malt extract (DME) can correct a low OG; if you have extract in your first aid kit then you can correct the problem during the boil. Remember to recalculate your hop additions if you change the boil gravity.

An error measuring specialty grains may not be recoverable. You will not get your intended results, which is not always a bad thing! Too much roasted grain makes your schwarzbier a porter, too much crystal results in a sweet, thick brew. You may like the results. One of the best American porters I've ever made was the result of over-sparging.

Errors measuring salts or acids may result in a mash that does not settle at the proper pH. If your measured pH is outside of your desired range, it can be adjusted using acids or bases. Specialty ingredients such as spices tend to be very strongly flavored so use caution when adjusting. Likewise, some sugars such as molasses have very strong flavors. Use discretion: You can always add sugars to the boil or the fermenter, bearing in mind the amount of extract in your wort will affect hop isomerization during the boil.

BOIL GRAVITY OR VOLUME IS NOT CORRECT

If you corrected water volumes or the amount of grain earlier in the process or your grain crush was too fine

Photo by Charles A. Parker/Images Plus

Decocting is an effective way to raise the mash temperature in a system in which heat cannot be applied. Remove part of the mash, bring that to a boil on the stove, and then return to the mash.

or coarse, your original gravity may be off, your wort volume may be off, or both. It is the brewer's decision if a correction is needed. If the volume is off but the gravity is correct, I would not adjust. Be sure to check the temperature of your sample, high temperature samples will give you a low gravity reading.

High gravity is adjusted by dilution with water or shortening the boil. Low gravity is adjusted by adding sugar or DME or extending the boil. Let gravity be your guide: Too little wort at the correct gravity is preferable to attempting to adjust both volume and gravity.

INSUFFICIENT HEAT TO BOIL THE WORT

Many brewers boil their wort using a high output propane burner and have few problems boiling wort, that is until they run out of propane in the middle of a brew. Or until the flame blows out in the middle of a boil. Having spare propane on hand and knowing how to use your boil-off rate to calculate the remaining boil time are the best ways to mitigate issues with empty propane tanks or strong gusts of wind. If your flame has gone out, you can calculate the time remaining if you know your boil-off rate. Turn the propane back on (or get another tank) and finish the boil as planned.

SCORCHING

If your propane burner runs hot you can scorch the wort on the bottom of the kettle. Likewise, if you boil a pot or kettle dry, the wort can scorch. Allowing a grain bag to contact the bottom of the kettle can also result in scorching (and burning a hole in the bag). Scorched wort generally does not make good beer, so it is a judgment call whether to ferment the wort or dump it. Cleaning a scorched vessel requires elbow grease and good cleaners. I've had good luck with Barkeeper's Friend, stainless steel scrubbies, and lots of hot water. A stainless-steel plate called a flame tamer may help if your burner runs hot.

ISSUES WITH HOPS

Forgetting a bittering charge is easy to fix if caught soon enough. Bring the wort volume back up to the starting point with water and restart the boil timer. Alternately, recalculate the amount of hops you need using the remaining boil time. If you do not have enough of the original bittering hop, calculate another addition of neutral hops from your first aid kit. The same logic may be used with flavor hop charges, just return the wort to the volume it should have been at the time of the addition and resume the boil. Use your brewing software to calculate the correct amounts for the modified hop charges.

A possible issue if you use leaf hops is clogging an intake or an outlet valve. Use backpressure to free the clog. Use a muslin grain bag, hop spider, or other screen to keep the hops from clogging things.

WORT VOLUME OR GRAVITY IS NOT AS PREDICTED

At the homebrew scale, many processes are not consistent. Boil-off rate is one. Altitude, humidity, and ambient temperature are some of the most common factors that can affect boil rate. I generally will not correct a volume error of less than a half-gallon (2 L) or a gravity error of +/- 2 points; your thresholds are your choice. If your gravity is too high, you can correct by adding water. If adding water, it should be dechlorinated then boiled, or the wort should remain above the pasteurization temperature, at minimum one minute above 160 °F (71 °C). If adding water to chilled wort, it should be dechlorinated, boiled, and cooled. If your gravity is too low, you may add sugar or malt extract to bring the gravity up, add directly if the wort is hot enough to pasteurize the addition, or make a syrup and boil it for a few minutes otherwise. If using a syrup, do not forget to add the volume of the water in the syrup to the volume of water in the wort calculation.

To determine how much water, sugar, malt extract, or other sources of extract you need to adjust your wort's gravity — brewing software makes this process relatively easy, but for old school brewers the math can be done by hand.

FINAL pH IS TOO LOW OR TOO HIGH

The wort going into the fermenter should have a pH of 5.0–5.2 according to this article: byo.com/article/the-principles-of-ph/. Adding Whirlfloc, a common kettle fining, raises pH due to the baking soda it contains. If your final pH is too high, add acid. I prefer lactic acid since it is a natural component in beer, you may choose a different acid. I've found that the wort seldom has low pH but if that is an issue, adding a base such as baking soda will bring the pH up. It's your call on pasteurization, both concentrated acids and bases are very hostile environments for microorganisms.

SANITATION ISSUES

Anything that touches wort once it has cooled below about 160 °F (71 °C) must be sanitized. Sanitization kills most of the microorganisms on a surface. For sanitization to work, the surface must be clean. You may not notice a speck of dried wort or a bit of film, the problem only becomes apparent after fermentation. If you forgot to sanitize something, after it has made contact with the wort, it is too late unless you can bring the wort back above 160 °F (71 °C). But an infection is not inevitable if you have kept everything squeaky clean. Time will tell if a sanitation issue turns the batch into a dumper as there is no fix once the wort begins to turn.

PITCH AND YEAST ISSUES

The worst possible pitch error is pitching into hot wort. If the wort is below 95 °F (35 °C), the yeast will likely survive but may produce excessive esters. If the wort was above the recommended temperature for a given strain, it is probably best to pitch new yeast after cooling. Yeast health is adversely affected by lack of oxygen if using a liquid yeast or a starter, but pure oxygen is toxic to yeast. If you have forgotten to aerate/oxygenate when using liquid yeast, you can aerate with a pump and an air stone, stir vigorously, or shake the fermenter to dissolve air into the wort. Dry yeast is packaged with the glycogen and sterols it needs for healthy fermenta-

tion, so oxygenation is generally not needed. If fermentation is not visible in a couple of days (for most strains) it won't hurt to pitch more yeast.

FERMENTATION ISSUES

Your fermentation temperature control may fail. If the beer gets too warm, you risk excessive fruity esters, too cold and you could freeze the beer, damaging yeast cells. In either case, if it happens, there's not much you can do other than adjust the temperature back to where it should be and let fermentation continue.

One particularly nasty fermentation issue is the dreaded clogged blowoff tube or airlock. The problem results in a rather nasty cleanup and loss of some beer. Whatever beer remains behind in the fermenter is likely still good. Avoid the issue by leaving adequate headspace in the fermenter or by using a blowoff tube during the most vigorous fermentation. When using a blowoff tube, suck-back of whatever fluid you use can be an issue when the wort must be cooled after the airlock or blowoff tube are affixed to the fermenter. To prevent suck-back, while the wort is cooling, crimp aluminum foil or use plastic wrap over the empty airlock or end of the blowoff tube then add liquid once the beer has cooled.

A stuck fermentation happens when the yeast stops fermenting before all fermentable sugars have been consumed. The first thing to determine is whether the fermentation is stuck. Check your final gravity against the predicted target. If the difference between measured and predicted final gravity is large enough, try swirling or stirring the wort to get the yeast back into suspension. You might try raising the temperature a few degrees. A fresh pitch of high-gravity yeast or actively fermenting wort can also bring the gravity down. But if the yeast is done, a point or two reduction of gravity is about all you can expect.

PACKAGING ISSUES

We usually either bottle or keg our beer. Bottling can introduce spoilage bacteria and oxygen, too much or too little priming sugar leads to over- or under-carbonation. If the bottles do not carbonate at all, either the yeast died, or you forgot priming sugar. Add measured amounts of pasteurized sugar syrup or granulated sugar to the bottles, recap, and see if anything happens. If not, add a few grains of dried yeast to each bottle. By this time, you may have introduced enough oxygen to spoil the beer, but you can find out what happened.

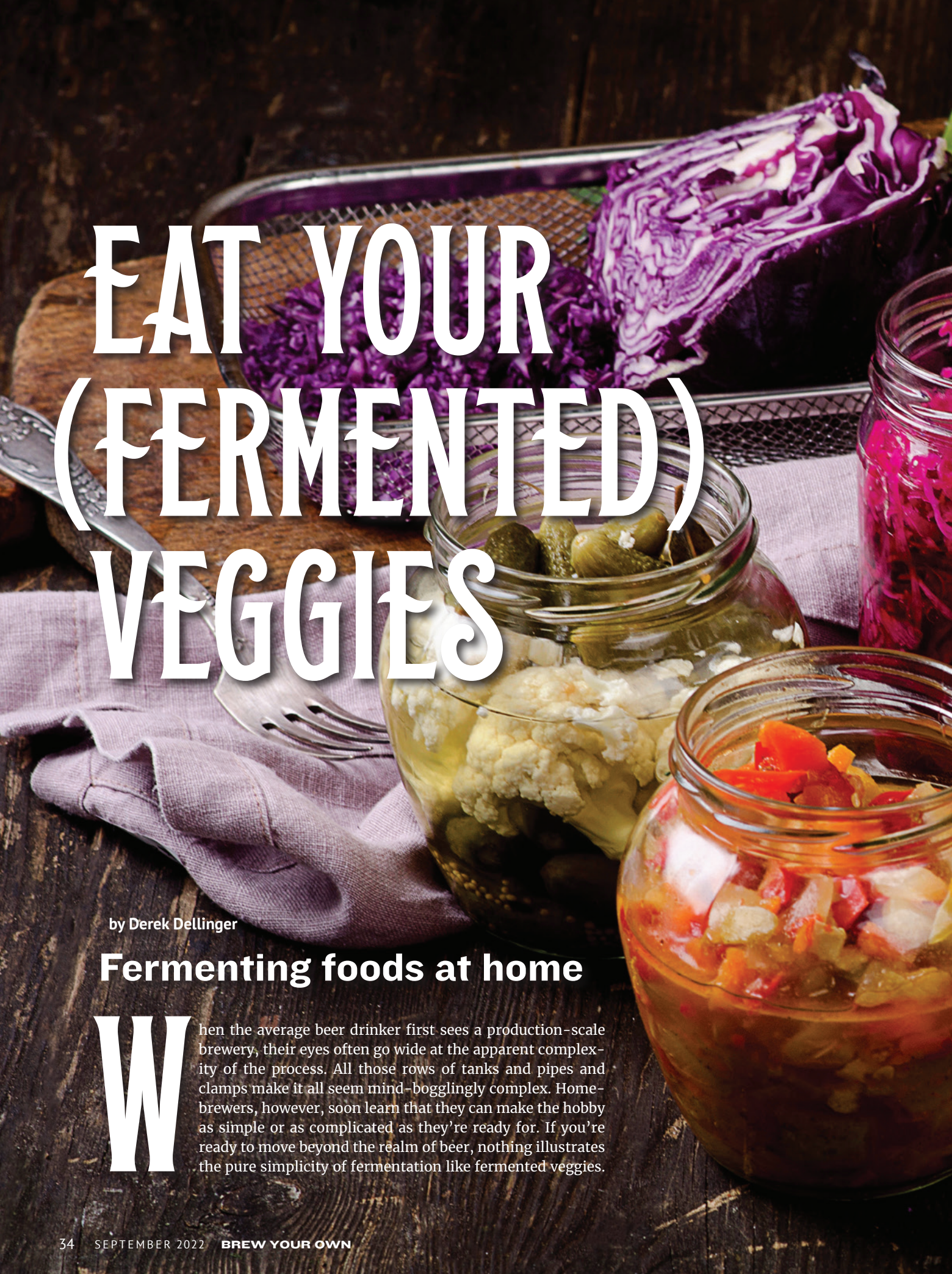
Extreme over-carbonation or infection can lead to bottle bombs and gushers. If you have gushers, chill the bottles as cold as possible and taste the beer. If there are no off-flavors, you can uncap the bottles, let them set for a while, then recap. How long is guesswork, there's no science to this. If you have off-flavors, you must decide if the beer is drinkable. If you keep it, chill the beer as cool as possible to retard further bacterial growth and control gushers. If not, chill the beer as cool as possible to reduce the chance of an exploding bottle, uncap carefully and drain. If you have had a bottle bomb in a batch, chill the remaining bottles as cold as possible, even freezing, then carefully uncap and dump the batch. Saving a beer is not worth an eye.

The most common kegging issues are over-carbonation or under-carbonation. To fix under-carbonation, turn up the gas pressure. To fix over-carbonation, shut off or disconnect the gas and burp the keg a few times. You can also spring a leak somewhere in the system and lose all your gas. Obtain or use a full bottle of CO_2 and reconnect everything. Use soapy water to find the leak and fix it to avoid repeating the problem.

CONCLUSION

Inevitably, if you brew long enough, you will have an opportunity to save a batch. Problems encountered after mashing tend to be less forgiving; however, a sanitation issue is not recoverable and a bottle bomb results in lost beer and potentially dangerous flying glass shards. But some of the errors on the hot side can be overcome. Corrections may result in a different beer than you had planned, and others may result in a drain pour. Using your homebrew first aid kit and brewing skills, document what went wrong and plan to avoid it and you can save most batches. And keep good notes, you may have stumbled upon your new favorite beer. BYO

If your fermentation ends prior to reaching the intended final gravity, you can try stirring to rouse the yeast, increasing the temperature slightly, or pitching fresh, high-gravity or actively fermenting yeast.



EAT YOUR (FERMENTED) VEGGIES

by Derek Dellinger

Fermenting foods at home

When the average beer drinker first sees a production-scale brewery, their eyes often go wide at the apparent complexity of the process. All those rows of tanks and pipes and clamps make it all seem mind-bogglingly complex. Homebrewers, however, soon learn that they can make the hobby as simple or as complicated as they're ready for. If you're ready to move beyond the realm of beer, nothing illustrates the pure simplicity of fermentation like fermented veggies.

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Photo by Derek Dellinger

With sauerkraut (a red cabbage version shown here) a brine addition isn't necessary as the cabbage releases so much water. But you need to get aggressive and pack it in tight with salt to release the water.

Fermenting veggies at home can be extremely simple — as simple as dropping some farm-fresh beets into a jar, pouring a little salt over them, and filling the jar with water. The microbes do all the work, and since veggie ferments utilize wild fermentation, the veggies themselves, plus some salt and a jar, are all you really need to get started.

Many of the instincts that homebrewers develop while making beer at home apply to fermented foods as well. When brewing beer, the greatest threats are usually oxygen and infections. A beer brewer's chief instinct, therefore, mainly revolves around keeping their beer protected from the open air as much as possible and practicing thorough sanitation. When making fermented foods, however, sanitation is actually less of a concern, since most veggie ferments utilize the microbes already present on their exterior. Vegetables, in other words, come with a built-in starter pitch, and since all veggie ferments employ commonly occurring bacteria in the first place, thoroughly sterilizing your jars isn't strictly necessary. Your fermentation vessel should be clean, of course, but the veggies themselves are already crawling with the right kinds of microbes. Once fermentation has commenced, lactic acid-producing bacteria quickly create an environment that is hostile to any unwanted competition. These bacteria produce both lactic acid and CO_2, and the resulting low-pH environment ensures that the veggies will remain stable, flavorful, and free of harmful microbes.

The real trick, for most veggie ferments, is making sure that all the bits and pieces stay submerged beneath that vital, protective layer of brine. While oxygen is not as big of a concern as when brewing beer (and in fact, is necessary for some types of fermentation, like kombucha and vinegar) a solid layer of liquid brine above your veggies prevents mold and aerobic spoilage bacteria from getting a foothold. Many people are suspicious regarding the safety concerns of preserved foods, worrying excessively that they might do something wrong and accidentally give themselves botulism. Yet dangers like botulism are primarily an issue with canned foods, and generally do not apply to fermented vegetables (unless those vegetables are themselves can-pasteurized at some stage). The high salinity, low-pH environment of fermentation deters the growth of harmful pathogens, while the sterilizing effects of canning paradoxically open the door to botulism. Botulism spores are incredibly hardy, and can thus sneak through the canning process and thereafter propagate in an environment where no other competition is left alive. Obviously, it is quite important to get things right. You don't want to blindly dig in to a botched jar of sauerkraut, even if the worst thing likely to happen is a bit of mold. As with beer, the "smell test" is often all that you need. Does the ferment look and smell fine? Is there anything noticeably horrid and rotten going on when you give it a whiff? If it doesn't pass the smell test, you shouldn't taste it either. Be on the lookout (or smellout, as it were) for anything with the odor of rot, which, fortunately, tends to be fairly obvious. When in doubt, throw it out! But if your sauerkraut smells like sauerkraut or your fermented hot sauce smells like tangy, funky hot sauce, chances are, everything is perfectly fine.

BASIC VEGETABLE FERMENTATION SETUP

Veggie fermentation can be carried out in a high-end Fido jar with a clampable lid, a standard glass jar with a modified screw-top lid and airlock system, or even just a basic Mason jar. While fancier setups with airlocks can be convenient for brewers who are likely to already have many of the pieces already on hand, fermented veggies are much more forgiving than beer. While as a brewer I had to learn to resist the impulse to open up my carboys and pull samples on a regular basis, opening up the container to check in on things is a fine habit to get into when it comes to fermented veggies. When you do, check to see if any veggies have floated up above the brine. If they have, simply use a clean fork or spoon to push them back under. In my opinion, this simple method of regular checkups and "nudges back under the brine" is the easiest, most reliable way to ensure a successful fermentation when on a budget. Airlocks and crocks are nice, but certainly not required.

Whatever container you use should, of course, be food-safe. Reusing a container like an old pickle or pasta sauce jar is a good place to start, and Mason jars are always an

excellent choice. Fermented foods are usually heavily salted, so the container must be non-reactive to both salt and acid. Glass and ceramics all fit these criteria, and are easy to clean as well. Avoid fermenting veggies in a metal container, which can corrode when exposed to high levels of acid and salt. For the same reason that brewers often use something like a blow-off tube to capture excess foam (and vent CO_2), placing your ferment in a tray or pan is usually a good idea. Depending what sort of vessel you decide to use, spillovers are common during the first week of fermentation and can create a mess that you might not even notice for several days.

As with homebrewing, there are many other additional small tools one can acquire to aid in their fermenting journey, but most are not strictly necessary. Measuring cups and spoons are helpful for measuring salt additions, though a gram scale can also be used. Chances are good, however, that you'll be able to carry out a few starter ferments using nothing more than what you already have around the house.

SALT, BRINE, AND STARTER CULTURE

Salt is a crucial ingredient in fermented veggies for its preservative powers, and a little bit also goes a long way to spice up the flavor of the ferment. With the addition of salt and proper management of the brine level, the beneficial microbes present on your veggies will have everything they need in order to beat back the competition and create a healthy, stable product. As mentioned before, the vegetables will need to be submerged below the level of the brine throughout fermentation in order to prevent mold from gaining a foothold — though in some cases, as with sauerkraut and kimchi, small air pockets may remain throughout your jar. (When properly packed down, these pockets will be doused with CO_2 once fermentation has begun). In most cases, therefore, the amount of brine needed is simply whatever amount is necessary to submerge the vegetables completely. The best fermentation results are achieved with a 2–2.5% salt brine, based on total weight. In other words, if the total weight of your veggies and liquid comes in at 1,000 g, you'll need to add 25 g salt for a proper ferment. For those without a gram scale, this works out, loosely, to about a teaspoon of salt per cup of water. Always use sea salt or pickling salt with no added chemicals. Table salt should not be used for fermentation because the iodine added to most table salts hinders bacterial growth and will not taste good.

Filtered water is essential. Many towns and cities add chloramines and fluoride for the specific purpose of inhibiting microbes. Significant levels of chlorine and fluoride will hinder fermentation from starting, as they can kill the fledgling communities of microbes resident on your veggies. Spring water from the store will work, but a water purifier with a fluoride filter means you'll have a regular, waste-free source of filtered water for drinking as well as for fermentation.

FERMENTATION

Fermented vegetables are far more forgiving when it comes to temperature than beer is, giving homebrewers a chance to relax even if your home sees regular temperature swings. The same basic principles apply here as apply to beer, however: At warmer temperatures, fermentation will proceed much quicker, and therefore may favor a funkier, more lactic profile. Colder temperatures make for a slower fermentation. If temperatures are too low (below 65 °F/18 °C) — *Lactobacillus* bacteria growth may occur more slowly, and other microbes are given an opportunity to make their presence known. Anecdotally, I have noticed that brine-based ferments like beet tonic are more susceptible to *Pediococcus* (leading to thick, snotty liquid — also a concern for wild beer brewers) below this temperature range. Fortunately, most households generally keep their thermostat set to a temperature that is fairly ideal for veggie fermentation. If you live in a region that sees extremely elevated summer temperatures and your home is not temperature maintained, you should still be able to manage by fermenting in a cool cupboard or basement, or by simply avoiding the hottest weeks of the year.

Fermented veggies don't mind a little bit of indirect sunlight, though direct sunlight can inhibit bacterial growth. Fermentation time will depend on a number of factors, including temperature, the quantity of salt, and the texture and density of the veggies themselves. Most ferments will do well with about two to three weeks of fermentation time, but this is only a general rule, and there are significant exceptions. Some ferments are not meant to go full-on funky, and really only need a few days of brining, while others enjoy aging and mellowing as long as any wine. A fermented hot sauce, for example, can safely condition for years. For most, you can simply go by taste. Try the veggies after a week and see if they've hit a level of flavor and acidity that is enjoyable to you. If you think they could use more time, give them another five to seven days and try them again. The finished product will keep for months in the fridge. For more tips on fermenting foods, plus examples, check out three unique recipes on pages 38–39.

Photo by Derek Dellinger

Placing your fermenting veggies in a pan or tray is a good idea as spillovers are common during the first week of fermentation.

SAUERKRAUT

1 medium cabbage
(about 2½ lbs./1.1 kg)
1.5–2 tsp. salt per lb.
(0.45 kg) of cabbage

As with any ferment, the better the ingredients, the better the end result will be. Sauerkraut, however, is a little more forgiving than some others. Sauerkraut (and other similar cabbage ferments), are one of the most common fermented foods on the planet for a variety of reasons. Cabbage is cheap, ubiquitous, and hardy. Sauerkraut is versatile and can be adapted to utilize a variety of ingredients that you may have on hand and wish to use up. It's also more forgiving, since even winter cabbage from the grocery store can still be transformed into a respectable sauerkraut. Just about any variety of cabbage can make for a good kraut — red cabbage kraut is especially tasty. Small amounts of other veggies, like carrots or jalapeños, make for a nice twist, as do spices like caraway or rosemary.

While kraut is more forgiving once fermentation is underway, the preparation stage demands a bit more grunt work than other ferments. Like other veggie ferments, sauerkraut needs an anaerobic environment. But kraut is generally made without adding brine, as cabbage itself already contains plenty of water. During the preparation stage you'll have to get rough with it. A good kraut requires aggression, and you'll need to really work to pack it all into the jar. The harder you pack, the more liquid will be released, and you'll have to compel the cabbage to release enough of its water to form a brine that covers the top of the veggies.

First, remove the outer leaves of your cabbage as well as any that are damaged. Cut the cabbage into quarters and remove the solid core. Rinse the cabbage well with cold water, allowing the water to flow between the cabbage leaves. This will remove any dirt and bugs that may be along for the ride, but will not affect the microbes that you'll need for fermentation. Set one broad, thicker outer leaf to the side. Shred the remaining cabbage with a knife or food processor. The chopped bits have to be fine enough that the whole jar of kraut can be packed down relatively densely, but before you transfer to a jar, place the cabbage in a large bowl. Sprinkle the calculated amount of salt over the cabbage, then toss well. Allow the cabbage and salt mixture to rest about 15–30 minutes so the salt can be absorbed.

After about half an hour, the cabbage should have released a good bit of its moisture. After this, pack the cabbage into a clean glass quart jar. Pour any liquid left in the bowl into the jar — although this likely won't be enough to cover the cabbage just yet. Keep packing the cabbage down until enough juice has been released to submerge the vegetables almost all the way. You should be able to get close, though some may struggle to get all the way to complete submersion. If needed, top off with a 2% solution of salt water (1 teaspoon salt per cup of water). If using a weight system to keep the veggies under the brine, take the reserved cabbage leaf and cut or fold it so that it covers the rest of the cabbage at the top of the jar. This extra leaf can be held under a weight to create an additional buffer between the veggies and any attacking mold.

FERMENTED HOT SAUCE

3.2 oz. (90 g) chili peppers
½ Tbsp. sea salt
½ Tbsp. honey
Splash of apple cider vinegar

While most hot sauces sitting on grocery store shelves these days are vinegar-based, fermented hot sauces are actually a lot more common than you may think. Fermented condiments in general have been around for a very long time, probably as long as any fermented food. Even today, a few popular brands like Tobasco and styles like sriracha are still made using fermentation, rather than vinegar. While vinegar hot sauces can be bright and punchy, fermented hot sauces unsurprisingly tend to play up the funk and complexity.

Fermented hot sauce may be my favorite ferment to make at home, simply because of how versatile and forgiving it is. Both managing fermentation and winging a recipe on the fly are simple tasks, and the resulting flavors can be unlike anything you'll find in the average store. Even better, fermented hot sauce lasts a long, long time — I've had half-empty bottles that stayed vibrant and flavorful for years.

The recipe given here is bare bones, because as with most fermented foods, you can modify the recipe to push it in just about any direction you want. For a first attempt, however, I recommend a mix of habanero and serrano peppers. Not only are these readily available in almost all grocery stores, they're easy to find fresh at farmers markets, and make for a hot sauce with good flavor and a moderate but manageable heat level. With any hot sauce, the heat can always be dialed down by blending in a bit of bell pepper (use whatever type of bell pepper best matches the color of the rest of your peppers). Peppers, like hops, are a lot of fun to mix and match, and testing out an obscure rare pepper variety on its own in a hot sauce can be every bit as satisfying as a single-hop IPA.

As for the process, I like to keep things simple. Blend the peppers, salt, and honey until they are the consistency of salsa, then pour into your fermentation vessel. Top off with a splash of apple cider vinegar so that the liquid level is above the solid veggies. Allow two weeks to ferment, then blend again, to create a finer, more sauce-like consistency. Additional vinegar or salt brine can be added if the hot sauce is still too thick. A dash of extra salt can also ensure that the hot sauce keeps for a long time. At this point, you can pour the sauce back into the same vessel, or you can

even transfer to hot sauce bottles at this stage. While the hot sauce should now be ready to consume, I usually prefer to age my hot sauces at room temperature for several months before I begin to use them. The flavor will continue to develop, and the heat mellows and integrates with the flavor of the sauce over time. For the first month of aging, however, be sure not to tighten the lid of the jar or bottles all the way. More CO_2 will be released as the ferment continues to condition.

FERMENTED FRENCH FRIES

2 medium / large potatoes
Salt (2% brine)

While fermenting potatoes and then later cooking them as French fries might seem like a slightly paradoxical way to enjoy a fermented food, I've always enjoyed the concept of this recipe as much for what it conveys as well as for how it tastes. Fermentation is useful for preservation, of course. But less frequently discussed is the fact that fermentation also breaks down complex sugars and starches and generally makes foods easier for our bodies to process. Probiotics get all the mainstream buzz, but fermentation also makes foods healthier by unlocking nutrients that our own bodies wouldn't have access to on their own. Many such foods, like beans and starchy vegetables, don't require a full fermentation. Usually a day or two of brining is sufficient to begin the breakdown.

French fries made from fermented potatoes are not only easier to digest, but more flavorful as well. Fermentation adds a tangy dimension that really complements the saltiness of French fries, creating a flavor dynamic similar to salt and vinegar chips. The longer you ferment the funkier the fries will be, of course, but I usually prefer to toss these in the oven after two or three days of fermentation.

Photo by Derek Dellinger

The process is quite simple: Wash the potatoes with cold water to remove any dirt, then cut them up into French fry style wedges. How thick you cut the wedges is entirely up to you. Pack the potato wedges into a jar and fill with a 2% salt water brine (1 teaspoon salt per cup of water). Allow to ferment for two or three days, then remove the potatoes from the brine and give them an hour or so to air dry. After this, you can bake or fry them as you would any other French fry, though they may need less time cooking than normal fries. Keep in mind that fermented French fries have already been salted, so you will likely want to hold off on adding any more salt until after you've cooked and tasted them. Additional spices can be added either during the fermentation process, or upon serving.

And, as pictured above, this same recipe works great for sweet potato fries as well!

THE ART & SCIENCE OF RECIPE DESIGN

The first step in crafting your own beer

by Aaron Hyde

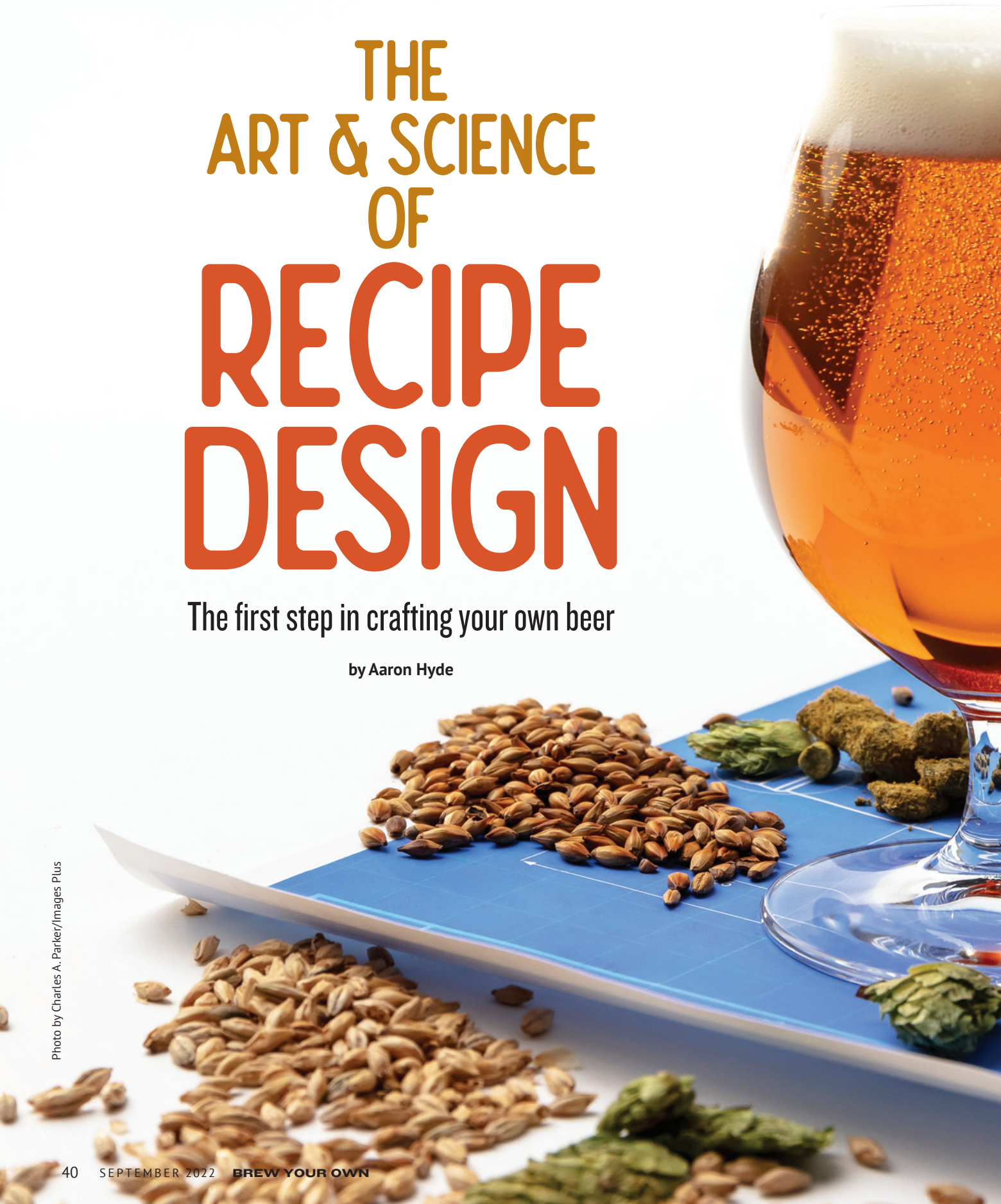


Photo by Charles A. Parker/Images Plus

Whether you primarily brew with extract, conduct a partial-mash, or brew all-grain, the end result is your own homebrewed beer. When it comes to recipe design it doesn't really matter how you brew. What many consider the "next-level" in homebrewing begins when they can design and create their own recipes. It's art. It's science. It's flavor. It's philosophy. Nothing quite like brewing beer can marry all these concepts and boil them down to fit in a pint glass!

When most people jump into recipe design, they are choosing a personal philosophy sub-consciously. Our brains typically push us toward either a left-brained or right-brained approach. On the left side, you have more mechanical and methodical ideas based around beer and styles you know. You might believe there's a theoretical perfect recipe if your recipe follows the numbers and processes set forth previously in books and by other brewers. You may see excessive creativity as deriving something "out of style" for a particular beer, maybe even as a sloppy approach. On the right side, you have artistic expression that you may believe should not be constrained by beer styles, ingredients, and maybe even tools or processes.

It'll come as no surprise that to make beer you'll need a little bit from both camps. What you typically have available is the information you've already gathered. This will be around ingredients you've seen used, equipment you have, brewing techniques and processes you've been introduced to and used, and outlined beer styles. Whatever knowledge you have is a starting point toward recipe design. Wherever you're at on your journey, you can start working toward designing your own recipes. The further along you are the more knowledge and experience you might have. Being knowledgeable about ingredients, equipment, techniques, brewing processes, and beer styles will allow you to be a technically proficient brewer, as well as an artistic and original recipe designer.

Whether you lean toward non-traditional, highly experimental one-off beers or are looking to create and perfect your own recipe of a beloved traditional beer style, keep in mind that beer recipe design is going to require you to be artistic yet calculated. Understanding how beer is built and then understanding your own approach and philosophy will help you achieve the best results.

ARTISTIC BREWING: CULTIVATING YOUR CREATIVITY

Many folks are drawn to beer as a creative outlet, whether they know it or not. I've met plenty of brewers who derive satisfaction from the process of creating something. They may also be unleashing a small amount of their own creativity without even knowing it. For the most part they are simply crafting beer. There is a difference between *art* and *craft*. Art is personal expression; craft is creating using learned skills and techniques. They crossover quite nicely in homebrewing. You may be crafting beer but I bet you could get more out of the process if you put some of your vision into the product, even if that vision seems hard to find right now.

How does beer become artistic? Allowing yourself some artistic license is a great first step. By simply making one conscious

decision outside a given set of parameters, like a recipe or style, is all it takes. Maybe it's a process change or experimenting with a hopping technique. Any decision that deviates from the given or the expected that you made on your own is an artistic decision. The biggest challenge is knowing what can be adjusted, and what parameters you might need to stay within to get a good result.

A great starting place is changing a single ingredient in a recipe you've brewed with a specific intended result in mind. For instance, it may go something like this:

- I brewed this American pale ale and it turned out great using a recipe from *BYO*.
- I just drank this IPA at a local craft brewery with El Dorado® hops and I really liked the aroma.
- My American pale ale recipe calls for 2 oz. (56 g) of Cascade hops added at 0 min.
- I'm going to substitute 3 oz. (84 g) of El Dorado® for the 2 oz. (56 g) of Cascade hops in the same recipe next time.

You've made a creative and artistic decision! What has aided or guided you in this decision?

- You brewed a successful American pale ale and now have a baseline recipe and process.
- You drank a beer with a hop profile that you enjoyed and took the time to identify the hop and appreciate the aroma.
- You also learned somewhere along the way that hops added at the end of the boil are used for aroma.

What's allowed you to be artistic in this scenario are a handful of experiences — brewing a successful beer, drinking a beer and understanding what went into it, as well as learning along the way what specific hop additions provide in a beer. Without doing things like brewing, tasting, and studying or trying brewing processes, ingredients, and equipment, you won't be able to unleash your creativity to its full extent.

We know beer can be artistic and a creative outlet, but let's take it one step further — should it be without rules? Should it be abstract? Probably not in most cases. There are some guardrails that come with anything, even art. We do have boundaries, even if brewers are constantly pushing them, and these boundaries can be good. An abstract beer might be something that distorts what beer is or makes it something else. Maybe it's brewed with just tomatoes and hops, open fermented with moldy bread, then carbonated and served in closed trash bags. It has many characteristics of beer, but if you handed someone that trash bag, their assumption isn't that it's going to be beer, or something they want to drink.

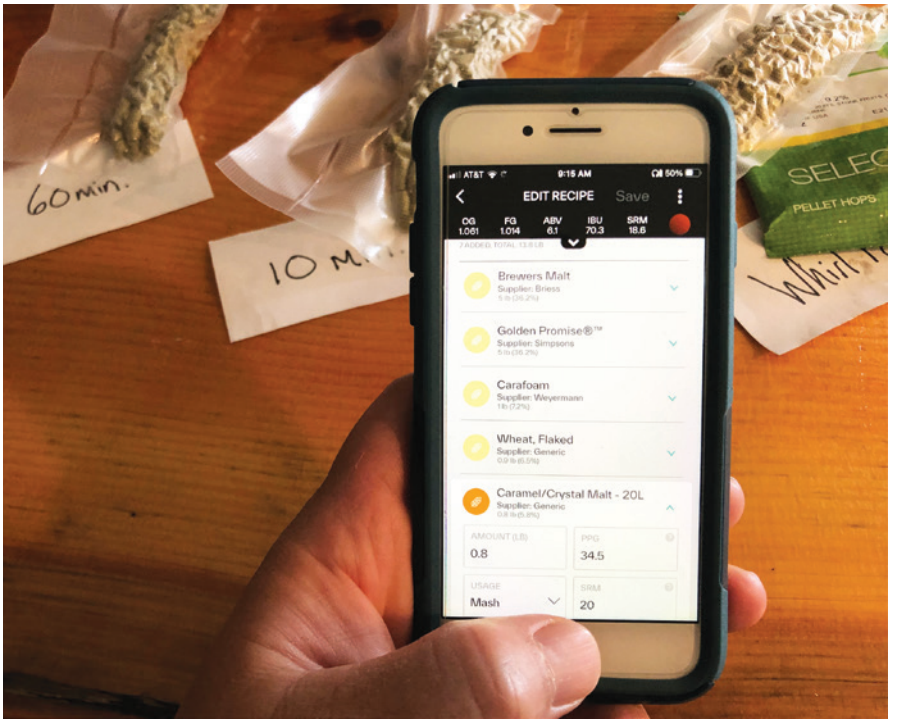
Use the guardrails brewing provides to your advantage, to help you imagine what your next beer recipe will be without giving yourself infinite possibilities. Just make sure those guardrails aren't too close, restricting you from thinking about how you might brew artistically.

TECHNICAL BREWING: APPLYING PRACTICAL PRINCIPLES

I have met many brewers who simply look to hone the craft of brewing beer. This in and of itself, without trying to take any artistic license, is a significant challenge. What it means as a brewer is that process and technique come before all else. For the technical brewer, a recipe should fall well within the guidelines of a style or be a very close interpretation of a commercial style. The idea of ingredient substitution may be non-negotiable. Unlike some creative brewers, the idea for many technical brewers is to repeat the process on a known brewing system, given a known recipe, until they can brew it to perfection. Sure, this may require some process and brewing system tweaks along the way, and maybe even some recipe adjustments.

Applying yourself to the craft of brewing is important. Being able to brew using a variety of techniques and ingredients will hone your skills and will improve your beers. Those techniques will ultimately provide you with the ability to brew anything you want.

Say you jump into recipe design and want to brew a sour beer, but have never experimented with different souring techniques, you may be severely limiting yourself. You'll be better off learning what can be



Brewing recipe software makes the process of creating your own recipes much easier as you can see the impact ingredient and process adjustments make in real time.

created via kettle souring, traditional souring techniques, or even experimenting with spontaneous fermentation or blending aged sours before you go too far down the road of exploring recipe design in the sour space. This will require you to take a step back and look at tried-and-true processes and recipes first.

Another reason some folks may choose the path of leaning toward being a more technical brewer is because they are looking to homebrew competitively. If you enter competitions, your beer will be judged on intangibles, around unique flavors, balance and other characteristics, but likely the majority of points to be gained or lost will be how well you brewed to the style guidelines. Technical brewing is critical when it comes to competing well. I'm sure it will be argued that creativity is needed, and I agree, just not to the extent of being a sound technical brewer.

FIGURING OUT FLAVOR & PHILOSOPHY

Two things worth touching on are flavor and philosophy. Flavor is the most critical aspect of beer. If you don't enjoy how it looks, you might be able to move past that if it smells and tastes great. But if you don't like how it tastes, you're just not going to enjoy drinking the beer no matter the other characteristics.

Sensory aspects of beer, especially around flavor, make up a large portion of recipe design and being able to determine what those different aspects are is critical. The most difficult is flavor sensory. You must understand what ingredients will taste like, as well as beer styles, and how to describe them. This is oftentimes one of the hardest things to learn and overcome. Consider sensory understanding the magic ticket to beer recipe design. Aligning your own perception to others can be difficult. Your definition of fruity, floral, caramel, or chocolate may be different than mine. Ingredient manufacturers and brewers do their best to provide this information to you as a brewer and consumer, and it's a great starting point to align with what's generally accepted and understood.

Philosophy might be a bit harder to quantify but you likely see yourself as somewhere in-between an artistic brewer or a technical brewer. Are you targeting making the most flavorful beer possible, maybe around a particular hop, or even a fruit? Or are you usually trying to make the best possible beer to a particular style, or commercial example? That might give you some clues. What's best is to make sure neither one completely defines you and you come out of your safe brewing space now and again. Challenging yourself to brew well to style, or out of style with new ingredients, is important to grow as a brewer and recipe designer.

BRINGING IT ALL TOGETHER: DESIGNING A DARK MILD

OK, so it is important to allow for creativity while having a technical understanding of brewing and how they relate to recipe design. Now let's bring this all together by going through the process of building a recipe together. I suspect that if we both go on the same journey, aspects of our beer recipe will be different!

Let's say a recent trip to my favorite local brewery introduced me to a lovely English dark mild ale. I thoroughly enjoyed it and went to ask the brewer what went into his recipe, but there were no brewers in sight. There isn't much on the menu about the beer besides some fluffy language and a stated ABV of 3.5%. Now the recipe creator in me kicks in. I start by making a few mental recordings: Not much hop character, a nice chocolatey note, and a bit of caramel note. It was also a bit sweeter than expected, but enjoyable.

The next day I go looking around to see if I can find any other dark milds at my local beer shop or maybe from another nearby brewery to explore the style a bit more. Nada, nothing. Although I love the beer I just had, I also know its time on tap may be limited. Time to give brewing a dark mild a shot!

Right away I know a few things based on the beer I drank:

- It's English in origin and it's an ale. It likely was brewed with British hops and an ale yeast.
- I also know an ABV I might like to target based on the beer I tried, 3.5%.
- Based on the darker color I saw in my glass (not to mention it's right there in the name), I know I'll be using some dark malts to derive some color. I also know there are other ways to add color to beer, but that dark malt is the most common. This fits nicely with the chocolatey note I tasted.

Don't Hold Me Back!

You may have the idea that beer styles are just "the man" telling you how to brew and are holding you back. Maybe you have an idea for a beer that doesn't fit any style. That's fine and great! To get beyond style guidelines takes a particular amount of knowledge of what styles are out there already and even the processes and techniques used. Beer doesn't need to fit a particular style guideline. Beer as a beverage has a significant number of expectations that come with it — grain base, in most cases hops, carbonation, and some alcohol. This all provides a medium in and of itself, and sets the expectation for you as the brewer, as well as for the drinker. This is where style guidelines are great — a beer drinker can assume, based on what they know about beer styles, that a beer in a particular style will taste a certain way. It helps set an expectation, and they may be able to make an early assumption whether they'll like it or not. If you give a drinker a beer with no detail around style they may be hesitant to try it, or come in with the preconceived notion that they won't like it. Guidelines can be great for the brewer as well as the drinker, with the limitation that not all beer can be defined by a particular style guideline.

You'll always need to make some logical assumptions when a recipe isn't given and starting with what is most likely is always good or you'll spend a lot of time going in circles. Again, this is where it's good to have a basic grasp of styles, ingredients, and basic brewing processes.

There is more information available and more tools to help me in my re-creation. One tool I can't stress the value of enough is a recipe design app. Otherwise you'll have the additional stress of doing the math, double checking it, and revising a recipe by hand until you get to the right color, bitterness, and ABV. It all becomes very tedious. There are numerous options available, and they all work well. Find one you enjoy using. There are free options available like Grainfather's app, Brewer's Friend, or Brewfather. Other subscription options like BeerSmith, Beer Tools, and a variety of other apps may offer more of what you're looking for. Many will have style guidelines built in providing you the technical parameters you'll want your recipe to align to.

Another critical source of information is style guidelines defined by the Beer Judge Certification Program (BJCP) and the Brewers Association (BA). Both have slightly different definitions, but either could be utilized to help determine what ingredients and brewing techniques we want to use. The BJCP will provide more detail around history, ingredients, and brewing techniques used, as well as commercial examples. This is extremely valuable to the recipe designer. You can find these guidelines on the BJCP and BA websites.

Alright, so we've set the scene — we have a beer we know a bit about, we have BJCP style guidelines we'll use, and we have a recipe creator software we'll bring it all together in. The specifications we'll use are listed as vital statistics in the BJCP guidelines, as they provide a range of technical specifications necessary to get us as close to something of a dark mild as possible:

OG: 1.030–1.038
IBU: 10–25

FG: 1.008–1.013
SRM: 14–25
ABV: 3–3.8%

Starting with the grain bill, or extract and grain, is always a great starting point. You'll need it to get the proper original gravity (OG) and final gravity (FG), along with what you'll soon choose for the yeast. In the case of malt it's easiest to start with base malt or extract. This will be the malt that gives you most of your sugar. Looking at the characteristic ingredients provided in the style guideline, you see pale British base malts are most common. If using extract, the easiest substitution is simply a light malt extract.

By having a few general parameters set in my recipe design program I can simply add 6 lbs. (2.7kg) of base malt and see that gives me an expected 3.1% ABV before I put any other ingredients in or change parameters. These assumptions preset in the app can be valuable (mine are 75% mash efficiency and 75% attenuation) and can be tweaked later. Knowing I'm targeting 3.5% and will be adding more malt and fermentables, I'll leave it there. The style allows crystal and dark malts, as well as adjuncts and sugar. Time to have a play and get creative!

I'm feeling adventurous and start mentally mapping all the options available and consolidating to a couple I might like to try:

Adjuncts:
- Corn flakes
- Wheat flakes

Sugar:
- Dark brown sugar
- Table sugar (sucrose)

Crystal Malts:
- Carastan malt (35 °L)
- Crystal (60 °L)

Dark Malts:
- Chocolate malt
- Roasted barley

What sticks out in remembering the dark mild I tried is that chocolatey note, so I want to get this into my recipe first. I decide to add a 0.25 lb. (110 g) of chocolate malt as I see it puts my

mild right in the middle of the color specification at 18 SRM. If I wasn't familiar with the fact that chocolate malt provides chocolate flavor and related cocoa notes, I would need to research my malts further. I do also know that other caramel notes help define the chocolate flavor in beer as our brains also need some of the other characteristics of chocolate to pull it all together, like sweetness and other sugary flavors.

From there I want to keep focusing on flavor and other attributes I liked — a caramel note and a sweetness. I may need to rely some on the yeast for sweetness (not sugar, which will ferment out), but can also consider it during my grain bill decisions. I'm considering crystal malt (60 °L) because I have it on hand, but through research I also found that many milds have Carastan malt, which mentions toffee as well as a slight bready note, which I didn't pick up on in my beer. Looking at the crystal 60 I have, the manufacturer mentions that it's sweet with a mild caramel flavor. I could continue looking for another malt, but can assess that what I have on hand will be close enough. If it's a malt I've used, I'll try to harken back to the flavor it may have contributed to other beers. I add 0.25 lb. (110 g) of this to my recipe as well. This addition brings my gravity and color up slightly, but anticipated ABV is still just under 3.4% ABV.

One thing that may have attributed to that sweetness was possibly some mouthfeel. By using some wheat flakes I know I can boost the mouthfeel. I decide to add 0.25 lb. (110 g), which may also aid in head retention. Something I'd like in this beer, even if I can't recall the head from the mild I had at the brewery.

With no further tweaking this brings my recipe to an OG of 1.036, my color to 18 SRM, and my ABV to 3.5%. All within style specification! I have one more ingredient to consider and that's the sugar I was originally thinking of using. In this case I don't want it or need it. The beer finished sweet, not dry, and I know that adding something like sugar will likely dry my beer out. No sugar this time.

Time to move on to hops. Because hops can add a very distinct flavor at both high and low levels, hops can get quite personal in recipe design. In the case of a dark mild where the hops were practically imperceptible, my only task is to make sure they don't show up too much in the beer. I look at the characteristic ingredients and it tells me I can use any hop. Likely because the expectation is that it's barely perceptible in the beer. In this case, I could dig out any hops from my freezer and simply calculate my IBUs. Since the style allows for 10–25 IBUs, I'll aim for the low end, and pull out some Willamette.

Knowing how hops affect beer is important. When added to the boil for the entire length you'll simply boil off the volatiles and isomerize the acids, leaving the hop to impart a small amount of flavor compared to the bitterness it will impart. Mid-boil and later additions contribute more flavor versus bitterness, and late additions (in the last 10 minutes) or post-boil will contribute some flavor and lots to aroma. In this case, I will add these for my full boil, typically 60 minutes, so that the flavor and aroma isn't too distinct. I have some Willamette on hand. My recipe calculator shows that 0.75 oz. (21 grams) will give me 14 IBUs. This leads to one other consideration — I had considered shortening my boil, but that would possibly leave me with more hop flavor and aroma. Plus, the tiny bit of kettle caramelization 60 minutes allows for will likely have a positive effect on this beer as I'm targeting a darker color, caramel flavors, and some sweetness. So, I'm going to stick with a 60-minute boil for this recipe.

That leaves me with the yeast. With the large number of manufacturers this may seem daunting. It really isn't. In fact, it might be the easiest decision of the bunch. Most yeast are named based on style, region, or country a style comes from. If not, the yeast manufacturer typically provides a list of beer styles the yeast is recommended for online or even on the package. In the case of my mild ale, I looked at what was available locally and began researching the yeast manufacturers by style. When it came down to two choices I opted for White Labs WLP002 (English Ale) yeast. Why? It was recommended for the style, but it also had lower attenuation, meaning more sugar left behind.

If you recall, I had preset my attenuation at 75%. My expectation for this yeast is only 70%, which means a higher final gravity, leading to a lower ABV. Once I change this to 70% in my calculator, my ABV goes down to 3.3%. A big deal? Not really, but that 3.5% ABV mild was great (and was the only real number I had to go off when starting this venture) so I want to adjust some accordingly. By simply adding 0.5 lb. (225 g) of British pale ale to my base to compensate for the loss in attenuation, I've achieved my 3.5%. I've moved my OG up to 1.038, right to the top of the style guideline's range.

A few more calculations around water and mashing based on a bit more research and I know I'm going to be fine with a single step infusion mash at my usual 152 °F (67 °C) for 60 minutes. Had this style required something more technical like a decoction mash to develop the correct flavor I would have needed to consider this. Fermentation will be as per the instructions on the yeast, nothing out of the ordinary. I'll keg, and review what typical carbonation levels for a mild might be — it looks like between 1.3–2.3 volumes is acceptable.

This exercise we just completed is one way to create a beer recipe. Had you drank the same dark mild as me and wanted to brew a beer close to it, you may have made some different decisions. That's OK, who's to say which would be better? When it comes to beer design you can only use the tools in front of you, as well as your own knowledge of brewing processes, techniques, styles, ingredients, as well as your own equipment. And after tasting this beer I'll have the pleasure of comparing my recipe to the original example and tweaking my recipe if desired. When you put in the work to become a better brewer and appreciator of beer, the world of beer recipe design will open wide. And what is left to be learned through experience is never ending! BYO

Germany's Beers of Autu

Brew your own Märzen and festbier in time for Oktoberfest

by Franz Hofer

Munich's Oktoberfest is about one beer, and one beer only: golden festbier, served by the *maß* (liter). No one seems to mind this exercise in efficiency. It eliminates the need for choosing from an array of beers so you can concentrate on the festivities at hand. Even better, servers bring armfuls of mugs filled with this magically delicious nectar right to your table. Take one, pay up, *eins, zwei, g'suffa!*

But wait a second. Isn't Oktoberfest beer an amber-hued and richly malty Märzen? You wouldn't be alone if you thought so. Few beers occasion more confusion in North America than Oktoberfest beer. It's an annual refrain on social media when homebrewers want to brew these beers: Just what is Oktoberfest beer? How is it different from Märzen? And what about festbier?

Here we'll consider what these Oktoberfest styles meant historically and explore how they taste today. When all is said and done, you'll have tips aplenty from German and American brewers who excel at brewing these autumn elixirs. And if you get started in mid-August, your beer will be ready by the start of October. All that's missing now is the lederhosen and dirndls.

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Thousands of people from across the world flock to Munich, Germany to take part in the Oktoberfest celebration each year. While Märzen used to be served by breweries at Oktoberfest, nowadays festbier is the style of choice served by the liter.

THE CHANGING FORTUNES OF OKTOBERFEST BEER

Once upon a time, Oktoberfest beer was just that: The name of any festival beer (festbier) served on the Oktoberfest *wiesen* (meadow). In 1872, Joseph Sedlmayr (brother of Gabriel Jr. of Spaten) released a beer based on the Vienna lager first brewed by his brother's friend and colleague Anton Dreher. He branded it a Märzen, breathing new life into an old concept. This amber-orange beer soon dominated the festival.

If Märzen was king, changing tastes provided fertile ground for golden festbier to blossom on the *wiesen.* In 1953, Augustiner's Wiesn-Edelstoff appeared on the scene, a sufficiently "fest-like" golden beer more potent than the Edelstoff Hell that Augustiner had served on the *wiesen* prior to World War II.

All the major breweries followed suit over the next few decades. Wiesenbier (as it's known colloquially in Munich and not to be mistaken with weizen or weissbier) displaced Märzen entirely by 1990, becoming simply Oktoberfestbier along the way. Nowadays, the term "Oktoberfest-Bier" is a protected designation reserved for the "Munich Big 6" (Augustiner, Hacker-Pschorr, Hofbräu, Löwenbräu, Paulaner, Spaten).

THE GERMAN BEERS OF AUTUMN

To clear up any confusion for 21st century fans of Germanic beer, here's a snapshot of what these beer styles represent today.

Märzen

Brewed to a minimum of 1.053 specific gravity (13 °P) but rarely topping 5.8% ABV, Märzen is a delectably malty beer that ranges in color from orange-gold to amber. Malt aromas and flavors run the gamut from *vollkornbrot* (whole-grain, dark country bread), Ovaltine, Leibniz biscuits, and toast to caramel and dried fruit reminiscent of dark cherry. Some versions are rich with a touch of residual sweetness. Others are toasty but leaner, the holdovers from the time when Märzen ruled the *wiesen* by the liter. Still others have a kind of "malt candy" flavor. Hops are present but subtle in some Märzens, showcasing baking spice.

Festbier (aka Oktoberfest-Bier or Wiesenbier)

The golden festbier served at Munich's Oktoberfest is more straightforward than Märzen, though no less delicious. Generally brewed to between 1.055–1.057 SG (13.5 and 14 °P), festbier lands between a helles and a golden bock with an ABV generally ranging from 5.8–6.3%. Subtle honey notes intertwine with hop and malt fragrances that recall freshly mown hay and Alpine meadows. Festbier features a velvety body with a hint of residual sweetness suggestive of white nougat, flavors of very lightly toasted country bread, and just a hint of hop bitterness — the epitome of what Germans call *süffig* (quaffable).

BREWING OKTOBERFEST BEER: TIPS FROM THE PROS

Now that you know what these beers are all about, it's just a matter of deciding which Oktoberfest style you want to brew. If you brew regularly, the choice is easy: Brew both! Since Märzens offer a broader range of interpretive choices, I'll focus more closely on them, with the occasional nod to festbier.

First, though, here's how the pros approach their Märzens, along with some advice to help you avoid common pitfalls.

Florian Kuplent, Co-Owner and Brewmaster of Urban Chestnut in St. Louis, Missouri, aims for a beer that is balanced and malty, but not as sweet as typical American Oktoberfest Märzen. He gets the maltiness for his Oachkatzlschwoaf (O-Katz for short) through a combination of decoction mashing and a properly controlled fermentation with plenty of active, highly attenuative yeast.

When Bierstadt Lagerhaus Co-Owner Ashleigh Carter brews Märzen for their annual Oktoberfest celebration in Denver, Colorado, drinkability is front and center. She also loves the subtle toffee character of Weyermann's Barke® Vienna malt. "When I think of a Märzen, I think of a beer that you'd want to drink more than one of. It's about balance, but also about crispness. It's about letting the malt and hops speak." How does she thread the needle between drinkability and teasing out the toffee? "Fermentability."

You may have noticed a theme just two tips in: Yeast and fermentability are the keys to drinkability.

Kuplent voices the opinion of many fans of German Märzen all too familiar with the flaws of Märzens brewed on this side of the pond: Too big, too hoppy, too sweet. Aside from recipe formulation, the main issue driving these characteristics is yeast: Yeast that's too old, yeast that isn't at its peak activity, and yeast pitched into under-aerated wort.

In fact, pro brewers adept at brewing German-style lagers emphasize three things: Yeast, yeast, and more yeast. "If your primary fermentation isn't done in 7 to 9 days, you haven't pitched enough yeast," states Kuplent. Carter concurs: "On a homebrew scale, it's nearly impossible to overpitch a lager. Pitch tons of it, especially if you're going to ferment below 10 °C (50 °F). You want a minimum of 1.5 million cells per mL per degree Plato."

To put that advice into perspective, you need roughly 400 billion yeast cells for a 5-gallon (19-L) batch of Märzen with a specific gravity of 1.056. Wyeast packs come off the assembly line with 100 billion cells, so you'd need four packs of yeast. Unless you're fine quadrupling your yeast budget, you'll want to make a starter and step it up at least twice.

Beyond that, North American brewers emphasize what's only implicit when German brewers talk about these styles: Attenuation. You get that attenuation by focusing on your mash regimen, by paying attention to your pH during the entire brewing process (keep it between 5.2 and 5.4 during the mash, and make sure it's around 5.0 or lower at the end of the boil), and by pitching tons of yeast into well-aerated wort.

INGREDIENTS

Water

Though water for both Märzen and festbier is typically soft, you have a range of choices. Urban Winkler of Kloster Weissenohe mentions his water source contains calcium carbonate. And Karlton Graham of Kansas City Bier Company aims to mimic the hard water of Munich, which clocks in at roughly 8 degrees on the German hardness scale (one degree of hardness on this scale is defined as 10 mg/L calcium oxide, or 17.8 ppm). That said, most brewers polled here recommend reverse osmosis water treated with calcium chloride. Use acidulated malt or food-grade acid to get your pH down to where it needs to be in the mash and at the end of the boil.

Grain Bill

Festbier is a straightforward combination of Pilsner with either Vienna malt or light Munich malt. Graham of KC Bier Co. uses a roughly 50/50 mix of Pilsner and Vienna in their festbier, while Chaz Lakip of lager powerhouse Chuckanut in Skagit County, Washington, goes with a 70/30 Pils/Vienna split. You can also sprinkle in some Carahell® or melanoidin malt to the tune of about 2–3% of the grain bill, especially if you don't decoct.

Märzen gives you more leeway. Some approaches are the epitome of elegance. When I asked Ayinger's Brewmaster Bernhard Neunhoeffer about grain bills, he offered a tantalizing hint about Ayinger's delicious Oktober Fest-Märzen, suggesting that you could use up to 100% Vienna malt. It's worth noting that a Märzen brewed with 100% Vienna malt is entirely in keeping with the spirit of Sedlmayr's Oktoberfest Märzen that debuted on the *wiesen* in 1872, even if contemporary Vienna malt won't get you much beyond a burnished golden color.

Specialty malts, caramel in particular, engender their fair share of debate among Märzen devotees. Urban Winkler, the fifth-generation Owner and Brewmaster at Kloster Weissenohe, doesn't mince his words: "If you want to brew something that tastes like a malt bonbon, use lots of caramel malt." His preference is for Vienna malts. Winkler achieves his signature amber-red color via Maillard reactions during his triple decoction mash, sprinkling in the smallest amount of specialty malts along the way.

A quick survey of other brewers reveals the range of interpretive possibilities for homebrewers. Kuplent uses a 2-to-1 mix of light Munich and Pilsner malt with 1–2% dark CaraMunich® for color and character. Lakip combines 50% Pilsner malt with equal parts Munich and Vienna and a few percent CaraMunich® I. And Carter mixes roughly 50% Barke® Vienna and 50% Bohemian dark floor-malted malt, adding about 1% CaraMunich® II "to get that beautiful orangey color."

Achieving that rich, hallmark maltiness of both Märzen and festbier is a difficult proposition with extract, but not impossible. A couple of options is to use a Munich malt extract (Weyermann makes one) or a high-quality Pilsner extract and steep some CaraMunich® and melanoidin malt for aroma and flavor.

As for that Märzen with 100% Vienna malt? Add a small handful of Carafa® (0.25% of the grain bill, or 2 ounces in a 5-gallon/19-L batch) during the vorlauf or sparge for color without the roastiness. This will yield a lusciously malty amber-orange beer with an SRM of about 10.

Hops

Hallertauer, Hersbrucker, Perle, Spalter, Tettnanger, Saazer — all are fair game in a Märzen. For Kuplent's O-Katz, it's "typical Hallertauer hops, added at the beginning, middle, and end."

For those who labor under the assumption that Märzen isn't made for hopping, consider this: Winkler, who brews a traditional Märzen, begins hopping during the run-off from the mash tun, and does his last addition in the whirlpool. This lends his beer a beguiling aroma of *lebkuchen*, a German Christmas delicacy similar to gingerbread. (If you go this route, keep in mind that the hop character is subtle.) Winkler's also not averse to combining hop varieties to get that spice.

Carter keeps it simple. "Oktoberfest beer doesn't need a ton of hops," she says. "Hops are there to kiss away the sweetness. I do a single hop addition. It doesn't need more than that."

Hop varieties for festbier are the same as they are for Märzen, though festbier's hoppiness is slightly more prominent — similar in character to an export. (A festbier should not merely be a Pilsner on steroids.) Lakip of Chuckanut adds hops at 75 minutes, at the midway point, and at 10 minutes. Graham of KC Bier Co. uses Perle and Hallertauer Tradition with a 60-minute addition and a small aroma charge with 10 minutes to go.

Yeast

Be it Märzen or festbier, the majority of pro brewers with whom I spoke use what Carter calls "old trusty": Weihenstephan 34/70 (White Labs WLP830 German Lager Yeast or Wyeast 2124 Bohemian Lager Yeast). This yeast works particularly well if you like eminently quaffable Märzens like Paulaner's Oktoberfest Märzen or Spaten's Ur-Märzen.

The maltiness in Urban Winkler's old-style Märzen is even more pronounced than it is in the Munich-style Märzens we see in North America, as is its subtle residual sweetness. White Labs WLP835 German X Lager Yeast (said to be the Andechs yeast) attenuates slightly less than 34/70, making it a solid choice. You could also use Wyeast 2308 or WPL820, especially if you're aiming to brew a richer, maltier Märzen with a hint of sweetness.

PROCESS

Mash

A decoction mash is the traditional way to go, whether it's a Märzen or a festbier. Winkler states that "it's essential for a traditional Franconian brewery to do at least a double decoction." He goes all-in on a triple decoction, describing the thinking behind his mash process in the following terms: "What's important is the right balance of proteins with a suitable ratio of maltose-to-glucose. Ultimately, I design my protein rest to yield high FAN (free amino nitrogen), along with a few high and medium weight proteins for the foam. During saccharification I aim to leave behind some unfermentables to give the beer its full body." (My recipe included on page 53 attempts to capture the spirit of Winkler's mash with a double decoction.)

If you prefer to skip the decoction, a step mash works just fine. Chuckanut's Lakip explains that they use a modified *"hoch-kurz"* mash (higher temperatures, shorter time period) with a 30-minute beta rest at 140–144 °F (60–62 °C) followed by a 30-minute alpha rest at 158–162 °F (70-72 °C). The even length of the beta/alpha rests will give you fermentability without sacrificing maltiness.

Whichever mash regimen you choose, remember that both Märzen and festbier need to be quaffable, even the richer versions. For festbier, conduct your decoction or step mash to balance body with fermentability. For richer Märzens, you generally want to favor body ever so slightly over fermentability. Performing a decoction will help take care of the maltiness. Bump up the caramel malt (CaraMunich® or CaraRed®) a touch if you're not decocting, but not so much that you end up with a beer that's too sweet.

And if all of this seems like too much trouble, do a single-infusion mash for an hour (or until conversion is complete) at 149–150 °F (65–66 °C) for a festbier and at 152 °F (67 °C) for a Märzen.

Fermentation

Whether you're brewing a Märzen or a festbier, fermentation practices recommended by the pros are similar: Conduct your primary fermentation around 46–48 °F (8–9 °C) for 7–9 days. (Note that some lager strains take a bit longer to ferment, while others are more comfortable a notch above 50 °F/10 °C.) You can forego the diacetyl rest if you've pitched enough healthy yeast.

Lagering is more of a patchwork, with brewers expressing divergent views of what's best. "Low and slow" is Neunhoeffer's fermentation maxim at Ayinger. "The stronger, the longer," he adds. But how slow, and for how long? "A minimum of three weeks for a standard-strength beer at temperatures between -2 and 0 °C (28–32 °F). Minimum six weeks for bock." That's a relatively long time, but not as long as conventional wisdom would have it.

Back in the days between the mid-sixteenth and mid-nineteenth centuries when summer brewing was prohibited in Bavaria, Märzen was traditionally brewed in springtime to last the summer. This perhaps played a role in shaping the dictum that calls for one week of lagering per degree Plato. Carter sees the merit in this rule of thumb: "Time is part of that equation. Something magical happens right around eight weeks. Everything just comes together."

Others, like Kuplent, are more skeptical. "Beer doesn't necessarily get better with months-long lagering times, especially when it comes to lighter styles," explains Kuplent. "Autolysis will start to play a role and affect the flavor."

Most brewers these days lager for 3–5 weeks, long enough for the beer to drop bright. Even Winkler, who evinces a healthy respect for tradition, is entirely contemporary in his sense of lagering time. His Eucharius Märzen gets about three weeks in the cellar — great news for homebrewers gearing up to brew their Oktoberfest beers in August and September.

Monks' Fortitude

(5 gallons/19 L, all-grain)
OG = 1.056 FG = 1.013
IBU = 24 SRM = 9 ABV = 5.7%

Monks' Fortitude is an homage to the malty Märzens of Franconia. Located in scenic Franconian Switzerland, Klosterbrauerei Weissenohe was once a monastery with a turbulent history, dissolved twice over the centuries before falling into private hands. I'd like to think it was the beer the monks brewed that gave them the fortitude to endure those troubling times.

INGREDIENTS

8.5 lbs. (3.9 kg) Vienna malt (3 ºL)
3 lbs. (1.4 kg) German dark Munich malt (10 ºL)
0.5 lb. (0.23 kg) CaraRed® malt (20 ºL)
4.8 AAU Hersbrucker hops (first wort hop)
(1.6 oz./45 g at 3% alpha acids)
1.5 AAU Hersbrucker hops (30 min.)
(0.5 oz./14 g at 3% alpha acids)
0.25 oz. (7 g) Hersbrucker hops (5 min.)
Yeast nutrients (10 min.)
Whirlfloc (10 min.)
White Labs WLP835 (German Lager X), Omega Yeast OYL-111 (German Bock), or Mangrove Jack's M84 (Bohemian Lager) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

If using liquid yeast, make a yeast starter two days prior to brew day. For your water, treat 10 gallons (38 L) of reverse osmosis water with ½ tsp. lactic acid for mash acidification, 1 g gypsum, 1 g Epsom salt, and 5 g calcium chloride.

Urban Winkler extols the virtues of a triple decoction mash as the old school way of achieving Märzen's signature maltiness, but you can get away with a double or single decoction. You can also do a *"hoch-kurz"* step mash with or without a protein rest. Alternatively, perform a single-infusion mash at 152 °F (67 °C).

Mash in for a 10-minute protein rest at 131 °F (55 °C). Raise temperature to 145 °F (63 °C) and rest for 30 minutes. Meanwhile, pull your first decoction and let it rest at 145 °F (63 °C) for 20 minutes before boiling for 10 minutes. Add it back to the main mash to raise the temperature to 162 °F (72 °C) for a 30-minute rest. Pull a second decoction and boil 15 minutes before adding back to the main mash to bring it up to 169 °F (76 °C) for a 10-minute mash out.

Sparge to collect 6.75 gallons (25.5 L) of wort once your mash has reached conversion, adding first wort hops to the kettle while sparging. Boil for 75 minutes adding hops, nutrients, and kettle fining per schedule. After the boil, cool wort, pitch plenty of yeast, and aerate well if using a liquid yeast strain. Ferment between 46–48 °F (8–10 °C) until primary fermentation is finished (7–9 days), then lager for 4 weeks around 32 °F (0 °C).

Spunding is ideal when it comes to carbonation. Aim for 2.4 volumes of CO_2. Bottle-conditioning also helps produce a rounder carbonation than forced carbonation. It's common to filter Märzen or let it drop bright, but an increasing number of brewers are serving their Märzen unfiltered.

Extract with grains option: Substitute 3 lbs. (3.9 kg) each of Pilsen and Munich dried malt extracts for the Vienna and dark Munich malt. If using liquid yeast, make a yeast starter two days prior to brew day. For your water, treat 6 gallons (23 L) of reverse osmosis water with ¼ tsp. lactic acid, ½ g Epsom salt, and 3 g calcium chloride.

Place crushed grains in a muslin bag and steep in the brewing water as the temperature rises to 170 °F (77 °C). Remove grains, allowing the liquid to drip back into the kettle. Remove from heat and stir in the malt extract. Once fully dissolved, add the first wort hops and bring the wort to a boil.

Boil for 60 minutes. Follow the fermentation, carbonation, and packaging suggestions from the all-grain recipe.

Festbier

(5 gallons/19 L, all-grain)
OG = 1.057 FG = 1.012
IBU = 28 SRM = 7 ABV = 5.9%

A traditional festbier to be enjoyed by the liter during Oktoberfest or any fall festivities.

INGREDIENTS

6 lbs. (2.7 kg) Pilsner malt
6 lbs. (2.7 kg) German Munich I malt (6 ºL)
6.5 AAU Perle hops (60 min.) (1 oz./28 g at 6.5% alpha acids)
2.3 AAU Hallertauer Tradition hops (10 min.)
(0.5 oz./14 g at 5.5% alpha acids)
Yeast nutrients (10 min.)
Whirlfloc (10 min.)
White Labs WLP830 (German Lager), Wyeast 2124 (Bohemian Lager), or SafLager W-34/70 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

If using liquid yeast, make a yeast starter two days prior to brew day. For your water, treat 10 gallons (38 L) of reverse osmosis water with ½ tsp. lactic acid for mash acidification, 1 g gypsum, 1 g Epsom salt, and 5 g calcium chloride.

Step mash with a 30-minute beta rest at 140–144 °F (60–62 °C) followed by a 30-minute alpha rest at 158–162 °F (70-72 °C). Lauter as normal.

Sparge to collect 6.5 gallons (25 L) of wort once your mash has reached conversion. Boil for 75 minutes adding hops, nutrients, and kettle fining per schedule. After the boil, cool wort, pitch plenty of yeast, and aerate well if using a liquid yeast strain. Ferment between 46–48 °F (8–10 °C) until primary fermentation is finished (7–9 days), then lager for 4 weeks around 32 °F (0 °C). Spunding is ideal when it comes to carbonation. Aim for 2.6 volumes of CO_2.

Extract only option: Replace the grains with 4.33 lbs. (2 kg) Pilsen dried malt extract and 2 lbs. (0.91 kg) Munich dried malt extract. Follow instructions in the Monks' Fortitude extract with grains option. BYO

BY DREW BEECHUM & DENNY CONN

THINKING BREW-IN-A-BAG

Helpful tips for this style of brewing

Over the centuries, mashing, and more importantly, lautering techniques have changed fundamentally. Dive into brewing history and you'll see endless ways of draining liquid from the mash. It's a simple problem and thus many choices. For homebrewers this choice has become even easier thanks to the now fairly ubiquitous brew-in-a-bag (BIAB) style of lautering.

When we both first started brewing, every brew shop was filled with endless variations on the idea of a false bottom or slotted pipes meant to sit at the bottom of the mash tun to collect all that sweet wort. After all, if it looks and feels like a professional brew system, it's better right?

Later, others, like Denny, began to promote using a simple stainless-steel braid to do the separation. Where other brewers fretted over proper distancing of pipes and slots from mash tun walls, the braid brewers let the water flow — fluid dynamics be damned — it still worked like a charm. The howls of indignation were loud in those early internet days.

Those howls would be repeated with the rise of the brew-in-a-bag brewers. No cooler? No separate vessel? Depending on a souped-up hop bag to hold back the weighty onslaught of wet grain? Your efficiency will nose dive! Your beer will be cloudy! Your beer will taste husky and astringent. Fly sparge, you fools!

But now that the dust has settled and we have companies like The Brew Bag offering professionally made bags, even the most ardent hater must grudgingly admit it works. (Drew: The Brew Bag bags are amazingly tough. No matter how much grain I've thrown at them, they take it.) Even old pros at homebrewing like the two of us as well as John Palmer and Jamil Zainasheff — have taken up brew-in-a-bag. In some cases, literally with a bag or using an all-in-one style system (e.g. Grainfather, Brewzilla, Robo-Brew, Anvil Foundry, etc.). After all, what is a malt pipe, if not a stainless steel "bag."

Before we tell you our tips about brew-in-a-bag, you may still have some skepticism in your heart. You see plenty of wood carved diagrams demonstrating older brewing processes with large mash tuns and using baskets to separate the wort and grain. (Drew: The major difference in the diagrams I've seen, brewers jammed baskets into the mash and ladled out the wort that ran into the basket. Almost as tedious as a decoction!) BIAB is a million times better than that as a process!

THE CRUSH

Our usual rule of thumb about crushing malt is: Crush until you're scared. Inevitably, every "hey, I missed my original gravity by X points!" comes down to the crush or overall beer volume. Assuming you're not accidentally making an additional half gallon (2 L) of wort, it's the crush. At least for values of X greater than, say, 0.08 gravity points. We've seen plenty of homebrewers freaking out about missing their target gravity by 0.02 points — say 1.050 instead of 1.052 – relax!

This is true regardless of mashing process, but for brew-in-a-bag, you can have more leeway to crush to your heart's content. No, you can't hammer mill your barley into flour and expect it to strain freely — for that you'd want a mash filter and if you can make one of those at the homebrew level, more power to you!

But with so many more "holes" and drainable surface area than your standard false bottom or other homebrew

Our usual rule of thumb about crushing malt is: Crush until you're scared.

Photo by Charles A. Parker/Images Plus

While fundamentals of brew-in-a-bag brewing are the same as split vessels, there are some differences that brewers need to consider.

filtering rig, a bag is much more forgiving of a finer crush. Again, don't be overzealous about it.

And while many of our thoughts apply to "malt pipes," you'll need to be more crush judicious since a malt pipe system doesn't convey the same overall filtering space as a bag. Having said that, still crush it like you mean it!

Denny: Like Drew implies, crush is pretty much dependent on the equipment you use. The grain and its size may have a large impact as well. The old "use a credit card to measure gap spacing" may be a good place to start, but it may not be the solution for everyone. Pay attention to how your mash reacts and adjust your crush according to that. I'm lucky in that all my systems can use the same crush and it is very fine. I run the gap on my JSP adjustable mill (2-roller) as tight as it will go for every brew.

Drew: Meanwhile I use a Monster Mill MM-3 with three rollers. You need to do something seriously weird to not get a fine crush from that piece of gear.

GO SMALL

The one problem with this "as according to Hoyle" game plan via brew-in-a-bag is right there in the name — it's a big floppy bag that we're going to fill with grain and water. Lifting a tulle fabric bag filled with hot porridge is heavy, risky, and asking for a burn or a bum shoulder.

To that end, when we brew with a bag it's almost always a smaller batch. We both have small induction burner setups that allow us to quickly brew a 2.5-gal. (9.5-L) batch of beer. The smaller volume of grain and water make the whole thing more manageable. That's where we think brew-in-a-bag shines. Small volumes, quick brews, and quick turnaround times.

Beside the advantage of less weight, smaller batches make it easy — from a time and financial perspective — to explore different ingredients, different hop combinations, different yeast strains, or really spectacularly wacky styles. It's a whole lot easier to drink through 2 gal. (7.6 L) of Double Raspberry and Habanero Turkey Jerky Imperial Stout than a whopping 5 gal. (19 L).

DON'T BE A HE-MAN

Mash gets heavy in a hurry. For every pound (0.45 kg) of dry grain in the bag, you'll end up with over 4 lbs. (1.8 kg) of sopping wet mash before it drains (2 lbs./0.9 kg once drained). In other words – for a 10-lb. (4.5-kg) mash aiming for a nominal gravity of 1.054-ish, your bag after the requisite mash rest time will be about 43 lbs. (20 kg).

Now, maybe you've been hitting the gym and love your shoulder rows and shrugs, but for most of us, a 40-lb. (18-kg) row is right at the limit of safety. If you're planning on going bigger, we really suggest getting an inexpensive hoist in your ceiling. No ceiling? May we suggest adapting Alton Brown's Turkey Fryer Derrick? (https://altonbrown.com/how-to-build-a-turkey-derrick/)

Disclaimer: This can be dicey. Be sure your ladder is sturdy and everything is well put together. We're not responsible if your ladder collapses spewing hot wort everywhere!

By the way, this applies for the malt pipe systems as well. While many reasonably strong people can lift a 5-gal. (19-L) pipe the short distance you need to set it on the draining platform, the bigger systems (think 10 gal./38 L) recommend or come with built-in mechanisms to hoist the basket/pipe.

HAVE A LANDING PAD

Stealing a tip from our pal Chip Walton of Chop & Brew – have a landing pad. There are many forms of landing pads such as a drip grate, a drain bucket, or a big colander. If you can't suspend your bag, then at least rest it somewhere sturdy. When Chip came on our show to talk about BIAB, he used a clean BBQ grate over the top of his kettle and allowed it to drain without worry.

You could use a cleaned grate from your favorite Weber filled with memories of countless cookout hamburgers, but we really think your beer will be better with a new one without the extra beef grease.

WATER CONSIDERATIONS

One of the great benefits of BIAB is the ability to fire and forget on your water volume calculations. Many BIAB brewers run their mashes at full volume (a.k.a. no sparge water), you really just need to figure out initial strike water. Kettle full = batch size + boil off + absorbed water. In regards to how much water will be absorbed by the grain (after draining) the rough rule of thumb is 0.5 quarts per pound (1 L/kg) of grain. For our hypothetical 10-lb. (4.5-kg) batch, that's 5 quarts or 1.25 gallons or 4.7 L. With that extra water calculated, your kettle volume becomes your batch size plus boil off plus the water to be absorbed.

With great advantages, come great tradeoffs – OK, not really, but in the case of a full volume mash, you'll need to be vigilant about your water chemistry. This is because of the very thin mash ratio you're using in a full volume mash.

Where a standard mash uses ratios like 1.25 qts. per lb. of grain (2.6 L/kg), (3.13 gal./11.8 L for our 10-lb./4.5-kg batch), the full volume BIAB is around 3.1 qts. per lb. (6.5 L/kg). This matters because your pH can take longer to settle with the ratios this far skewed. You'll want to check your pH and not just guess at what your water will do. Use your favorite water calculator or use our favorite – Bru'n Water. (brunwater.com)

DON'T FORGET TO SPARGE OR DUNK

If you're not doing a full volume mash (our small countertop rigs can't), then you'll need to rig up a way to sparge your mash. For most of our brews, it's a simple grab a pitcher and slowly pour it over the suspended bag. (Bonus points – open the bag slightly and pour directly into the grain. This is also a place where malt pipes beat a bag.)

But if you happen to have a second kettle running with exactly the right amount of sparge water, there's no reason you can't dunk the bag into the second kettle, let it sit for 10 minutes and then drain back into the sparge kettle. When everything is drip dry, combine the two kettles and away you go.

Oh and if you're doing this, you can even start your boil early on your "first runnings" and get some extra concentration. This could prove useful for styles that you want to boost the malt character in. BYO

BY JASON PHELPS

APPLES TO APPLES!

New cider adventures

I frequently get asked what helped me get better at making cider and what has kept me experimenting with different ideas. The answer to both of these questions is simple: It's all about the adventure of finding the gems by trying different ingredients and techniques. In this article I will share two different wide open styles to take your cidermaking in new and interesting directions. First up is a look at the range of potential creativity of New England-style ciders, a style that undergoes chaptalization (sugar added) to increase strength. Raisins are also typically added and it is not uncommon to find the style barrel-aged. Some folks may call the style apple wine but there are some key differences.

Next up we will take a look at graf, an intersection of cider and beer with elusive historical roots, broad potential for expression, and a name right out of 20th century pop culture. To finish off is one of the more recent sources of excitement and cider-making inspiration for me; an annual group purchase of cider. The opportunity for social interaction, education, creativity and some healthy competition from buying cider as a group is not to be missed.

If a little creative inspiration is what you are looking for, look no further than the New England-style cider.

Photo by Charles A. Parker/Images Plus

NEW ENGLAND CIDER

If a little creative inspiration is what you are looking for, look no further than the New England-style cider. And no, that doesn't just mean it's a hazy.

So what is a New England cider then? We can define the "technicals" of this style based on the BJCP (Beer Judge Certification Program) 2015 guideline definition for New England cider, category C2A. Simply, this style represents cider that can be made as follows:

- From apples typically found in the New England region (predominantly eating apples, with high acid and medium tannins).
- Also containing adjuncts that both produce more alcohol but also impart flavors and aromas to the finished product. Brown sugar and raisins are two such examples.
- Alcohol levels are elevated to 7 to 13%.
- The finish can be dry to semi-sweet.
- Barrel aging is fair game, including used spirits barrels.
- Carbonation is a stylistic choice.

Overall, consumer choices for apples are generally constrained and overlapping, although everyone's local apple types will still vary to some degree. While the selected apple varieties are one part of this style, there are several other aspects that play into the cider as well.

In southern New Hampshire where I live I am lucky enough to have local farms that produce small harvests of an array of heirloom, vintage, and specialty apple varieties. These might include Russets, Baldwins, and Northern Spys, and more rarely names like Black Oxford and Hudson Gem. Finding a good blend is an adventure in its own right. But don't feel like you need to go out of your way to find New England-specific varieties in order to make a New England cider. Store bought juice like Martinelli's could be used as a substitute.

What else can we add? This is where things can get fun with this style of cider. According to the style guide, additions of white and brown sugars, molasses, small amounts of honey (otherwise it could be mead), and raisins are all acceptable. There is a lot we can do here with just different types of sugars, but once you add molasses or honey you should expect to be able to taste the flavors of those additions, as well as the increased alcohol. When it comes to raisins you can choose either traditional or the golden varieties commonly found on grocery store shelves. For a twist you could also use raisins dried from your

own or locally grown wine grapes.

This is a great style to try to experiment either with oak products you have on hand or a fairly neutral barrel. Soaking the oak in some form of spirits should add some spirit character to the final New England-style cider and is an element that is traditional for these ciders.

With the potential diversity of outcomes in this style we will need to seek further inspiration by getting our hands into the two New England-style cider recipes found below (Baked Apples and The Olde Country).

GRAF: AN OLD IDEA WITH A NEW NAME

The idea of fermenting apples and grain together is definitely not new. It's been documented as far back as 7,000 B.C.E. Despite that, it isn't a common style and does not have any identifiable history of production that can be used to understand how people in the past may have riffed on the theme.

This is where it gets really weird. The name graf as applied to a hybrid beer/cider beverage comes from Stephen King's *The Dark Tower* book series, so late 20th century (1982-2012) at the oldest. This seems like a happy accident, because no specific etymology has been documented for its inclusion in the series. So graf is something old that is new again, with a pop culture twist!

Because we don't know the full extent of what our forebearers have done with the intersection of beer and cider due to the missing history, we can only reflect on what has been documented on the style in the last decade or so since the introduction of graf in *The Dark Tower* grabbed the imagination of homebrewers:

- A blend of cider and beer, no specific ratio is agreed upon.
- Lightly hopped, mostly for complexity and a bit of balance.
- Higher alcohol (6%+) is thought to be more typical although "session" versions are considered valid.

This means a graf can represent many different expressions of more or less apple and malt flavor with a little hops, but let's consider what a specific example might actually look like in the Hello World recipe below.

The outcome of this recipe is a delightfully crisp, light and refreshing beverage that represents all three of the primary ingredients very well. There is a noticeable fruitiness, but not just apple, and there are other herbal and floral notes from the rice. The backbone of the malt

BAKED APPLES (NEW ENGLAND-STYLE CIDER)

(1 gallon/3.8 L, scale as needed)
OG = 1.068 FG = ~1.010
ABV = ~7.6%

INGREDIENTS

0.9 gal. (3.4 L) pasteurized apple juice (12–13 °Brix /1.047-1.051 SG, which is typically bottle strength)
12 oz. (340 g) dark brown sugar
¼ tsp. Fermaid O
5 g SafAle US-05 yeast (or similar strain)
30 g corn sugar (if priming)

STEP BY STEP

Mix the apple juice and brown sugar together until the sugar is dissolved. Sprinkle yeast on top and close the vessel with an airlock.

Ferment until the specific gravity reaches about 1.015 then cold crash. Once the yeast has flocculated and the active fermentation appears to have stopped, rack into a small keg and carbonate to 2.5 volumes. Opting to keep mine cold I did not stabilize with potassium metabisulfite and sorbate, but that would be necessary if the cider was being bottled or transported without temperature control.

THE OLDE COUNTRY (NEW ENGLAND-STYLE CIDER)

(1 gallon/3.8 L, scale as needed)
OG = 1.062 FG = ~1.010 ABV = ~7%

INGREDIENTS

0.9 gal. (3.4 L) pasteurized apple juice (12–13 °Brix /1.047-1.051 SG, which is typically bottle strength)
8 oz. (240 mL) unsulfured molasses
8 oz. (227 g) golden raisins, chopped
¼ tsp. Fermaid O
5 g SafAle US-05 yeast (or similar strain)
30 g corn sugar (if priming)

STEP BY STEP

Mix the apple juice, raisins, and molasses together until the molasses is dissolved. Sprinkle yeast on top and close the vessel with an airlock.

Ferment until the specific gravity reaches about 1.015 then cold crash. Once the yeast has flocculated and the active fermentation appears to have stopped, rack into a small keg and carbonate to 2.5 volumes. Opting to keep mine cold I did not stabilize with potassium metabisulfite and sorbate, but that would be necessary if the cider was being bottled or transported without temperature control.

HELLO WORLD (GRAF)

(3 gallons/11.4 L, all-grain)
OG = 1.050 FG = 1.008
IBU = 9 ABV = 5.5%

INGREDIENTS

3 lbs. (1.4 kg) Calrose rice (or similar)
2 lbs. (0.91 kg) Maris Otter malt
1 gal. (3.8 L) pasteurized apple juice (12–13 °Brix /1.047-1.051 SG, which is typically bottle strength)
4.9 AAU Bramling Cross hops (15 min.) (0.75 oz./21 g at 6.5% alpha acids)
½ tsp. amylase enzymes
11 g SafAle US-05 yeast (or similar strain)
90 g corn sugar (if priming)

STEP BY STEP

It is recommended to use a brew-in-a-bag system for this mash. Wash and steam the rice. Mash the steamed rice and crushed Maris Otter malt along with the amylase enzymes in 2.5 gal. (9.5 L) at 152 °F (67 °C) water for 30 minutes. Rinse the grains with 1 gal. (4 L) of 170 °F (77 °C) water. Bring it to a boil, boiling for 30 minutes. Add the hops at 15 minutes to flameout. Chill to 80 °F (27 °C) and transfer to a carboy. Add the apple juice and mix to combine. Sprinkle yeast on top and close the vessel with an airlock. Ferment until completion then package.

is present, but is restrained and does not prevent the flavors of the rice and apple to persist through.

For additional experience with this unique beverage I asked my fellow homebrew club member Brian Romanowski about what motivated him to try it and how his recent experiments had turned out. Tasting and discussing a recent graf of his is what put the style on my radar as I was brainstorming for this article. I had never made one until the Hello World recipe.

"I couldn't find any commercial examples of a graf. My first thought was to try to emulate a stout braggot (stout base beer with a noticeable portion of honey), a pretty tried-and-true mash up of its own that I had had a few times. I was thinking that the cider would be a good substitute for honey. The results were much thinner and lighter than I expected. My mistake was not accounting for the difference in density between honey and cider and my general understanding of recipe design. I'd recommend a more complementary style more similar in gravity to unfermented cider like a fruity saison."

BREW CLUB BULK BUY

In the section on New England-style ciders we talked about some of the purpose-grown fruit. If you live in an apple-growing region, you may find getting a unique pressing of apples with more of these cider-friendly varieties is better achieved as a team sport. The potential for getting cider at a group rate is the most beneficial reason to consider a bulk buy. But a larger volume purchase may also make it easier for a farm orchard to help you with a custom blend of apples. No matter how you do it, the fun social activity that ensues is even more exciting.

I've been a member of the Brew Free or Die homebrew club here in southern New Hampshire since 2010. For much of that time we've done a group purchase of cider and over the last seven years we've worked with a specific farm that has really helped make this activity a seasonal highlight for us. We've even attracted longtime, beer-focused members to make their first ciders because of how much fun we have.

I caught up with Josh Latham, the club coordinator for the annual cider buy and asked him to tell me about how the club rallies around this seasonal group activity.

I am interested in any observations about apples from your experience over a number of consecutive harvests.

JL: We chose to go with a local apple orchard for the past several years for a few reasons. First, they are a small family farm that I have been dealing with for several decades that treats their entire team with a great deal of respect. From a quality standpoint they use several antique apple varieties for their cider, and will increase the ratio used for our specific club pressing, which we generally get at $1 less per gallon than their house cider. They also don't use drops (fallen apples), which is a rather common practice in cider pressing, all leading to one of the best ciders in the state.

2016 was an interesting year because of the massive drought that the state was dealing with. It resulted in much smaller apples with a higher sugar content. About 20% higher than we typically see. They were super concentrated with flavor that year.

Tell me about the social event on bulk buy day, typically in early November. Then what happens?

JL: Members will generally bring ciders from past years as well as snacks made with apple. The orchard farm makes some amazing cider donuts too. Annually we average 15 people and about 130 gallons (500 L) of cider, give or take. All of this makes for a great atmosphere to have members share techniques and ask questions of one another in a relaxed atmosphere.

Having everyone get the same base cider also sets up great club competitions because it lets members show how creative they can be with the same product. We generally run two competitions side-by-side, a people's choice for both a cider and a cyser (mead made with apple/cider). It's a little less structured and the two tracks means more lively discussions happen. It also makes it so everyone at the meeting can be involved, from entering to tasting, and ultimately judging to pick the winners. BYO

BY JOHN BLICHMANN

CELLAR CONSIDERATIONS

Planning and care

As brewers we know that the romance is in the brewhouse. Fine-tuning the malt bill for the finest balance, creating the perfect hop schedule with the latest hop variety for that ultimate flavor explosion for the customer. But the reality is that a lot of the magic of beer happens in the cellar. Here the wort and the yeast perform their beautiful dance to create the sublime beer that will be all the rave of the taproom. Or it hits a rock on the tracks and creates a train wreck of epic proportions . . . think exploding cans due to hop creep.

When working with nanobreweries-in-planning, a decent bit of time is spent helping to select a right-size brewhouse and even more time is spent helping to select the right quantity and size of cellaring equipment. It is rare for the brewhouse to be the bottleneck of production. Almost always the cellar is the regulator of capacity.

The key to success is having a solid plan for how much finished beer you will need to start and how much capacity you need to add as you grow. Study your local market to know what types of beers you may sell and how much. Check out the other breweries in your area, or visit communities similar in size and consumer type as yours. Breweries in other communities will likely be more open about what beers sell best, what quantities, and what proportions are sold in their taproom vs. what is sold in kegs or cans to other retail outlets. Take good notes and try to put together a sales plan for your business.

Too many brewers get caught in the mindset of brewing only what they personally prefer or what their heart and soul love to create. While creativity is a huge element of the success of the craft industry, it really needs to be balanced with the hard reality of the needs of the business. Homebrewers can afford to make whatever they want, experiment, tinker, dump batches, and be the artist of their brewery because their paycheck and bank balance don't come into play too much. There are two strategies to employ. You could tune into what customers in your area are buying, and make sure your cellar is adaptable to that. Or you could go out and focus on beer styles that are not commonly available and develop a niche brewery (e.g., sours, lagers, etc.). This information will be valuable as you determine needed tank capacity for aging ales, lagers, and other beverages you might be making to fill your market need.

TANK SIZING

Most of our nanobrewery customers have a few "flagship" beers that they may rotate seasonally, with the balance being a continual rotation of beers so customers always have something new to come in and try. There are a couple ways to manage flagship beers. One is to have one or two double-batch sized fermenters, and if you are not kegging all the beer, a matching bright beer tank. The balance can be tanks matched to your brewhouse size. Alternately, the flagship beer can just simply be fermented in separate vessels. This also allows you to brew on separate days of the week as opposed to back-to-back, or having to brew a second batch immediately the following day. That said, it now means you have to clean and manage a second tank.

A lot of running the brewery has nothing to do with brewing beer. Be sure to recognize your time is limited, particularly as a nanobrewery owner. Be realistic as to what you can get done. As a rule of thumb, brewing three days per week is fairly typical, particularly to start with. As your business grows you can

The key to success is having a solid plan for how much finished beer you will need to start and how much capacity you need to add as you grow.

Photo courtesy of Blichmann Engineering

increase that but you'll probably need to consider adding staff to allow for more batches per week.

Once you've determined your needed output, the next step is to determine how many tanks you need to start with and how many you'll need to meet your growth plans. Some of the key parameters that a nanobrewery-in-planning needs to consider when charting their cellar space are their brewhouse size, percent lagers vs. ales, and days per week they want to brew. Once those details are ironed out, it's time to place an order. Here is the link to our online planner tool that allows you to run multiple scenarios: https://www.blichmannengineering.com/tankplanner/index/index

GLYCOL SYSTEM

I cannot stress how important it is to plan ahead, even though you don't need to buy all the equipment upfront. Planning in advance lets you be prepared to expand quickly without having to build an addition to your building, or get delayed waiting for that long lead time glycol chiller to arrive. As the saying goes, the runway behind you does no good. In fact, many breweries add the plumbing for additional glycol hook-ups at the initial installation. It is also wise to add spare temperature controllers in your main control panel if you are not using tank-mounted controls.

Glycol systems are a vital part of your cellaring performance. And temperature control is the key to repeatability, healthy vigorous fermentations, and getting the best possible beer quality. This is NOT something to skimp on. The key to selecting a glycol system is two-fold. You should select a commercial-grade unit with excellent LOCAL service support. If the unit goes down, you need to get it back up and running as quickly as possible! And make sure the company you are dealing with is familiar with brewing applications. The second is having it sized for the capacity you'll need in the future. It is also helpful to select a chiller manufacturer that can provide an installation schematic specific to your system to avoid any startup issues, and have everything ready for expansion. An alternative is to plan for a second chiller as you grow. The advantage is backup. If one unit fails the second can maintain temperatures of the affected tanks. You may not have enough cooling capacity for crash cooling a tank, but you'll protect the beers you have actively fermenting.

EXPANSION CONSIDERATIONS

When to expand should be a trigger point from your sales and growth rate you planned for earlier. I highly recommend having a target sales rate at which you'll review your expansion plan. Be sure to do it early enough to order and receive additional tanks. A good rule of thumb: If you're debating it in your mind you should probably get off the dime and start ordering equipment. Recent supply chain issues have thinned the available inventory. Be sure to keep in touch with your suppliers letting them know your plans in advance to reduce your wait time.

With that said, be mindful of overly optimistic expansion plans based on exaggerated growth as well. Too many brewery owners end up in financial jams and eventual bankruptcy because they did not realistically model their growth. A brewery should be able to afford new equipment with zero additional revenue to prevent fiscal problems. Be sure to catch up on all of Audra Gaiziunias' columns to make sure your financial books are in order and you have a firm grasp on your cash flow before making a major investment in a cellar expansion: https://byo.com/writer/audra-gaiziunas/

CLEANING & MAINTENANCE

Brewhouse equipment cleaning and maintenance is fairly simple. Cellaring equipment, on the other hand, is in constant contact with the beer, so proper care and maintenance is vital to keeping your gear in top operating condition. When you are first commissioning your equipment always perform a thorough cleaning and a good passivation. Most manufacturers do clean and passivate the equipment, but some residual soils and grinding dust may remain on the surfaces. Work with your chemical supplier for specifics, but in general, a caustic wash and rinse, followed by a nitric or citric acid treatment will give a thoroughly clean surface that contains no free iron from the manufacturing process.

When brewers talk about passivating a tank, they really mean "thoroughly cleaning the surface and removing all free iron." When the surface dries and is exposed to air, the chromium in the alloy instantly reacts with it and forms the protective layer of chromium dioxide automatically. The brewer's job is to facilitate the meeting! So what exactly is free iron? Free iron can be carbon steel dust, grinding dust, or areas of stainless no longer protected by the chromium dioxide passive layer. This could be in the parent alloy material such as weld defects, or from a foreign object on the surface such as grinding dust. If left untreated, these defect areas can create a pit or rust where corrosion can accelerate rapidly. Frequent close inspections are highly recommended. If you do see a pit don't panic. It can be ground out and cleaned deeply with a pickling gel, and you can be on your merry way. Just note that DIY grinding projects can quickly end in failure when folks grind through thin-walled, small vessels.

For ongoing maintenance, we recommend passivating with nitric/citric acid about once per year. Remember, stainless isn't a magical alloy tolerant of all things we throw at it. It is predominantly iron, with enough chromium and nickel added to create enough corrosion-resistance to survive in the environment to which it is exposed. Never use chemicals longer than recommended and we don't recommend storing your vessels full of chemicals. Certain chemicals can cause permanent damage to the stainless and gaskets, including silicone butterfly valve seals!

As a small business owner and brewer you'll soon realize that time is a rare commodity divided between brewing, sales, marketing, purchasing, distribution, etc. So anything you can find to expedite processes without sacrificing quality is a must. A large time consumer is cleaning kegs. If you use a lot of kegs in your process an automated keg washer is a worthwhile consideration. A single head keg washer can clean and sanitize upwards of 20 kegs per hour. The added plus is the consistency and quality of the cleaning and sanitizing. It also doesn't require a lot of skill to run so the work can be delegated to "the new guy." BYO

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BY CHRIS GRAHAM

PEAK PERFORMANCE

Brewing on top of Mt. Whitney

I joined the MoreBeer! crew in August of 1998 (back then it was called Beer, Beer & More Beer) and I moved down to San Francisco, California (Bay Area) the same weekend my new business partners were set to climb and brew on Mt. Whitney. Mt. Whitney is not only the tallest peak in California at 14,505 feet (4,421 m), but it's the highest point in the lower 48 states. I didn't really think twice about it as I wasn't on the trip, but they did it and had great tales that soon became a distant memory as we embarked on growing our tiny company over the next 25 years.

Fast-forward to April 1st, 2020 and we started brainstorming fun things to do to celebrate the company's 25th anniversary. One of the partners, Olin Schultz, came up with, "We should brew on Mt. Whitney again." I asked what's involved and he made it sound super easy, but that we couldn't do it until the following year due to the need for a wilderness permit. "Sure," I replied, how hard could it be? I promptly forgot that I had signed up for the adventure. But several months later Olin comes into my office saying, "We got the permit in the lotto. We are set for end of July."

So I started to research the hike itself to prepare. As I'm not a hiker, I came to realize this isn't a half-day or even a one-day type hike, especially if we were going to brew on top. In planning, we were looking at a one day up, camp, next day to the summit where we brew; then either head all the way back to the trailhead or camp on the way back.

A few months before the hike I started thinking about what we were going to brew and quickly decided we would need to do a brew-in-a-bag (BIAB) as we wanted to do an all-grain batch. After several trips to outdoor supply shops I had pieced together a system to do a 1-gallon (3.8-L) brew and proceeded to do a test batch in our brew room here at work. The brew went well and I thought I had a solid plan.

A month or so before the hike, we were checking on everything and it seemed there was a problem with the permit . . . we had never confirmed our plans. But we learned there were alternate permits we could put in for cancellations. Unfortunately, these alternate permits were not for the original trail, now called "easy way," but for the backcountry John Muir Trail that gets you up to the summit in four days. Turns out it was a blessing in disguise as it gave us another month or so to train and plan.

The new permit also opened another opportunity: The California Golden Trout. Olin and I both fly fish and we'd only read about them. They live only in high elevation mountain lakes and streams in the Sierra Nevada . . . right where we would be hiking through! So instead of training, I spent countless hours at night on odd websites and forums learning how and where people caught them. We had backpacks brimming with gear for living outdoors, brewing, and now fishing. The first thing we did was weigh our bags and, whoops, both were well over 50 lbs. (23+ kg) . . . oh well.

Onto the brew. We got to the top of Mt. Whitney around 8:30 a.m. after hiking since 4 a.m. and it's in the 40s °F (upper single digits °C) and windy. Needless to say none of my numbers held true for strike water temperature, holding mash temperature, time to get to boil, etc. So we improvised. We ended up doing decoctions to get the mash up, which in hindsight was pretty cool. The beer was super hoppy as I started with a 1-gallon (3.8-L) recipe, but on night three of camping cut it to ½ gal. (1.9 L) after revisiting how much water would be needed to brew with. Check out the video using this QR code. BYO

We had backpacks brimming with gear for living outdoors, brewing, and now fishing.

Photo courtesy of MoreBeer!

MoreBeer! partners, Olin Schultz (left) and Chris Graham (right), brew a beer on top of Mt. Whitney to celebrate the company's 25th anniversary.

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