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JULY/AUGUST 2023

THE MAGAZINE OF THE AMERICAN HOMEBREWERS ASSOCIATION

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POSTMASTER

Send address changes to:
***Zymurgy*, 1327 Spruce Street**
Boulder, CO 80302

Printed in the USA.

Published by the American Homebrewers Association, a division of the Brewers Association℠. The purpose of the Brewers Association is to promote and protect small and independent American brewers, their craft beers, and the community of brewing enthusiasts. The Brewers Association is a not-for-profit trade Association under Section 501(c)(6) of the Internal Revenue Code. Offices are located at 1327 Spruce Street, Boulder, CO 80302 USA. Membership is open to everyone. ***Zymurgy*** (ISSN 0196-5921, USPS 018-212) is the bi-monthly journal of the American Homebrewers Association and is published six times per year. Periodicals Postage Paid at Boulder, CO and additional mailing offices. Canada Post Agreement Number 41197537. Annual memberships are $49 U.S. and $63 international and include a subscription to ***Zymurgy***.

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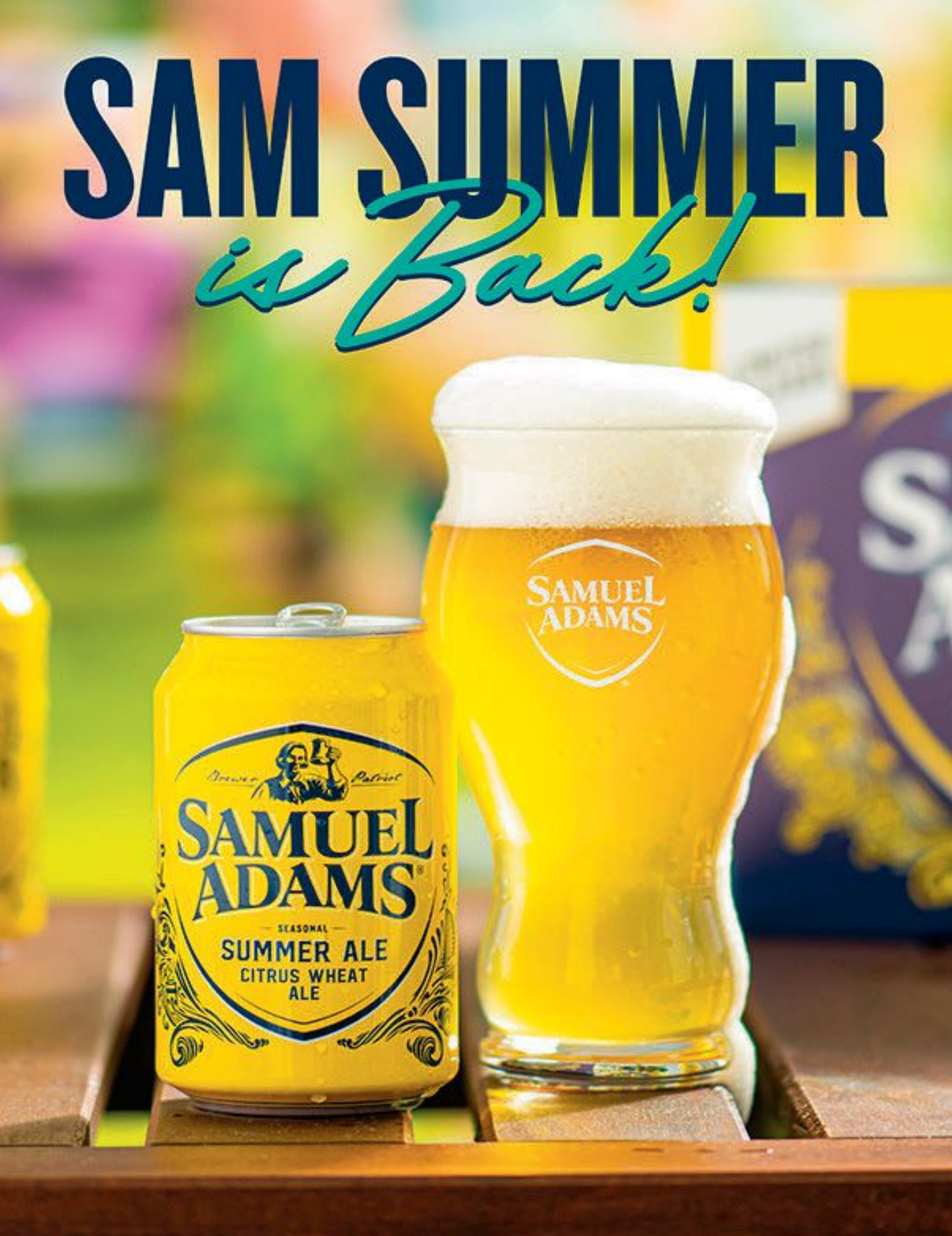
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EDITOR'S *Desk*

BY DAVE CARPENTER

Support Your Local Homebrewers

I love to visit breweries when I travel. I'm sure you do, too. Before I've even checked in for my flight, I've probably researched the local scene and dropped a few pins in Google Maps, perhaps with a note about what to sample at each venue. If your town's claim-to-fame brewery specializes in Continental lagers, I might head straight there from the airport: "Go now post haste, my good Uber, for the Pilsner is nigh!"

My wife would very much like me to introduce myself to taproom staff, but I usually prefer to remain undercover. Especially on vacation, enjoying a beer as a civilian instead of as a magazine editor, a Certified Cicerone, or a BJCP judge is a rare, simple treat. I also don't want to give brewery staff the impression that I somehow deserve special treatment. Lots of people judge and write about beer, and if we all got free beer at every turn, there'd be less of it to judge and write about.

I don't just visit breweries, though. I also like to visit homebrew shops when I travel. Here, I adopt the same incognito attitude I do at unfamiliar breweries. This is very much in contrast to my colleague Julia Herz, who I've not doubt introduces herself straight away, asks about business, and literally talks shop. Instead, I offer a hello and get to browsing the bounty. I have good reason for this.

Homebrew shops, meet me at camera three.

I don't usually introduce myself off the bat because I want to engage with your store as an everyday homebrewer, not as someone who might enjoy an "in." I want to see how a typical customer might be received. If the experience is positive, I'll eventually say, "Hi, I'm Dave. I work for the AHA," after which we'll have a lovely chat about the biz and geek out over Frohberg strains or the relative merits of tri-clamp and camlock. Depending on your licensing, we might even share a beer or two (which I'm totally good for, mind you).

If, on the other hand, you and your pals continue whatever important conversation you were in the middle of when I walked in, if you never ask if you can help me find anything, if you don't offer the impression that you're excited about homebrewing and you think newcomers should be, too, then I'll just find something to buy (I always buy *something*—I'm not a jerk) and take my leave.

I wish I could say that most of my under-the-radar homebrew shop experiences end in jovial, beer-fueled camaraderie replete with hearty knee slaps and a promise to pay each other a visit next time we're in each other's cities. Instead, I often leave with a few ingredients and a sense of disappointment.

"Oh no," you might say, "we're very welcoming at our shop."

Are you? Have you critically examined how your retail space presents itself and how you welcome new faces? Have you considered your shop's personality beyond the echo chamber of your day-to-day homebrewing friends?

Is it any wonder so many brick-and-mortar retail homebrew shops have had to shutter their doors? Recent economic conditions have not been favorable, to be sure, but the decline of retail was in place before COVID-19 came along. For brick-and-mortar homebrew shops to make it, much less thrive, it's imperative that they be more than just retail spaces.

I say all of this as someone who so badly wants to see the underdog not just survive, but dominate. I say this as someone who believes brick-and-mortar homebrew shops can serve as social and educational nexuses that strengthen their communities (see Editor's Desk, Nov/Dec 2019). I say this as someone who forgets to buy things in advance and needs a day-of option.

I know many shop owners are trying, and I'm pleased to have had rewarding discussions with many of you. You know who you are. But it's discouraging to have seen enough indifference to make such repeat experiences feel systemic. I think you, too, know who you are.

I'm not a retailer. I know retail is hard, and I don't pretend to have good advice on how to run a store. But I am still a would-be customer, and I can offer some unsolicited opinions, all of which are solely mine.

I like items to be labeled. I can't tell you how many times I've wondered what's in an unmarked box with neither a price tag nor any clue as to what's within. It might very well be a miracle widget that scavenges oxygen, fortifies yeast, boosts hop aroma, annihilates acetaldehyde, and makes tea while you wait. I would buy that thing from you at an irresponsible price, but I can't if I don't know it's there.

I like a *reasonably* clean shop. The floor needn't be surgically sterile or even all that tidy. But if your customers are wiping malt dust off their shoes *after* they get home, it's time to consider periodic sweeping, even a bit of mopping now and then.

I like shop employees to act like they care about beginners as much as they care about seasoned brewers. Maybe you don't care about beginners, and that's OK! Just *act* like you do. When an unfamiliar face enters your shop, assume they are genuinely curious about our hobby, and offer to help them. That first impression could mean the difference between a few minutes of browsing and many repeat sales.

I hear shop owners ask over and over, "What is the AHA doing to support shops?" It's a valid question, to which I suggest checking out the AHA's Homebrew Industry Support resources at HomebrewersAssociation.org/business-tools/industry-support. However, I also ask, "What is your shop doing to support your local homebrewers?"

Homebrewers are your homebrew shop's reason for being. Please give them good reasons to give you more of their money.

Dave Carpenter is editor-in-chief of Zymurgy.

304 Ss brewtech

The SVBS has become one of the most elusive products in Ss Brewtech history, but we're excited to announce it is finally here. With a clear vision of what we wanted, we had to bend a few rules. Countless design revisions, and one or two complete restarts, and we now have a product we feel will one day be as iconic as our original Brew Bucket. An all-in-one brewhouse that draws inspiration from every facet of Ss Brewtech, a true passion project for our entire the team, the SVBS.
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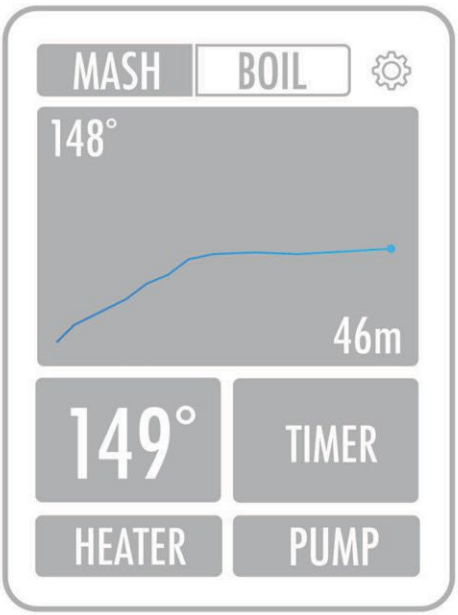

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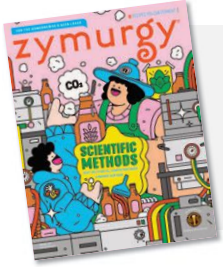

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Vol 46 • No. 4
July/August 2023

zymurgy®

(zī'm ɚr jē) n: the art and science of fermentation, as in brewing.

ON THE WEB
Find these homebrewing recipes and more on our website @ HomebrewersAssociation.org/homebrew-recipes

NOW ON Tap

BA Diversity, Equity, and Inclusion Mini-Grant Program

The Brewers Association (BA), parent organization of the American Homebrewers Association, has supported diversity, equity, and inclusion (DEI) efforts through the DEI Mini-Grants Program since 2019. This program provides funding for events, media production projects, and educational and training initiatives that work to create a more inclusive and diverse craft beer community for brewers, industry partners, and beer lovers everywhere.

The Brewers Association's Philanthropy and Outreach Subcommittee invites proposals from individuals and organizations creating virtual, in-person, or hybrid events, media projects, and educational and training initiatives that will be developed and/or executed in 2023. With homebrewing's integral role in the craft beer community, the BA grant program accepts proposals that foster diversity, equity, and inclusion within the hobby-beermaking community.

Proposals for 2023 projects are accepted on a rolling basis through October 31, 2023. Awards of up to $5,000 are available and may not exceed 25 percent of a project's proposed budget. For more information on the application process, including eligibility details and lists of past grant awards, visit BrewersAssociation.org.

STRATEGIC GOALS FOR THE DIVERSITY, EQUITY, AND INCLUSION MINI-GRANTS PROGRAM

1. Increase access to and responsible appreciation of craft beer for underrepresented populations and those who have experienced barriers to accessing the broader craft brewing community.
2. Promote employment and ownership opportunities in the craft brewing community for members of underrepresented populations and those in the craft brewing community who have experienced barriers to access and advancement.
3. Celebrate the diversity of the craft brewing community and increase the visibility of underrepresented groups and experiences.
4. Develop cultural competence and increase the adoption of diversity, equity, and inclusion best practices among members of the broader craft brewing community.
5. Leverage the strengths of the craft brewing community to fight injustice, eliminate disparities, and provide solutions to an array of challenges that impact those who produce and enjoy craft beer.

Illustration © Getty/melitos

Prairie Beer Awards 2023

By Dave Cole

While judging the Alberta Beer Awards in 2021, Owen Kirkaldy and Morgan Flegg offered to help me start the Prairie Beer Awards. On my way back home from Edmonton, I got hold of the Saskatchewan Craft Brewers Association and the Manitoba Brewers Association and asked if I could create the competition. Both quickly said yes. After reaching out to several judge friends, I had assembled a full panel of highly ranked judges before I even got home!

Mark Heise of Rebellion Brewing and Matt Hamill of Red Shed Malting.

With Morgan's help, we reached out to several potential sponsors, and within a short time, many of them had confirmed their support. Even better, many signed up for four years of sponsorship, such as our Foundation Sponsor, Brunswick Steel. This demonstrated to me that there was a lot of long-term support and demand for this competition.

Before I organized the first Prairie Beer Awards in 2022, Manitoba and Saskatchewan did not have their own commercial competitions to show off their beers and directly compete with one other. Individually, Manitoba and Saskatchewan are too small to have their own competitions, and there is a long-standing friendly rivalry between us. So, together it is, and we are all the better for it.

There are many moving parts to a competition, and even more hurdles to get over. The greatest one is sponsors: how do we pay for this and keep brewers' costs as low as possible? We got super lucky and found businesses like Brew Ninja, who believed in us as much as we did.

The next hurdle was breweries. Manitoba and Saskatchewan collectively occupy 1.3 million square kilometers and have just three main cities—Winnipeg, Saskatoon, and Regina. By comparison, the entire United States, including Alaska, is 9.8 million square kilometers, while the continental U.S. represents 8 million square kilometers. Thus, taken together, Manitoba and Saskatchewan are about 13 percent and 16 percent the size of the entire U.S. and the lower 48, respectively—with less than 1 percent as many residents.

Jeff Allport of Nokomis Craft Ales.

We found partner breweries that allowed breweries to drop off entries and keep them in cold storage to ensure top-quality samples for judging. We also lined up free shipping between the three main cities, as freight is often the highest cost breweries face in competing.

BJCP competitions are double blind, which means judges have no idea what beer they are tasting. We try to be triple blind by having no local judges who might recognize a sample. If we do have local judges, they only get hard-to-identify categories like Hazy IPA and American Brown, which all taste very similar. A good judge should know their local unique beers.

I've been fortunate enough to travel to many different competitions—commercial beer, homebrew, and even barbecue. I've always tried to figure out who did what best and how to incorporate the best features of each into a competition.

I heard from a lot of breweries about low-quality feedback scoresheets, either in content or word count. Our judge pool →

Jeff from Nokomis.

Photos courtesy of Prairie Beer Awards

average rank is National, which is pretty much unheard of. We even had a Master judge stewarding for us in 2022! This year the average word count was 121 per scoresheet. We had set the minimum word count at 50, and no judge was anywhere near that. The top two judges averaged 185 words per scoresheet!

There are two general approaches to determining best-of-show winners: bottom up (eliminate the worst beers first) or top down (pick the best beers first). We decided to go with a top-down approach I learned from Malcolm Mackenzie. It is a very simple process.

Five best-of-show judges receive five entries at a time. Each judge picks their favorite beer, and everyone keeps those. Any entries not picked are eliminated. The next five entries come out, and each judge again picks their favorite from among the new five and last round's favorite. Everyone keeps the favorites, and the rest are eliminated. This process continues until all beers have been considered.

Technically, there could be five favorites in each round, but often one or two beers really stand out, so multiple judges often pick the same beers. Each elimination round starts with a new judge to reduce the chance that any one judge might dominate the process.

Once all the beers are out, the judges are left with up to five beers to discuss. These top five are re-poured to give judges fresh samples for deciding winners. With elimination rounds, there is minimal to no discussion, as your favorite is correct. This saves a ton of time and ensures each beer gets a fresh "first impression" instead of having 25 to 50 beers poured at once, which allows early beers to warm or fade by the time judges receive the final samples.

Little Brown Jug of Winnipeg took home best of show for its Black Lager schwarzbier, and of the 45 breweries that entered the 2023 Prairie Beer Awards, 33 took home hardware. A full list of winners is available at beerawardsplatform.com/prairie-beer-awards-regina-2023/results.


Little Brown Jug crew.

Proceeds from this competition support Sophia House and Carmichael Outreach, two valuable community assets in Regina. I am grateful to all our sponsors, judges, and stewards who helped make this event happen. Without your dedication, skill, and professionalism, there is no way we could do what we do.

Dave Cole is organizer of the Prairie Beer Awards.

Homebrew Con™

We hope to see you in San Diego as Homebrew Con 2023 gets underway just a few days after this issue of *Zymurgy* goes live. Whether or not you attend in person, all AHA members can take advantage of the educational sessions that take place during the conference. Session recordings will be available for all members to enjoy a few weeks after Homebrew Con concludes.

We'll have additional coverage of this year's conference in the Sept/Oct 2023 issue of *Zymurgy*, along with our annual feature of gold-medal-winning recipes from the National Homebrew Competition.

Homebrew Club Insurance

One way the AHA supports homebrew clubs is through the AHA's club insurance program, which offers U.S.-based, AHA-registered homebrew clubs affordable general and liquor liability insurance, as well as an option for directors and officers insurance. Such insurance coverage is typically too expensive for clubs to afford individually, but the AHA works with West's Insurance to collectively offer coverage at a very reasonable price. At press time, West's general and liquor liability coverage for clubs was expected to cost just $4.48 per club member per year (subject to change).

To make this insurance even more accessible, the AHA will reimburse a club's general and liquor liability insurance coverage premiums if 75 percent or more of that club's members, as reported to West's Insurance, are also AHA members. AHA members can update their club affiliations in the AHA database by logging into HomebrewersAssociation.org.

In the 2022–2023 enrollment period, 361 clubs obtained coverage through West's Insurance, and the AHA reimbursed premiums for 63 of them. Fifty-seven clubs opted to add directors and officers insurance to their policies.

The enrollment period for 2023–2024 club insurance—which covers policyholders from September 1, 2023, to September 1, 2024—is open July 1 through September 1, 2023. Don't miss this opportunity to get your club's insurance premium reimbursed while supporting the AHA at the same time. See HomebrewersAssociation.org for details.

Home Fermentation Day is August 5

Join the celebration of all things fermented on Home Fermentation Day! From our favorite homebrews to fermented foods, the American Homebrewers Association is your hub for fermentation recipes, techniques, and inspiration. What will you start fermenting on August 5?

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DIRECTOR'S *Cut*

BY JULIA HERZ

Are We Doing Enough?

Inviting All Walks of Life to Homebrew

My first brew day was 23 years in the making. That's how old I was when my friend Charlie Gunn and I brewed a Scottish ale extract kit in his parents' kitchen on what I refer to as a cosmically transformative Sunday. Four fast weeks later, we bottled the beer in repurposed Grolsch swing-top bottles. I was smitten from that first pop of the bottle cap and the initial malt-laden, perfectly carbonated, subtly ethanol-influenced sip.

Brewminories_Homebrew Club

Now, hundreds of batches later, I embrace the attitude of "once a beginner, always a beginner," on an unending journey to always learn more. If you identify as a newbie, well, then, welcome to the homebrew party. A top question I get from seasoned homebrewers is, "How can we get more people to homebrew?"

"How did *you* start homebrewing?" I respond. No doubt many stars had to align before we each poured water into kettle, set aside time, and actually brewed, right? One of those stars might have been your belief that brewing was cool and worth a *try* and that others around you would support you. Charlie and I had never homebrewed before, but we had both been inspired by others we knew who had brewed. Maybe you knew an experienced homebrewer to whom you related or looked up, possibly a family member, neighbor, or coworker.

To get more people to homebrew, we need seasoned homebrewers who inspire others. We need people who identify with those who mirror our own life experiences and backgrounds. The more walks of life who homebrew, the more who remain open minded to all brewing approaches, and the more who lead and mentor others, the more the entire hobby will grow.

The only requirement for enjoying homebrew is being of legal drinking age. Extract or all grain? Stovetop, patio, or garage? Soup pot, crawfish kettle, or brew sculpture? One, five, ten, or more gallons? Strictly beer, or mead, cider, sake, and fermented foods? Does not matter. Welcoming everyone and all brewing approaches is obvious and what we each deserve. Nobody should feel held to arbitrary standards of fermentation enjoyment.

Here are some quick-hit considerations for working to inspire others:

- ❏ Buy a kit for a newcomer and schedule (no squishy factor allowed—plan the date!) a brew day at their house. Helping somebody brew in their own home is like teaching a person to drive and putting them behind the steering wheel. That's when real learning happens.
- ❏ Invite a would-be homebrewer out for a beer. Use an AHA Member Deals discount at a participating taproom (AHAMemberDeals.org) and then take a tour to help them understand the brewing process.
- ❏ Establish an "all in on extract" mentality and support extract brewers as much as all grain brewers. All brewing approaches and all brewing ingredients are worthy of support.
- ❏ Be inclusive of all fermented beverages and fermented foods. What if you encouraged a newbie to brew a fermented beverage that resonates with what they already enjoy, including grape or fruit wine, or a beer that incorporates their favorite fruit, vegetable, or botanical?
- ❏ Use the AHA's annual homebrew holidays (see HomebrewersAssociation.org) as reasons and days to brew. If you're in a club, publish your homebrew holiday activities and all events on your website, and share those dates on your social media channels, too.

Cheers and let's celebrate who you brew with and all the beginners out there. Share your photos with us, too. Go to HomebrewersAssociation.org/your-homebrew-experience.

Julia Herz is executive director of the American Homebrewers Association. You can follow Julia's homebrew talks and travels on Instagram @ ImmaculateFermentation.

MARCH/APRIL Q&A
(And Appreciation)

Photo © Aaron Colussi

***Dear* Zymurgy,**
Thank you for the cover article of the Mar/Apr 2023 issue of *Zymurgy* featuring "Pulque: The Rebirth of Mexico's Ancient Brew!" As a longtime homebrewer of Mexican descent, I was pleasantly surprised to see pulque featured on the cover.

I made pulque for the first time in January to share at my mom's 90th-birthday celebration. I also brought some to share at my homebrew club meeting in February. I described it as "the Americas' version of mead," which resonated with club members. I'm happy to share that it was well received by the club, as well as by my family at the birthday celebration.

I will definitely continue making pulque and will try a variation of the pulque/beer hybrid recipe shared in the article. Thanks again for featuring pulque in the Mar/Apr issue. David wrote a wonderful article, and now I plan to travel to Guadalajara and visit a few of the pulquerías he recommended. *¡Salúd!*

Armando Torres
That Dam Brew Club, *Folsom, Calif.*

***Dear* Zymurgy,**
In the article "Re-Creating the Past" by Peter Symons in the March/April 2023 issue, the published recipe for the 1905 American Porter on page 49 shows a mash temperature of 144°F (62°C). That seems abnormally low for a single-step mash of any type of beer in which malt character or body are desired.

Porter is one of my favorite styles, and I have brewed it dozens of times, I am wondering if this is a typo, and should read 154°F (68°C). None of the other recipes in the article mash anywhere near that low a temperature.

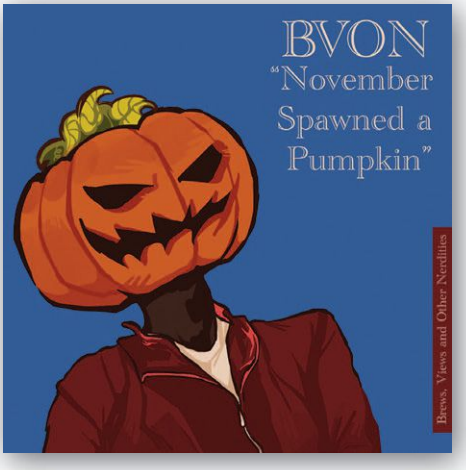
Thanks!
Jim Morris
Rocket City Brewers, *Huntsville, Ala.*

Good question, Jim. We asked Peter, and he says the* Brauer Manual *had no information about mash temperatures, which is why he turned to the* Handbuch *for advice. He cites this passage:

> For the production of ale and porter, the same upward mashing infusion is usually used here as for the production of lager worts, with the difference that the mashing temperature is usually 48-50° R., [60-62° C] since the mashing water is approx. 56° R., which means that as the beer is heated to mashing temperature immediately after mashing, beers rich in dextrin are produced. *The original text uses the Réaumur temperature scale, with Peter's conversion to Celsius shown in brackets above.*

It's not a typo, but given how much malts have evolved in more than a century, it's probably worth using your best judgement based on experience and the type of beer you like to drink. Hope that helps!

DEAR *ZYMURGY*
Send your Dear *Zymurgy* letters to **zymurgy@brewersassociation.org.**
Letters may be edited for length and/or clarity.



November Spawned a Pumpkin is the fifth beer brewed for the podcast *Brews, Views and Other Nerdities* (BVON). It was really supposed to be a Halloween-themed pumpkin ale, but it was delayed by a few weeks. The title and artwork are parodies on a musician often discussed on the show. Cheers! (Homebrewer 1 year, AHA member 1 year)

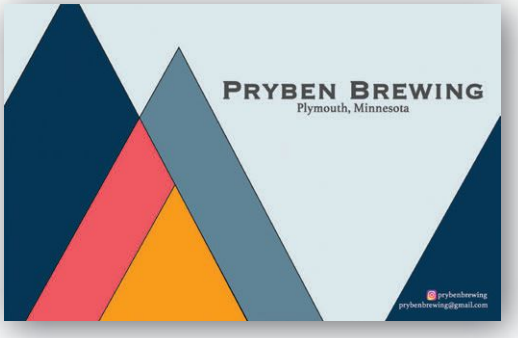
Leonard Martinez
Monterey Park, Calif.

I have been homebrewing for a while, and my wife and I came up with The Fermented Firefly as a name not long ago (she also created the logo). It pays homage to the arrival of the insect that marks the start of summer for us. I use photos I've taken as the backdrop for the beers we brew. They work well. (Homebrewer 8 years, AHA member 2 years)

Craig Simpson
Marion, Ohio

I really liked how this new design came out for my labels. The two large overlapping triangles represent my wife and me, while the the two smaller triangles within their intersetion represent my two sons. Hope you like it. (Homebrewer 24 years, AHA member 10 years)

Matt Johnson - *Plymouth, Minn.*



Catchy name for my home brewery, don'tcha think? Everyone wants happy butts. (AHA member 4 years)

Mike Butts
Fellowship of the Brew
Watertown, S.D.

SUBMIT YOUR LABEL

Do you make custom labels for your homebrew? Want it featured here in the pages of *Zymurgy* for all to see your work? Upload your label to **HomebrewersAssociation.org/your-homebrew-experience** and we will take it into consideration!

SCAN ME

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Homebrewing is all about sharing, and we get hoppy when *Zymurgy* readers share their homebrewing and fermentation experiences with us. We'd love to show the AHA community what *your* experience looks like. From 1-gallon batches on the stovetop to 20-gallon brew days on your custom sculpture, we all have fun with family, friends and pets while we make and enjoy our favorite beverage. Show us your brewing/fermentation day, who you brew with, the ingredients you include, what special processes you use, and how you enjoy the final product of beer and beyond.

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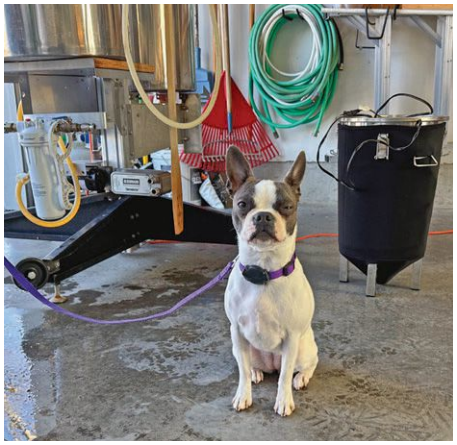
Brew Day! Two-tier pump and gravity system.
Richard Vargas
(Homebrewer 10 years, AHA member 2 years)
Golden State Brew Club
Stockton Calif.



Fiona the Boston Terrier waits patiently for me to finish brewing so we can enjoy a walk and a cold homebrew after.
Tim Howe
Blaine, Wash.

Harvesting the last hops with hophop dog Otis
Gerard Spin (Homebrewer 2 years, AHA member 1 year)
Drentebier
Gieterveen, Drenthe, The Netherlands

SHARE YOUR BEST HOMEBREWING SHOTS!
Homebrewing is all about fun and sharing. We would love to show others in the community what your homebrewing/fermentation experiences looks like. Upload photos of your homebrew related fun at **HomebrewersAssociation.org/your-homebrew-experience** and you may see it in the pages of *Zymurgy*!

SCAN ME

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MUSTARD

By Dave Carpenter

When it comes to Belgian cities, Bruges consistently takes the top spot for Instagrammable charm. With its winding canals, well-preserved medieval architecture, and pubs lurking around every corner, Bruges's romance and charm are undeniable. As Harry observed in *In Bruges*, it is a "fairytale f***ing town."

I like Bruges, but if I only had one day in the area, I would choose Ghent. For one thing, Ghent is slightly less crowded. Ghent also has Gravensteen castle, a well-preserved heap of medieval stones that features Europe's most entertaining audio tour. There's also plenty of excellent beer to be had at such venerable haunts as Dulle Griet, Het Waterhuis aan de Bierkant, and other equally impossible-to-spell venues. →

My preference for Ghent, though, is largely so I can hand over fistfuls of money to the condiment clerks at Yves Tierenteyn-Verlent, who produce what has been called the finest mustard in the world. Ghent's famous mustard firmly but respectfully punches the nasal cavity before yielding to a smooth flavor that leaves one pining for more. Tierenteyn-Verlent mustard is only for sale in the company's Ghent shop at Groentenmarkt 3 and at certain retailers in Belgium and The Netherlands.

If a trip to Belgium is in your future and you enjoy mustard, do yourself a favor and pick up some of this world-famous condiment while you're in Ghent. If, however, you are like me and unsure when your next European vacation might be, you can do the next best thing and make your own mustard.

Now, I don't even begin to suggest we can clone Tierenteyn-Verlent's mustard any more than we could clone a Magritte. We can aim for something close, but ultimately, *ceci n'est pas la moutarde*. However, homemade mustard can satisfy our own personal tastes much better than anything sitting on the grocery shelves right now.

MUSTARD VARIETIES

The two types of mustard seed you'll most commonly encounter are white mustard (*Sinapis alba*) and brown mustard (*Brassica juncea*). Black mustard (*Brassica nigra*) is less ubiquitous in North America but is an essential component of Indian cuisine. White mustard is the mildest, brown is considerably more pungent, and black can be downright punishing if you're not careful.

Prepared mustard, the condiment, can come in any number of forms and is infinitely adaptable. Here are a few of the most common varieties you might come across in your local supermarket.

- **American yellow mustard:** This is the stuff you grew up with. It probably comes in a yellow squeeze bottle, and it is the only valid condiment for ballpark hot dogs. The bright yellow color comes from generous additions of turmeric.
- **American "deli" mustard:** This is the stuff you might generically call brown mustard. It's spicier than the standard-issue stuff and complements deli meats very well, hence the appellation.
- **Whole-grain mustard:** This is the stuff that features whole seeds suspended in its mustardy matrix. The presence of whole mustard seeds isn't necessarily an indication of pungency, but in general, these tend to be middle of the road, not too hot, not too mild.
- **Dijon mustard:** This is the stuff you ask for when your Rolls-Royce pulls up next to another Rolls-Royce at a traffic light in the 1980s. Its signature acidity comes from the addition of white wine or, historically, verjuice. Its signature snob appeal comes from marketing executives.
- **Chinese mustard:** This is the stuff that comes in the little packets that accompany egg rolls and crab wontons from your favorite takeout spot. It's powerfully hot and, if done right, can make your eyes roll back in your head.
- **English mustard:** This is the stuff that you serve with English roast beef. Like Chinese mustard, it packs quite a punch. Jacob Marley might have been a blot of it.
- **Bavarian sweet mustard:** This is the stuff that accompanies the Weisswurst, pretzel, and Weissbier in a traditional Bavarian breakfast. Like the Bavarians themselves, this mustard is sweet but not spicy.
- **Düsseldorfer mustard:** This is the stuff that comes in a miniature beer mug at World Market. It's not as powerful as Chinese mustard, but it's considerably more pungent than plain American yellow.

These are what I consider "foundational" mustards, any lineage of which can be further bifurcated with honey, spirits, beer (!), spices, and so on to head in whatever direction you want to take it. Note the absence of a Ghent-style mustard. That's because there isn't one. Ghent-style mustard is just easier to say than Tierenteyn-Verlent.

TIPS FOR PREPARING AND FERMENTING MUSTARD

You can certainly make a great mustard using water or vinegar alone, but as this is *Zymurgy*, we're going to ferment ours. It's not terribly difficult. You need only prepare a brine of sufficient salinity to discourage growth of mold and spoiling bacteria. Mix crushed mustard seeds in said brine and allow it to sit at room temperature for a week or more.

Mustard seeds are less likely than vegetables to grow mold and other nasties, but it's still worth considering a fermentation weight to keep all the seeds submerged during fermentation.

Mustard seeds on their own don't have much pungency. Even grinding them into powder won't get you there. It's when mustard seeds come into contact with liquid that the enzyme myrosinase begins its work, revealing the sinus-clearing magic within. It takes about 10 minutes to reach peak pungency. For the spiciest of mustards, hydrate crushed seeds or powder only with cold water, as heat renders myrosinase less effective.

Hydrating with acidic liquid such as vinegar or white wine tempers enzymatic activity and, thus, the final pungency. It also helps stabilize the product, which is why prepared mustard almost always includes an acidic component.

Fermentation gets you a little bit of both worlds. Initially hydrating with a cold brine activates myrosinase. As fermentation progresses and lactic-acid bacteria render the environment increasingly acidic, the resulting acidity serves to naturally stabilize the heat and flavor.

Fermenting mustard has the potential to smell like rotten eggs. Storing it in your bedroom is, of course, ill-advised, but even keeping it in your kitchen may yield some aromatic surprises when you come home from work. You could always use a charcoal-filter airlock hack (HomebrewersAssociation.org/how-to-brew/homebrew-hack-diy-smell-proof-airlock/), but since the smell only lasts a couple of days, it's easiest just to find some out-of-the-way corner in which to hide it until the worst is behind you.

Ferment This!

Homemade Fermented Mustard

Recipe by Gabe Toth, reprinted from The Fermentation Kitchen.

This is not the yellow mustard you might be used to. The ground mustard seed (Colman's is a commonly available brand) packs some punch, similar to the spice that horseradish has.

INGREDIENTS

50 g	whole mustard seed (yellow, brown, black, or a combination)
60 g	ground mustard seed
7.8 g	salt
150 g	water
Herbs, garlic, chiles, or chile powder (all optional)	

DIRECTIONS

Pound the mustard seeds lightly in a mortar and pestle, just to break them open. Mix all ingredients in a pint jar. Cover jar with a lid and let ferment for a couple of weeks, then put into the fridge.

Photo © Getty/urfinguss

Once you've determined that your fermentation is complete, it's time to blend, season, and adjust for texture. This is where you can really steer your fermented mustard in a direction that pleases your palate and tickles your nasal cavity.

This is less about adding specific amounts of any one ingredient than it is about taste, adjust, and repeat. Do it a few times and you'll get the hang of it.

First assess what nature has given you. How salty is it? How acidic? Is there enough spicy heat or do you need more? These elements are adjusted with additions of salt, water or vinegar, and dry mustard powder.

I recommend starting by blending your lacto-fermented mustard to your desired level of smoothness. Unless you want an incredibly thick product, you're going to need to add some liquid to thin it out. This is where you choose to thin with water, vinegar (I like white wine vinegar), or a blend of the two. Choose vinegar to gain more acidity, or choose water to temper the acid that's already there. There may be some back and forth until you hit the texture you want.

Now season with additional salt if desired, and add dry mustard powder if you want more bite. Remember to wait about 10 minutes between dry mustard additions, as it takes about that amount of time for the enzymes to work their magic and fully express the level of heat.

If you've yet to tackle any of the other beer-adjacent ferments in *Zymurgy*, might I suggest you give mustard a try. Whatever you end up with is guaranteed to be a cut above.

***Dave Carpenter is editor-in-chief of* Zymurgy.**

Ferment This!

Gentse Mosterd

Recipe by Dave Carpenter

This is not, and is not intended to be, a clone of Tierenteyn-Verlent's famous mustard. The mustard produced there is not fermented, and even if it were, you can't source their same raw materials or follow their same exact process. Rather, this mustard is inspired by the fiery, velvety product that gets ladled from wooden barrels and into stone crocks in Ghent. Adjust as needed.

The main ingredients here are given as fractions, by weight, relative to the amount of mustard seeds used. So, if you start with 100 g of mustard seeds, you'll need 1.5 × 100 g = 150 g of water and 0.8 × 100 g = 8 g of salt. The blend of mustard seeds is up to you. If you prefer a milder product, focus on white mustard seeds. For something closer to what you'd get in Ghent, use a higher percentage of brown, or even black, seeds.

If I have some available, I like to add a little sauerkraut brine to my mustard ferments to kickstart the process, but that is entirely up to you. You could also use cultured whey or any pickled vegetable brine. For extra punishment, use fermented hot sauce brine.

INGREDIENTS

1 part by weight	whole mustard seeds
1.5 parts by weight	non-chlorinated water, cold or room temperature
0.8 parts by weight	non-iodized salt

OPTIONAL INGREDIENTS

30–60 mL (2–4 Tbsp.)	sauerkraut brine as a starter culture
White wine vinegar, to taste	
Commercial mustard powder such as Colman's, to taste	

DIRECTIONS

Coarsely crush the mustard seeds. Thoroughly stir the salt into the water to create a brine. Add the brine and the mustard seeds (and sauerkraut brine, if using) to a fermentation jar or crock, loosely seal, and leave to ferment for 7 to 14 days. The mustard seeds will greatly expand in volume as they absorb liquid.

Using a blender or food processor (an immersion blender works great in a wide-mouth Mason jar), blend your mustard to the desired level of smoothness. You may wish to add water and/or vinegar to thin out the final product, especially if aiming for a highly flowable product such as the one sold at Tierenteyn-Verlent. Use vinegar to heighten the impression of acidity or water to tone it down. Adjust salt level if needed by thinning with water or adding salt.

If your finished mustard isn't as nasally searing as you'd like, mix in some commercial mustard powder to increase the olfactory burn. As you get to know your mustard seeds, process, and preferences, you'll rely on this less and less.

Transfer your finished mustard to a clean jar and store in the refrigerator for a week before enjoying. In theory, it will last indefinitely. In practice, you'll want to start another batch sooner than later.

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WORKING WITH EXTRACT RECIPES

By Gordon Strong

The ability to convert between all-grain and extract recipes is a skill every brewer should master. You shouldn't have to pass on a great-sounding recipe just because it's all-grain and you only brew extract beers. Likewise, you might sometimes find wonderful extract recipes in basic brewing books and want to brew them on your all-grain system. →

In the United States, more than half of all brewers are extract brewers [as of 2015], but the percentage of all-grain brewers keeps growing. Homebrewers in South America are all-grain brewers because malt extract is not available. Don't make the assumption that brewing using a particular method equates to skill level or experience. Brewers of all skill levels might need to convert recipes to suit their needs.

My recipes are all-grain because that's how I brew. I'm not comfortable giving extract versions if I haven't actually brewed them. I am, however, more than happy to describe the conversion process so that you can adapt them yourself.

CONVERTING ALL-GRAIN RECIPES TO EXTRACT

I'll first give you my method for converting recipes, and then walk through an example and discuss the various points where there might be alternatives. The basic method involves substituting malt sources; more advanced approaches look at other aspects of the beer (I'll cover those separately). Note that this method uses the US customary measurement system (sometimes colloquially known as English units), but the quantities can be converted to metric afterwards, if needed.

1. **Address malt first –** In the recipe, separate the mashed grains from the steeped grains. Steeped grains are crystal malts, dark/roasted malts and grains, and anything that does not contain convertible starches. If it's already a form of sugar, leave it alone, it doesn't need to be converted. Mashed grains are generally base malts (two-row, pale ale, Pilsner, Vienna, Munich, and similar) that make up the bulk of the grist.
2. **Get recipe parameters –** You'll need to have the batch size and the system efficiency in the recipe. If this information isn't present, you'll need to calculate it (recipe software can help). I'm assuming you'll be brewing a batch of the same size as the original recipe (if you're not, see the Advanced Topics). Keeping the volumes equal allows you to use the original recipe's OG and IBU, saving you considerable time and effort.
3. **Calculate total gravity points contributed by base malts –** Add up the total pounds of base malts. Multiply this number by the system efficiency. Then multiply the product by the theoretical extract from the base malt. This can vary by type of malt, but is generally 36 to 38 points per pound (if you are unsure, use 37). The result represents the total number of gravity points in the wort that must be replaced by extract.
4. **Replace gravity points with an equivalent amount of pale extract –** If you want to substitute liquid malt extract (LME) for the base malts, divide the total gravity points contributed by the base malts by 36 to get the pounds of LME (or liquid sugars) required. If substituting with dry malt extract (DME), divide the total gravity points contributed by the base malts by 45 to get the pounds of DME (or dry sugars) required. If you want to use both LME and DME, keep in mind that the total gravity points contributed by malt extract should match what was contributed by the base malts in the original recipe.
5. **Steep steeped grains, then boil with extract –** The most common extract brewing process involves putting crushed specialty grains in a mesh bag and holding it in the strike water at 150–170°F (66–77°C) for between 15 and 30 minutes. After the grains have been removed, the malt extract is added, and the kettle is brought to boil. From this point on, the converted recipe should be the same as the original (hop additions, chilling, fermentation, and packaging).

As an example, consider this partial recipe for a dark mild:

- ❏ 6.5 gallons @ 1.036 (75% efficiency)
- ❏ 7 lb. Maris Otter
- ❏ 12 oz. Crystal 65
- ❏ 7 oz. Chocolate malt
- ❏ 0.5 oz. Target hops @ 60 (15 IBUs)
- ❏ Wyeast 1968 yeast

Using my process step by step, we can convert this to extract:

- Base malt: 7 lb.; steeping malts: 19 oz. (12 oz. + 7 oz.)
- Batch size: 6.5 gallons; Efficiency: 75%
- 7 lb. • 0.75 • 37 points per pound = 194.25 points
- 194.25 / 36 = 5.4 lb. LME (or 194.25 / 45 = 4.3 lb. DME)

The converted extract recipe would be:

- ❏ 5.4 lb. Pale liquid malt extract
- ❏ 12 oz. Crystal 65
- ❏ 7 oz. Chocolate malt
- ❏ 0.5 oz. Target hops @ 60
- ❏ Wyeast 1968

Steep crystal and chocolate malt in mesh bag in 8 gallons 158°F water for 15 minutes. Remove bag from water, add liquid malt extract, bring to a boil, and boil 60 minutes.

Be sure to check your calculations:
5.4 lb. • 36 points per pound = 194.4 points.
19 oz = 1.2 pounds. 1.2 lb. • 30 points per pound = 36 points.
194.4 + 36 = 230.4 points.
230.4 points / 6.5 gallons = 35.4 points per gallon
35.4 is close to 36, or 1.036 starting gravity; recipe validated.

With rounding and approximation, the number won't usually be exact, but should be close. Note that I also averaged the gravity contributions from specialty malts, using 30 points per pound for combined crystal-type and dark malts. For a more accurate calculation, calculate the contributions independently.

With me so far? Let's try a bit more complicated example. Consider this Belgian dubbel:

- ❏ 6.5 gallons @ 1.064 (70% efficiency)
- ❏ 7 lb. Pale ale malt
- ❏ 3 lb. Munich malt
- ❏ 2 lb. Dark Munich malt
- ❏ 1.5 lb. Aromatic malt
- ❏ 4 oz. CaraPils
- ❏ 8 oz. CaraMunich 60
- ❏ 6 oz. Special B
- ❏ 1 oz. Chocolate wheat malt
- ❏ 1 lb. Dark candi sugar
- ❏ 1.5 oz. Styrian Goldings @ 60
- ❏ 0.5 oz. Saaz @ 15
- ❏ 0.5 oz. Saaz @ 2
- ❏ Wyeast 3787
- ❏ 22 IBUs

Editor's Note: *This excerpt from* Modern Homebrew Recipes: Exploring Styles and Contemporary Techniques *by Gordon Strong has been lightly edited for length and style.* Modern Homebrew Recipes *and many other Brewers Publications® titles are available for free until December 31, 2023, with purchase or renewal of an AHA membership. See HomebrewersAssociation.org for details.*

OK, maybe a lot more complicated. A version of this recipe was my first all-grain batch, since I knew I couldn't get the same malt flavors from extract. But let's see how close we can get when following my process:

- Base malt: 13.5 lb. (pale, Munich, dark Munich, Aromatic); steeping malt: 19 oz. (CaraPils, CaraMunich, Special B, Chocolate wheat); sugar 1 lb.
- Batch size: 6.5 gallons; Efficiency: 70%
- 13.5 lb. • 0.7 • 37 points per pound = 350 points
- 350 / 36 = 9.7 lb. LME (or 350 / 45 = 7.8 lb. DME)

The converted extract recipe would be:

- ❏ 5 lb. pale liquid malt extract
- ❏ 4.7 lb. liquid Munich malt extract
- ❏ 4 oz. CaraPils
- ❏ 8 oz. CaraMunich 60
- ❏ 6 oz. Special B
- ❏ 1 oz. Chocolate wheat malt
- ❏ 1 lb. Dark candi sugar
- ❏ 1.5 oz. Styrian Goldings hops @ 60
- ❏ 0.5 oz. Saaz hops @ 15
- ❏ 0.5 oz. Saaz hops @ 2
- ❏ Wyeast 3787

Steep specialty malts in mesh bag in 8 gallons 158°F water for 15 minutes. Remove bag from water, add liquid malt extracts and candi sugar, bring to a boil, and boil 60 minutes.

Be sure to check your calculations:
5 lb. • 36 points per pound = 180 points
4.7 lb. • 36 points per pound = 169 points
19 oz = 1.2 pounds. 1.2 lb. • 30 points per pound = 36 points. 1 lb. candi sugar = 45 points
180 + 169 + 36 + 45 = 430 points
430 points / 6.5 gallons = 66 points per gallon
66 is close to 64, or 1.064 starting gravity; recipe validated

Did you see the extra trick I slipped in (it's something I cover in the advanced tips)? I noticed that some of the base malts included Munich-type malts (Munich, dark Munich, Aromatic) so I separated those from the pale ale malt, converted them into Munich malt extract, and used the more common pale malt extract for the pale ale malt.

This method will result in beer similar to the all-grain version, but it is unlikely to taste exactly the same due to the differences in ingredients and methods. If you're a perfectionist and want your extract brew to be an even closer match, there are still a few more advanced methods you can try.

ADVANCED TOPICS IN EXTRACT RECIPE CONVERSION

Not all recipes are easily converted. Sometimes there are ingredients that can't be found in extract form, or sometimes the recipe needs to be adapted to the size or idiosyncrasies of your brewing system. Rather than overly complicate the basic recipe conversion procedure, I've separated out the special cases and optimizations. Use any or all of them if they apply, and you want to make your recipe more accurate. Many of these methods can be calculated using recipe software.

Concentrated boil – If doing a concentrated boil (boiling less than the full wort volume, adding water post-boil to reach the target volume; sometimes called a partial boil), your original bitterness calculations will likely be wrong. The extraction of bitterness from hops is gravity-dependent, with higher gravities resulting in lower hop utilization. A concentrated boil has the same amount of sugar in a smaller quantity of water, so the gravity will always be higher. You can correct for this difference by first calculating the bitterness obtained using the parameters of the actual boil (which is a higher-gravity, smaller-sized batch than the full recipe), then further reducing the bitterness due to dilution as the partial boil is topped up with water in the fermenter.

If you're confused by what that means, here's a quick example. First, let's handle the dilution factor. If you have 3 gallons of 1.060 wort, and you top it off to 5 gallons by adding water, the final gravity of that batch will be 1.036. To reach that number, take the gravity points of the concentrated boil (60) and multiply by the volume (3) to yield the number of gravity points in the wort (180). Adding 2 gallons of 1.000 water doesn't change the total gravity points, just the volume. So the final gravity is the number of points of sugar (180) divided by the batch size (5), which gives 36, or 1.036 specific gravity. You could also do this by percentage scaling, if that makes more sense to you. The concentrated boil (3) is 60% of the total volume (5), so you can multiply by 0.6 to get the same answer.

How do you calculate hop bitterness? If you're only boiling hops in the concentrated boil, you need to determine the bitterness based on a 1.060 gravity beer, not a 1.036 beer. Perform the standard bitterness calculations using the higher gravity and actual boil volume, which will estimate the bitterness of the concentrated boil. You can scale IBUs the same way as the specific gravity because IBUs are a measure of isomerized alpha acids in solution (diluting the bitterness with additional water reduces the IBUs accordingly). Apply the same scaling factor based on batch size to get the estimated IBUs of the final beer.

The basic point to remember is that if you use a concentrated boil, you will have to add more bittering hops to reach the same level of perceived bitterness as the full boil recipe. There are other limiting factors; remember that it's nearly impossible to get more than 100 IBUs in a beer, so if your concentrated boil is above that limit, you should cap it. You won't get an 80 IBU beer by diluting a 160 IBU beer with an equal portion of water since a 160 IBU beer can't exist.

Different volumes – For homebrew-size recipes, you can typically apply a batch scaling factor to the weight of the malt and hops to get an equivalent recipe. If you want to brew a double-sized batch, double all the ingredients. If you want to brew a half-sized batch, halve all the ingredients. If you're converting a 6.5-gallon recipe to 5 gallons, use 77% as the scaling factor (5.0 / 6.5 = 0.769). This isn't perfect math, but it's close enough for the batch sizes homebrewers use. Recipe software works wonders for this type of scaling.

Matching malt to extract – You can replace specific malts with "varietal" flavors (if available), but that can be expensive. Some styles (such as bocks) depend more heavily on the flavors of Munich or Vienna malt, for instance. Some brewers writing 5-gallon recipes will add in a pound of Munich (maybe 10% of the grist) here or there just to increase the overall maltiness (guilty as charged). If

the flavor of a specific malt is an important part of the style profile, try to use an extract version of that malt. If an ingredient is used only as an accent, it's not vital to the recipe and can be substituted.

Munich, wheat, and rye malt extracts exist, and can be used as substitutes. It's also possible to find Maris Otter extract, which is pretty important for many English beer styles. You may need to search some of the larger online homebrew retailers for these products if you don't see them in your local shop. Given their specific uses, they can sometimes be hard to find.

I tend to use pale or extra pale LME and DME as much as possible. If using amber or darker extracts, you often have no idea what malt produced the color; therefore, the flavor of the extract is a big unknown (for example, was dark extract made using chocolate malt, roasted barley, black malt, dark crystal malts, caramel coloring, or something else? They all have different flavor profiles). You also have no idea what mash program was used, so you won't know the wort composition or fermentability. In general, I assume that pale malt extract is made with pale ale malt, and extra pale malt extract is made with two-row or Pilsner malt. If the malt extract comes from a certain country, I might further assume that the flavor will have a character typical of base malt that originates from there.

If you can obtain information about the composition of the malt extract, you can do a better job matching the extract to the base malt. Modern extract often comes with more information, and some is produced from single varieties of malt. Read the information packaged with extract carefully, as you might not be getting what you expect. For instance, some wheat extracts are actually a blend of a pale malt and wheat malt in a ratio common for brewing German weisse beers. You don't want to assume that it is 100% wheat malt, because it may be 50–65%, and throw off your recipe. Instead of just using the blend, you'd want to substitute the wheat malt extract for both the pale and wheat malts from the original recipe in the same proportion.

The earlier section on Ingredient Substitution has other ideas that you might want to use to add flavors that might be present in the all-grain base malt but not in the extract. If there are character malts in the grist that are providing flavor and not gravity points, you can steep them or perform a mini-mash. Note that steeping starchy grains will add unconverted starch to your wort, which could lead to clarity problems.

Some of the starch will likely go away as part of the break. Anything darker than light Munich malt that isn't a crystal or roasted malt falls into this category. I would generally treat these as minor grist additions, unless it has a signature flavor (dark Munich, brown malt, etc.). I'd generally use a mini-mash for these, or in a pinch, steep them since I care more about their flavor contributions than potential problems with clarity.

Eliminating small grist additions – Sometimes all-grain brewers have personal preferences for including a little bit of certain malts as a "house character" ingredient, or add in certain grains only for their side effects (adding body, assisting with head retention, adjusting color). These grains can often be eliminated since the issues they are trying to address are generally not present in extract beers. For instance, if you see a brewer including less than 5% wheat malt in a recipe, chances are they included it to improve head retention. Small additions of CaraPils, flaked oats, flaked barley, dextrin malt, and the like are typically used to increase body. Less than 1% of a dark grain or malt is likely just to add a darker hue to the appearance, or to add a touch of dryness. As I mentioned previously, up to 10% of Munich or Vienna malt is likely being used to increase the general maltiness of the beer, and can be converted to pale malt extract (unless you want to perform a mini-mash).

Converting First Wort Hop additions – First wort hopping (FWH) is difficult to perform on extract batches since you never lauter the beer. You could mix together the full volume of extract and water, raise it to mash temperature, then slowly syphon it into another pot, and bring it to a boil when done. But it's probably easier to convert it to traditional additions. You could try using the FWH addition as a 20-minute boil addition instead, as equal levels of perceived bitterness and some hop flavor should persist. Or you can calculate the IBU contributions of the FWH addition and add those IBUs through a flavor addition and a bitterness addition. Use the same quantity of FWH hops as a flavor addition at 10 minutes, calculate the bitterness of that 10-minute addition, and calculate how many hops need to be added at 60 minutes to reach the same level of IBUs. Or you can ignore the flavor contributions of the FWH hops and use them as a straight bittering addition at 60 minutes. That's admittedly a little sloppy, but certainly easy.

Accounting for the mash schedule and fermentability – Several mash techniques bring flavor and body contributions to the beer. For example, a step mash increases fermentability and attenuation, a decoction mash increases the maltiness and color of the beer, as well as improves efficiency and attenuation, and higher-temperature rests build body. An all-grain brewer controls wort fermentability through selecting rest temperatures in the mash program; if the rest temperatures are too high, or the wort contains excessive dextrins, then the wort fermentability is likely to be too low.

If your beer lacks sufficient fermentable sugars (i.e., you wind up with a high final gravity), next time substitute sugars for some of the malts. Corn sugar and plain table sugar are both highly fermentable and add little, if any, flavor. If the body of your beer is too thin (due to an excessively fermentable wort), reduce the amount of plain sugars. If there are no sugars in the recipe, add some malt with dextrins such as CaraPils. Start with 2 or 3% of the total fermentables.

If your recipe uses a decoction mash, try adding Munich malt (which is also available as an extract). Dark Munich and aromatic malts can all provide the extra color and flavor commonly produced during decoction mashes. You can add these (depending on the style, but try to limit them to 5 to 10% of the total fermentables to start), but you may cause other problems (such as needing to perform a mini-mash).

Economical purchasing quantities – While it's easy to crunch the numbers to find the necessary amounts of extract you need to exchange for malts, you can't always buy exactly the right amounts due to how they are packaged. So you wind up buying more than you need, and not using it all during that brew session. Using full cans or jugs of LME can reduce the possibility that the remaining amount will oxidize and ruin future batches. DME is more stable, as long as you keep it dry. Measuring DME over a pot of boiling water is a bad idea since steam can enter the bag and cause the powder to solidify.

It may be advantageous to first determine the weight of the LME you can buy in an individual container, then use whole multiples of that weight in your recipe. Determine the number of gravity points each container contributes (weight of container • 36), and then divide that into the total number of gravity points needed. Take the whole number of containers (mathematically this is the quotient) and allocate that towards LME. Calculate the remaining gravity points; this value is what the DME needs to contribute. Divide those gravity points by 45 to determine the number of pounds needed (it's easier to weigh out fractional amounts of DME than LME).

CONVERTING EXTRACT RECIPES TO ALL-GRAIN

To convert an extract recipe to all-grain, perform the extract conversion procedure in reverse. Keep specialty or steeping malts the same, but replace malt extract with grain. You will still need to know your mash efficiency to perform the calculation.

Determine how many gravity points are contributed by extract (multiply the weight of liquid extract by 36, and the weight of dry extract by 45). Sum those calculations to determine the total gravity points from extract. Divide that number by 37 to determine how many gravity points from base malts are needed. Finally, divide that number by your mash efficiency to determine the total weight of base malt needed.

Your next task is to choose which base malts to use. If there is a specialty type of extract used (such as Munich), then use Munich malt for that fraction of the grist. The remainder of the grist can consist of two-row, Pilsner, or pale ale malt if the beer was using pale malt extract. Look to the style of the beer to give you clues as to the proper type of malt rather than relying on a certain brand.

Start with a mash temperature of 150°F (66°C). You can adjust that if you know the style requires it, such as increasing the mash temperature if your beer needs a more dextrinous body. If you are brewing a style that traditionally uses another type of mash technique, you can obviously use that instead.

Converting extract recipes to all-grain is generally easier than going the other way since you have more control in your ingredient choices. Primarily you are seeking to hit the same gravity numbers first, then adjusting the bitterness to get the same balance, then finally selecting the ingredients that give you the desired flavor profile while hitting the color target. If you get the style parameters right, any mistakes made on the flavor profile can be adjusted in subsequent batches through malt substitutions. But if you selected your ingredients with knowledge of the style, you have a very good chance of being close on your first try.

Gordon Strong, author of* Modern Homebrew Recipes: Exploring Styles and Contemporary Techniques *(Brewers Publications, 2015) and* Brewing Better Beer: Master Lessons for Advanced Homebrewers *(Brewers Publications, 2011), is the only three-time winner of the coveted National Homebrew Competition Samuel Adams Ninkasi Award. He is president emeritus and highest-ranking judge in the Beer Judge Certification Program, and principal author of the BJCP Style Guidelines and the BJCP Mead Exam Study Guide.

CARBON CAPTURED

MITIGATING THE NEED FOR PRESSURIZED CARBON DIOXIDE IN HOMEBREWING

Editor's Note:
This is the first in a three-part series exploring how homebrewers can reduce their consumption of commercially purchased, compressed carbon dioxide and even make use of CO_2 naturally produced from fermentation.

By Andy Tipler and Pierre Margraff

Illustration by Emans

A few months ago, our southern-Connecticut homebrewing community had a nasty shock when local gas suppliers were unable to refill or exchange pressurized carbon dioxide (CO_2) cylinders. We were also told that there would probably be no further supplies until well into 2023. What a disaster!

This came as a complete wake-up call for many of us to learn how dependent we really were on the availability of this pressurized gas in our regular homebrewing activities. How could this happen? Surely, the world has too much CO_2 already, as evidenced by climate change concerns about its greenhouse effect.

A quick internet search revealed many articles explaining causes for the shortage, including production cuts during the pandemic, evolving cannabis production, COVID-19 vaccine production, and even contamination by gases from an extinct volcano. All these factors seemed to create a perfect storm, and where beer is involved, CO_2 producers obviously prioritize their biggest clients—who are not homebrewers!

The severity of this CO_2 shortage may vary between locations, but there seems to be a real and current need to address it if we want to continue brewing our favorite beers. In this, the first in a series of three articles, we explore various options that are readily available to homebrewers to reduce our need for process CO_2. In homebrewing, we typically use compressed carbon dioxide for three things:

1. Purging vessels of oxygen before and after filling with beer to prevent oxidation
2. Force-carbonating flat beer
3. Pushing beer out of a keg for serving

What can we do to improve the methods we use for these, and what alternatives do we have at our disposal?

ELIMINATING GAS LEAKS

The first step in more efficient CO_2 use is preventing waste in the first place. How many of us have been disappointed to discover an empty CO_2 tank connected to a depressurized keg? Much of this is common sense, but there's no need to consider more exotic options if we haven't got this straight!

CO_2 is compressed to high pressures. A tank of CO_2 will indicate about 500 psi (35 bar) on the regulator's primary gauge. The purpose of the regulator is to reduce the tank pressure to a working level of about 10 to 15 psi (0.7 to 1 bar) for dispensing beer and other purposes. The appropriate pressure depends on the length and diameter of the draught lines and the temperature of the beverage. Leaks are often readily located simply by spraying a non-toxic solution of Star San over all junctions, and then watching and listening for bubbles. →

First, consider the junction between the tank and the regulator. A few different types of washers could be sealing the junction: nylon, plastic, or a more permanent one made of brass with an O-ring. If it's nylon, trimming burrs around the washer with a nail clipper can improve the seal and make it easier to install. Unfortunately, others can't be easily modified.

Most regulators are equipped with a side gauge that indicates tank pressure, ostensibly so you know to prepare for a refill when the needle hits the red. The top gauge indicates the dispensing pressure, and a knob or screw is used to adjust pressure. Most regulators also have a small shut-off valve. Any of these connections can be potential sources of leaks.

A common culprit for leaks on regulators is the inner rubber diaphragm, which can age and wear out. It's possible to replace the aging diaphragm on a leaking regulator, and many manufacturers offer rebuild kits to render your old regulator as good as new.

A tank that isn't secured properly can easily fall and damage a gauge, and a damaged gauge may spring a leak. All junctions, gauges, knobs, and threads should be sprayed and inspected for bubbles and hissing, and then promptly wiped with a soft cloth.

The next culprit for leaks is the junction between the shut-off valve on the regulator and the lines leading to the keg or gas manifold. There are three common types of connections used by homebrewers. The first type, and the most reliable for permanent installations, is a barbed-type connection with a clamp to keep the hose in place. This connection is inexpensive and effective. To install, use a hose of a slightly smaller diameter than the barb fitting. Carefully dunk the hose tip in boiling water to soften it, then stretch it around the barbed fitting. As it cools, the vinyl will shrink very tightly around the barbed fitting.

Another common method of connecting the beer line uses a ¼" flare fitting and a female flare-to-barb adapter. Because this is a metal-to metal connection, a nylon washer is needed between the two pieces of metal. Omitting this washer, or using an old one, is a good way to get a gas leak.

The third type of connection is a push-to-fit connection, introduced a few years ago by John Guest brand fittings, with more recent Duotight fittings performing the same function with an additional O-ring. These push-to-fit connections can be unreliable if your hoses have not been cut perfectly straight, or if the hose is subject to kinks or tugging. Push-to-fit connections are fantastic for beverage lines but are not recommended for gas lines.

A gas manifold is often a culprit for leaks because it acts as a junction to multiple kegs. The integrity of the fittings should be verified using the methods above to ensure that no leaks are found.

The gas line leading to the keg disconnects, and of course the kegs themselves, also demand a thorough evaluation. Because of the multiple junctions on a Corny keg, it's easy for leaks to develop, especially older units. First, the keg should be cleaned and pressurized. A small quantity of food-grade lubricant should be applied to all O-rings to ensure a good fit, especially around the lid. Next, a clear bucket is filled, halfway with water and the keg is turned upside down and submerged in the bucket of water. Any bubbles will indicate a leak. Keep a set of O-rings, universal pressure relief valves, and universal poppet valves on hand for leak testing. It is also recommended to use transparent or semi-transparent tubing to monitor potential liquid ingress that could allow mold to grow in the gas lines.

KEEPING OXYGEN OUT OF BEER WHILE FILLING A KEG

The next target for eliminating potential waste is the way we purge air out of kegs before filling them. We want to minimize contact between the beer and air to avoid oxidation problems later. So, what is the best way to remove air (or its effects) from a keg? A few options are available to us, all of which involve pressurized CO_2.

Henry's Law

Before we delve into the various options for eliminating oxygen exposure, let's first consider why this is important. If air comes into contact with beer, then some of the oxygen in the air will pass into the beer.

Table 1 shows typical dissolved oxygen levels at various stages of production and packaging (these data appear in many publications, but we couldn't source their origins). It looks like commercial brewers will expect an increase in concentration of oxygen, added during beer packaging, of around 20 to 250 ppb.

To hold our homebrewed beer to a similar or better standard, we need to know the maximum amount of oxygen in the air that will allow us to remain below this threshold. This can be calculated using Henry's Law, which relates the concentration of dissolved gas in a liquid to the concentration of that gas at the liquid-gas interface (i.e., the headspace). If you know one, then you can calculate the other. One form of this relationship is given as

$$k_{H,cc} = \frac{c_{aq}}{c_g}$$

where

- $k_{H,cc}$ is the Henry's law constant for concentration ratios (0.035 for oxygen in water at 20°C/68°F)
- c_L is the concentration of O_2 in the liquid (g/L)
- c_G is the concentration of O_2 in the gas (g/L)

The value of the constant for oxygen in beer is very close to that of oxygen in water.

We calculate that keeping the CO_2 concentration in the packaged beer below 250 ppb means we need less than 1.1% oxygen in the air in contact with that beer. You can do these calculations yourself, but we've made life easier for such masochists by creating a spreadsheet to do it for you.[1] Of course, it will take a long time (many hours) for the oxygen to pass from the air into the beer to reach those levels—if the keg is not shaken!

Now let's look at the options available to us to meet this requirement.

TABLE 1: BREWING PROCESS OXYGEN LEVEL

In wort	6–14+ ppm
Fermentation	< 30 ppb
Filtration	1–200 ppb
Bright beer after filtration	1–200 ppb
Beer at the filler	1–200 ppb
Package dissolved oxygen (bottle)	30–250 ppb
Package dissolved oxygen (can)	20–120 ppb
Total package oxygen	50–450 ppb

Blast-In CO_2 Method

In the past, some of us may have gotten into the habit of rather naïvely just connecting a CO_2 tank to the gas post on a Corny keg and letting CO_2 blast under pressure into the keg for a few minutes: should be enough, shouldn't it? We don't bother to measure the flow rate or even time this process. How many of us are doing just that?

Let's do the math and find out how effective this method is. If we assume that CO_2 fully mixes with air as it enters the keg (which is likely at these high flow rates), we are essentially performing an exponential dilution of the air (and, thus, the oxygen) inside the keg. We can model the behavior for the decrease in oxygen concentration and the volume of gas added by using the functions given below:

$$C_t = C_0 \bullet e^{\left(\frac{-u \cdot t}{V_k}\right)}$$

$$V_t = U \bullet t$$

where

- C_t is the concentration of oxygen in the keg at time t (% v/v)
- C_0 is the initial concentration of oxygen in the keg (% v/v)
- V_t is the volume of CO_2 added at time t (L)
- u is the flow rate of CO_2 gas into the keg (L/min)
- V_k is the keg capacity (L)
- t is the elapsed time (min)

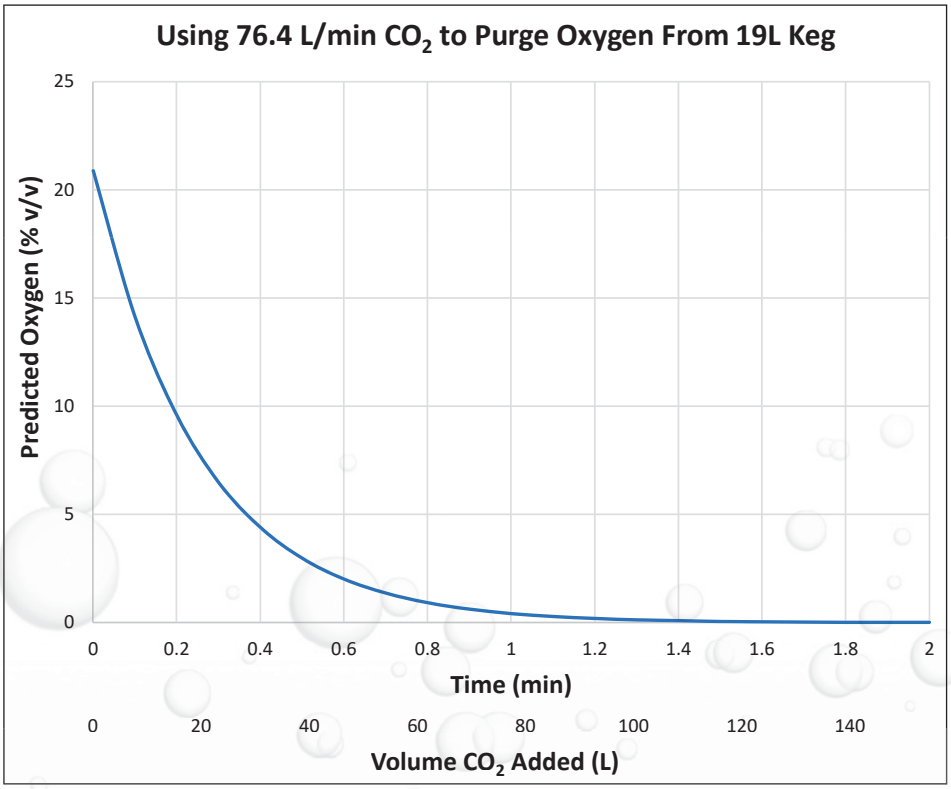
This calculation is included in the downloadable Excel spreadsheet for you to model your own kegging system.[1]

Let's take the system described above. We're blasting carbon dioxide into a 19-liter keg (ours was measured to be 19.606 liters to the rim). We had no idea what the flow rate was, so we weighed the CO_2 tank before and after blasting the keg for a minute and found that we had used 150 g of CO_2, which is equivalent to a volume of 76.4 liters at ambient temperature and pressure, so our flow rate was about 76.4 L/min.

We assumed that the initial concentration of oxygen in the air inside the keg was 20.9% by volume, which is the global average for oxygen in atmospheric air. We entered these values in the spreadsheet and could see how efficiently we expunged oxygen from the keg. Figure 1 shows how the oxygen level was predicted to decrease with time and volume of CO_2 used.

In one way, this chart is encouraging: it was predicted that in just 1 minute, there would be 0.4% oxygen left in the keg. However, we would have used about 80 liters of CO_2 to achieve this, which is about 8 percent of a full 5-pound tank of CO_2! Decreasing the flow rate increases the time taken to make this purge, but it doesn't significantly affect the volume of CO_2 needed. More time also allows more air to diffuse back into the keg. This is not a very efficient way to use our CO_2.

FIGURE 1: BLAST-IN CO_2 METHOD.



CO_2 Pressure-Pulse Method

Another option might be to seal the keg and repeatedly pressurize and vent the CO_2 inside using a pressure pulsing method to drive out the oxygen. Would this be any better? The functions to model this method are

$$C_n = C_0 \bullet \left(\frac{P_a}{P_p}\right)^n$$

$$V_n = n \bullet V_k \bullet \left(\frac{P_a}{P_p} - 1\right)$$

where

- C_n is the concentration of oxygen in the keg after n pulses (% v/v)
- C_0 is the initial concentration of oxygen in the keg (% v/v)
- V_n is the volume of CO_2 added after n pulses (L)
- V_k is the keg capacity (L)
- P_a is the ambient absolute pressure (psia)
- P_p is the pulsing absolute pressure (psia) (= gauge pressure + P_a)
- n is the number of pulsing cycles performed

Again, a worksheet is provided in the downloadable file to model this method on your own system. So, is this method any better than the exponential dilution method? Figure 2 shows how efficient this method is at removing oxygen.

Under these conditions, after four pulses, the oxygen level was predicted to drop below 0.4%. However, filling and venting a 19-liter keg to and from 30 psig is tedious and time-consuming, and it looked like we would need to use about 160 liters of CO_2 to achieve this result. This is not an efficient method of using CO_2 either.

CO_2 Blanket Method

Carbon dioxide gas is about 50 percent denser than air, so if we add a small layer of it into the bottom of the keg, air should float upon it. If we now feed beer into the keg below this layer of CO_2, it should remain in place as a barrier between the beer and the air. Perhaps this is what many of us think happens when we blast CO_2 into an empty key.

Two phenomena fight against this as a successful method: turbulence, which enhances mixing, and diffusion, which is the natural movement of a gas from a region of high concentration to one

of lower concentration. This method is difficult to model theoretically, so we performed some experiments to find out how effective this blanket method could be.

Our first experiment was simple: we placed an oxygen gas sensor 2 centimeters from the bottom of a dry, partially sealed keg and carefully added CO_2 to the bottom of the keg. We used a rotameter and needle valve to deliver a low controlled flow of 1 liter per minute for 6 minutes. If none of the CO_2 mixed with the air above it, it would form a layer 20 centimeters in height from the bottom of the keg, and the sensor should be totally immersed in CO_2. When the CO_2 supply was disconnected, the sensor read 0.7% oxygen. We then waited while the sensor recorded the oxygen level. Figure 4 shows how the reading changed during this test.

Once the CO_2 supply was disconnected, there was an immediate but slow increase in the oxygen level, presumably from diffusion with the air above. If it took 10 minutes to fill this keg, then the beer would be exposed to 3% oxygen above it, assuming no physical mixing during filling. This is a reasonable result, but hopefully we can do better. Note that we only used 6 liters of CO_2 for this method, which is a huge improvement over the blast-in and pressure-pulse approaches.

Sustained CO_2 Blanket Method

The blanket method seemed to work until the CO_2 was disconnected. Perhaps, once the blanket is created, we could sustain it with a lower flow of CO_2? The problem here is how to continue adding CO_2 to the surface of the beer as it rises within the keg during filling. Our answer was to use a device that floated on the beer to deliver the flow of CO_2.

We developed and 3D-printed such a device, which is shown in Figure 5. It's beyond the scope of this article to describe all of those details, but we provide a link at the end of the article if you'd like to try this at home.[2] It's essentially two very flat circular plates mounted a fraction of a millimeter away from each other. CO_2 enters through the center of the top plate and exits the device through the gap around its circumference. In this way, gas is distributed evenly around the

FIGURE 2: CO_2 PRESSURE-PULSE METHOD.

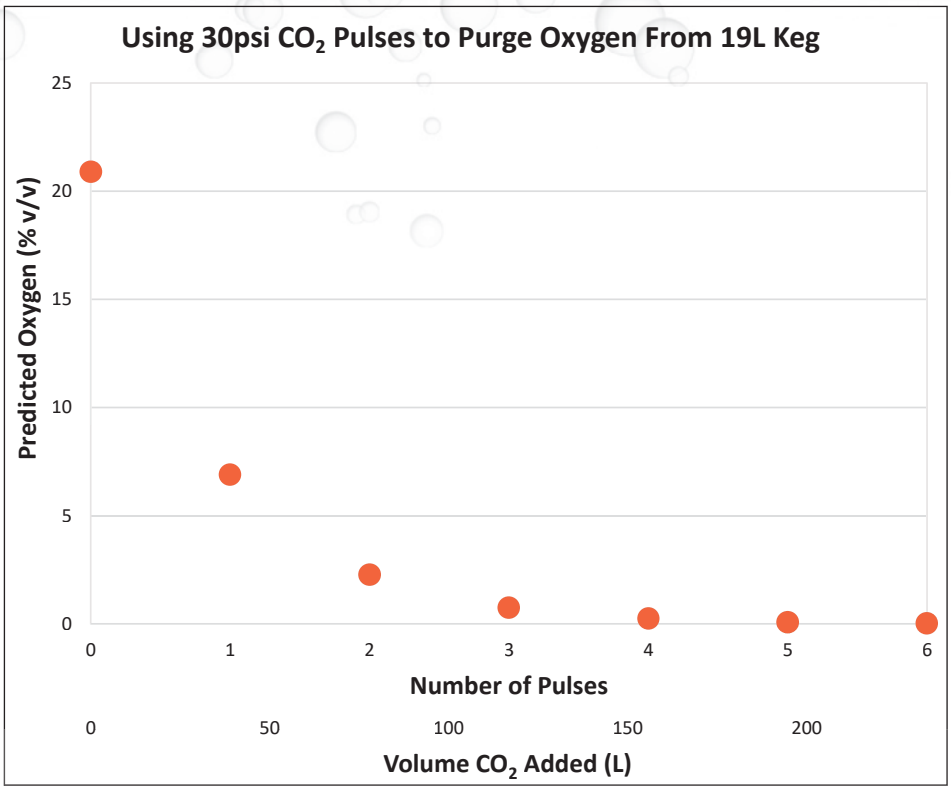
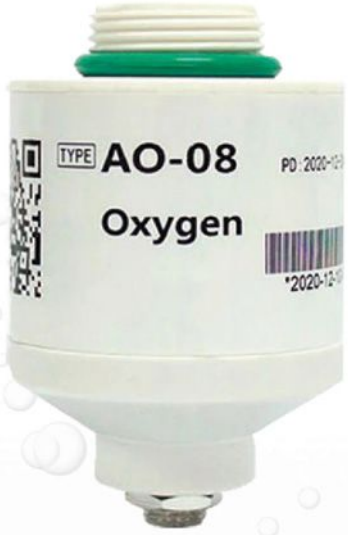
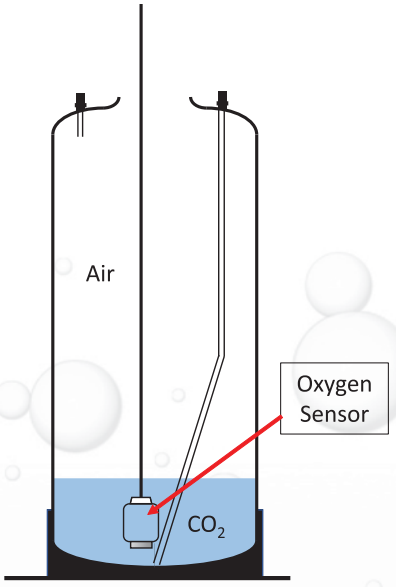


FIGURE 3:
LEFT TO RIGHT: **ROTAMETER, OXYGEN SENSOR, SCHEMATIC OF BLANKETING METHOD.**





Photos © courtesy of Andy Tipler & Pierre Morgraff.

FIGURE 4: CO_2 BLANKETING METHOD.

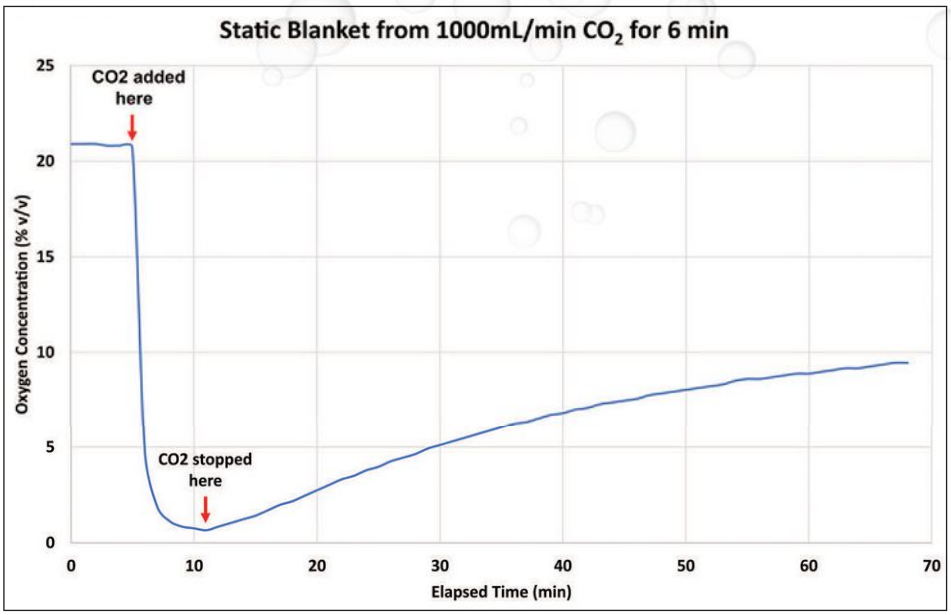


FIGURE 5: CO_2 DELIVERY DEVICE.

FIGURE 6: SUSTAINED BLANKET METHOD.

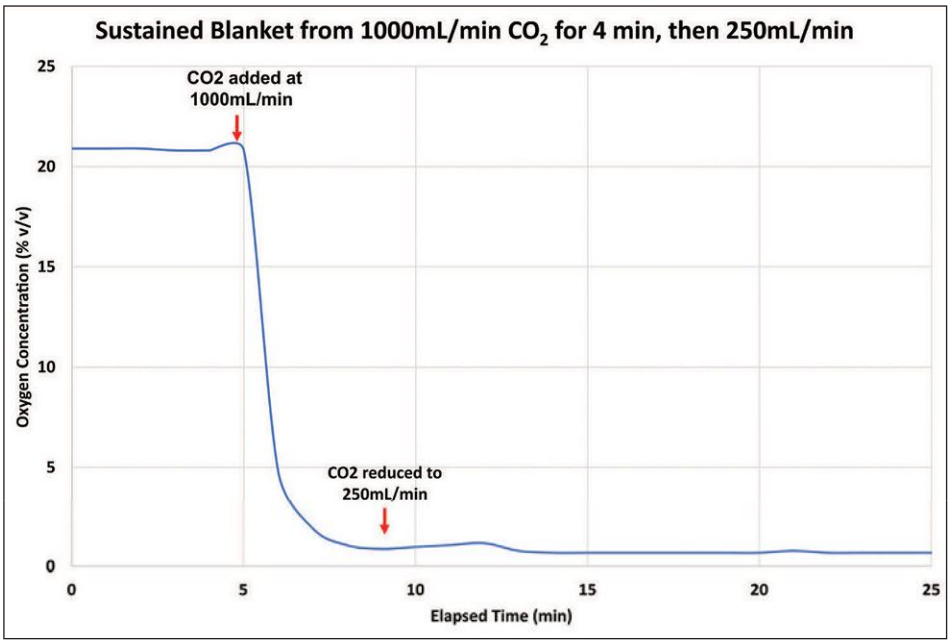


FIGURE 7: FLOATING FOAM METHOD.

assembly in a horizontal direction with very little turbulence. We used the same rotameter and needle valve as before to control the flow rate of CO_2 going into the device.

We placed the device at the bottom of the empty keg, alongside the oxygen sensor and fed in CO_2 at 1 liter per minute for 4 minutes, which should give us an initial blanket of 4 liters and establish an initial blanket height of around 7 centimeters. We then reduced the flow rate to 250 mL/min to see if this would stop the diffusion we saw in the last test. As before, we waited while monitoring the oxygen concentration.

This time, not only did we create an effective blanket, but we were able to sustain it long enough to fill the keg. If it took 10 minutes to fill a keg, we would have used 6.5 liters of CO_2 total. The oxygen level remained about 0.7% during filling. This is a big improvement on the static blanket result.

Floating Foam Method

This next method for keeping oxygen out of beer as it fills a keg is perhaps the simplest and most effective. The CO_2 blanket worked reasonably well when it was continually renewed using the floating gas distribution device, but it requires a special part to be made. Another way to get CO_2 to sit on top of the beer as it fills a keg is to use beer foam.

Foam is a collection of bubbles that are less dense than beer and therefore float. If the foam breaks up, just make some more of it. Bubbles are essentially a thin layer of liquid (in our case, beer) surrounding a volume of gas (CO_2). This thin layer won't

absorb much oxygen itself, and the passage of oxygen in and out of a bubble is slow. Once oxygen is inside a bubble, it will try to get out again, which means it must pass through other bubbles. This whole process is very slow, and there could be a layer of dozens of bubbles thick between the air above and the beer below, making foam a very effective oxygen barrier.

The practicalities are easy. Get an aerating wand (one with a 0.5-micron porosity is best), stick it right down into the keg, feed CO_2 into the aerator, and start adding beer from the bottom of the keg through the liquid dip tube or a racking cane. If there's too much foam, turn down the CO_2 flow; if the foam dissipates, turn up the CO_2. Use a fine aerating stone (0.5 micron) and a rotameter to control and monitor the flow rate of CO_2 used. Once the beer is fully loaded, the foam can fill up the headspace, helping to purge air from that area.

We haven't conducted any tests to measure the efficacy of this method (we're not sure what such a test would be), but we're sure that it must work really, really, well. It doesn't need any special equipment either. A benefit of this method is the very low flow rate of CO_2 needed—we found that 50 to 100 mL/min worked well. Thus, to fill a keg in about 10 minutes, we would need less than 1 liter of CO_2! This is, by far, the most efficient use of CO_2 for this purpose.

Although we've not seen this floating foam technique used for filling kegs, it has been used to fill cans and bottles, and "cap on foam" is common advice for packaging from kegs.

Liquid Displacement Method

This is another very effective method of keeping air out of a keg while filling. By first completely filling the keg with liquid, we effectively eliminate all the air within. We then feed CO_2 into the keg to displace the liquid and end up with a keg full of CO_2 and no air (or oxygen) before filling with beer. Many brewers already use this method today. There are a few points to note about this method:

- It's best to use a sanitizer solution as the working fluid so that the keg will be fully sanitized before any beer enters it. The expelled sanitizer can then be used for some other purpose.
- The sanitizer solution may contain dissolved oxygen, which could be released into the keg.
- Putting the lid on a totally full keg may allow some air to be sealed inside the keg.
- The CO_2 supply is connected to the gas post of the keg, and a tube is connected to the liquid post that directs the expelled sanitizer solution into a bucket for collection.
- It's best to use low pressure CO_2, which will help prevent potential loss of CO_2 by dissolution into the sanitizing solution.
- When liquid stops flowing out and gas bubbles can be seen, the keg has been fully flushed and is ready to accept beer.

This process, although effective, can be time-consuming. It typically took about 15 minutes to purge a 3-gallon keg full of sanitizer because of the flow resistance of the 3/16" inner-diameter tubing we used to feed the CO_2. If we were to increase the diameter of the tubing, how fast would it be?

We ran a side-by-side comparison with two identical kegs sharing the same 2 psig of CO_2 pressure, using 6-foot lengths of 3/16" and 5/8" inner-diameter tubing. To our surprise, the wider bore tubing emptied the keg in 4 minutes instead of 15 minutes. We then went on to test a 5-gallon keg with the wider-bore tubing—the keg was emptied in just 20 minutes. So, when using this liquid displacement method, with low pressure CO_2, it's best to use wide-bore tubing to feed the gas into the keg.

TABLE 2: COMPARISON OF THE 6 METHODS OF FILLING A KEG.

Method	Typical CO_2 used (L)	Effectiveness at removing oxygen
Blast-In	80	Medium
CO_2 Pressure-Pulse	160	Medium
CO_2 Blanket	6	Low
Sustained CO_2 Blanket	6.5	Medium
Floating Foam	1	High
Displaced Liquid	20	High

ELIMINATING AIR FROM THE HEADSPACE OF A SEALED KEG

Once the beer is in the keg and the lid is fitted and sealed, there could still be air left above the beer in the keg. We normally fill a Corny keg to just below the gas post dip tube. This means there is some residual volume of gas in the keg when sealed. Much of this could be air still left after purging the keg or from diffusion of air from outside back into the keg.

The easiest way of purging air out of the headspace is to use the pressure pulsing technique described earlier. It works here because the volumes involved are much smaller. We measured the volume in a keg above the air post dip tube and found it to be about 600 milliliters. We've already shown that pulsing a keg four times at 30 psig will drop the oxygen concentration from about 20% to about 0.25%.

Our tests with the oxygen sensor have shown that the oxygen concentration in the headspace before sealing the keg is about 17%, even if we don't do anything else to remove the air as we fill the keg. This is probably because the beer releases some CO_2 during the filling process. After four pulses, the 17% oxygen will have dropped to 0.2%, and we will have used under 5 liters of CO_2.

Remember that the contact time between the beer and the air while filling the keg is relatively short, but any air trapped in the headspace will remain with the beer throughout dispensing, so this use of CO_2 is well justified.

If performed correctly, the floating-foam and water-displacement methods should not leave much residual air in the keg, so this second purge shouldn't be needed. But it might be a prudent precaution, as dissolved air could be released from the displaced liquid, and how possible is it to fit the lid without letting in any air?

CARBONATING BEER

Once we have our keg filled with beer, the next step is to properly carbonate it. Generally, there are two options: forced carbonation and natural conditioning.

Forced Carbonation

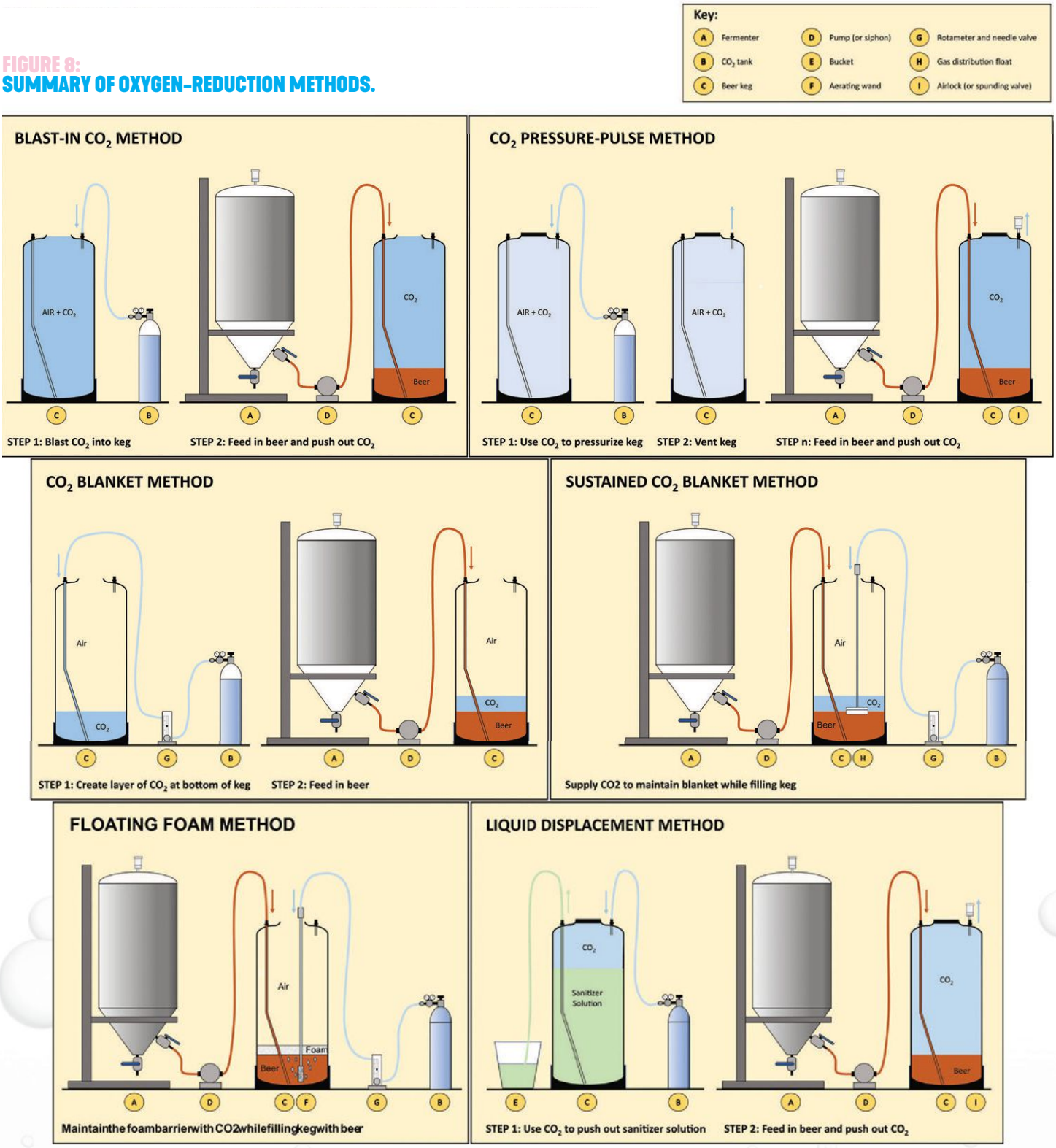
A big advantage of kegging is that beer can be quickly carbonated with forced CO_2. CO_2 is delivered to the keg at a pressure known to give the required carbonation level for the type of beer in the keg. This pressure can be found in published tables online, or it can be calculated using Henry's Law. If you want to try the latter, there's a section in the referenced Excel spreadsheet to help you do this, and there's an excellent paper available which discusses this.[3]

In homebrewing, we express CO_2 concentrations in volumes, which represents the volume the dissolved CO_2 would occupy, relative to the beer volume, if it were a gas at 0°C (32°F) and 1 atmosphere of pressure (about 14.8 psi). So, if we wanted 19 liters of kegged beer to have a carbonation level of 2.5 volumes, we would have to add an equivalent of 2.5 × 19 liters = 47.5 liters of CO_2 to the beer, plus enough to maintain the same headspace pressure throughout serving, which makes making the total addition close to 70 liters. Choosing the right pressure will do this.

Once carbonated, kegged beer can be transferred to bottles using a beer gun or counter-pressure filler, both of which will consume even more pressurized CO_2.

Forced carbonation is quick and easy but it does use significant amounts of CO_2.

FIGURE 8:
SUMMARY OF OXYGEN-REDUCTION METHODS.



Natural Conditioning

The CO_2 needed for forced carbonation and bottle filling can be completely eliminated by using natural conditioning, which represents perhaps the easiest way for us to cut down on our use of pressurized CO_2. Usually, beer would be primed by adding sugar to the bottle or keg prior to sealing it. No added CO_2 should be necessary.

However, one question that frequently arises in our homebrew club meetings is whether we need to purge the keg of air (as discussed earlier) or if the yeast refermentation will scavenge oxygen from the bottle or keg. There's surprisingly little hard data published on this question, but there are many opinions. We used our oxygen sensor to monitor the oxygen levels in the headspace while we naturally conditioned an English bitter in a Corny keg at 20°C.

The good news is that, yes, nearly all the oxygen disappeared from the headspace, so the yeast did indeed scavenge it. The bad news is that it took five days for this oxygen to disappear. Would this oxygen damage the beer within those five days? Pundits claim that two hours of exposure is enough.

The bottom line is that we should eliminate air from kegs before and after filling them, whether we conduct natural or forced carbonation. The English bitter turned out fine, so draw your own conclusions.

POURING BEER CORRECTLY

We've discussed how to best use a CO_2 resource that's becoming scarce and expensive in making our beer. Assuming we are successful in doing so, what happens when we come to serve the beer? We have all probably experienced a situation in which highly carbonated beer dispenses with a great head, but when the foam has died down, and we taste it, the beer is almost completely flat! If the beer poured in the glass looks like that in the picture, then we have probably wasted most of the CO_2 we have worked so hard to get into that beer when we packaged it.

So, not only do we have to be efficient in making and packaging our beer, but we should also be efficient in the way pour it. So, what's the best way to serve a beer? Let's first consider why beer may be foamy.

The answer depends on multiple factors, such as CO_2 pressure and beer line length and diameter. We need to provide just enough resistance to slow the flow to give the perfect pour. A good rule of thumb is that it should take 8 to 10 seconds to fill a pint. Keep the lines cold: a temperature differential doesn't help. Look out for beer stone on the lines or hop or husk residue trapped in the keg's or disconnect's poppet valves. Beer stone in the draught lines provides an area for carbon dioxide to nucleate and form bubbles as the beer travels through the lines. You must clean your lines regularly.

Beer trickles to the glass often when the beer is not fully carbonated, and pressure applied mostly gets absorbed by the beer that may be too cold. If there is not enough pressure, bubbles will appear in the lines.

Beer that pours at the right pace, but whose foam disappears immediately, could indicate dirty glassware, a contaminated batch, or beer that is not carbonated at all.

Beer that gushes into the glass may be due to an imbalance between the CO_2 pressure and the line length and diameter. Another common cause is keg warming, which allows bubbles to escape, adding to the dispensing pressure and further gushing of the beer. When serving a cold beer, it will help if the glass is cold, too (but not frosted).

If the beer lines are too short for a given inner diameter, there is not enough resistance in the line and the beer will gush into the glass and cause even more foam.

FIGURE 9: MEASURING OXYGEN DURING NATURAL CONDITIONING.

FIGURE 10: A WASTE OF CO_2.

RESOURCES

1. HomebrewersAssociation.org/ja23
2. https://www.thingiverse.com/thing:6037148
3. Liger-Belair G, Cilindre C. How Many CO_2 Bubbles in a Glass of Beer? ACS Omega. 2021 Mar 31;6(14):9672-9679. doi: 10.1021/acsomega.1c00256. PMID: 33869947; PMCID: PMC8047704. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8047704/)

Born and raised on Tafelbier in Belgium. Pierre Margraff moved to the States 25 years ago and learned to homebrew shortly after tasting his first American beer, Andy Tipler grew up in England and moved to the United States 30 years ago for his job as a research chemist. He has been homebrewing (legally) for more than 50 years and is a certified beer, mead, and cider judge. Andy is active in competitions as a judge and as a contestant, and he enjoys talking and writing about brewing. He is a member of the Underground Brewers of Connecticut (the second oldest homebrew club in the USA). He would very much like to have an English pub next door.

ON THE WEB

Read more about using carbon dioxide to prevent oxidation at HomebrewersAssociation.org/ja23

The Game Is Afoot!

Intriguing Blind Tasting Challenges for Homebrewers and Clubs

By Ron Minkoff

Blind tastings are always fun challenges for brewers. It's a little like working through a CSI beer mystery in which you pick up on clues and get a payoff when the answer to the mystery is revealed. This article describes four variations of blind tastings homebrew clubs can easily do. They're not necessarily meant to be scientifically rigorous, but they often help sharpen the brewer's palate and dial in a Spidey-sense for BJCP style recognition and off-flavors. Plus, after a session, brewers usually come away with lessons learned.

BLIND TASTING #1 BEER STYLE CHALLENGE

Years ago (a little before the iPhone was a thing), my fellow club member Jeff declared that he didn't think I could tell the difference between a Munich dunkel and a schwarzbier in a blind tasting. Challenge accepted!

I did well in this original challenge, but more importantly, I found I loved the concept. Despite the simple goal, you have to Sherlock through the style clues of aroma, flavor, and mouthfeel, plus the visual clue of the foam color to make your pick.

This past year, while thinking up new beer education classes for my club (The Hogtown Brewers), I recalled that challenge from over 15 years ago. I decided to resurrect it and create this first blind tasting by doing a series of style challenges for the BJCP judges, and aspiring judges, within my club. Naturally, I did a bit of fine tuning of that original challenge.

Setup

You want the session to be educationally well rounded and fun, so you don't want to simply plop 10 samples in front of everyone and say, "Go at it!" It's OK to nerd out a little and put in a bit of planning and structure! The process I chose included the following.

- Choose styles that have nuanced differences, porter vs. stout, for example.
- To ensure all participants have some kind of baseline understanding of each style involved, create a style comparison chart for each participant and lead a discussion of the chart prior to pouring any samples. The chart would compare and contrast the high points of each style. For example, doppelbock can have low dark-fruit flavor, slight chocolate, and no roast, while Baltic porter, which can be very similar to doppelbock, has hints of dark dried fruit, caramel, and toffee, plus a schwarzbier-like roasted flavor. Another chart example shows that German Pilsner has a crisp finish, but Munich helles has a dry finish that is not crisp.
- Sample cups were not labeled with numbers (1, 2, 3, etc.) or letters (A, B, C, etc.). Instead, they were labeled with random shapes (star, moon, square, circle, etc.) to dissuade participants' imagining the pours were done in some kind of pattern.
- As I wanted participants to use all clues to determine the style (this challenge was not meant to be strictly based on aroma/flavor/mouthfeel alone), I decided it was OK to use clear cups. However, if you prefer, you could serve samples in opaque cups so participants can't see beer color or clarity.
- Provide each participant an evaluation sheet to record their verdict. The sheet contains a table of cup label shapes with fields for the participant to write in their notes.
- All samples strictly used commercial beer, preferably a classic example of the style or an example from a reputable brewery. This is not an off-flavor lab!
- The mission for each style challenge was simple: pick the correct style.

Over the course of the summer and fall, I hosted a series of three style challenges.

Porter vs. Stout

For the education portion of the challenge, we went over some of the well-known history of porter and stout (e.g., porters were named after the working-class porters, porters were initially blended from beers in barrels known as butts, stouts initially were called stout porters, etc.). But I also "did my own research" to find a consensus on the exact difference between modern porters and stouts.

Conventional thinking is that stouts lean towards using black malt and roasted barley to impart roast and coffee flavors, while porters may lean towards using brown malts for chocolate character and balance between malt sweetness and hops. Except when they don't! After going through numerous articles, opinion pieces, and commercial brewery recipes, I'm convinced that the determining factor for if a commercial beer is a porter or stout is this: it's whatever the brewer says it is! Now, how will that reflect in a blind tasting beer style challenge?

The game is afoot. We proceeded with the challenge, bringing out 10 samples for each participant (we had around 14 club members participating). After a sufficient period had elapsed, it was time to hear the verdicts. I would go one by one down the list of samples, referring to each by the shape on their labels. For each sample, I would pick a club member to announce their verdict. I would then ask for a show of hands on who agreed and who disagreed, then reveal that sample's actual style (at least, according to the commercial brewery).

How did everyone do? The top participant got 80 percent correct (nice job Mr. Brock: enjoy your *Zymurgy* shout-out!), while most participants correctly guessed only around half. Not much better than a coin flip. Did I mention this blind tasting wasn't scientifically rigorous? That said, we all agreed the line between porter and stout can be very blurry, especially when the assigned style can be at the whim of the brewery. Case in point: one of our own local breweries has a particular seasonal beer they originally called a porter. But, a few years ago, they changed the style to American stout. Did the recipe change? Did ingredients need to be swapped out? No, none of that. The style designation changed purely for marketing reasons!

Doppelbock vs. Baltic Porter

Fair to say I'm a fan of Baltic Porters. Komes Baltic Porter is one of my favorites. It's malty and rich with delightful dark fruit flavors and smooth alcohol warmth. Those same adjectives often apply to doppelbock, too. I've always thought if someone handed me a pint of Komes and told me it was a doppelbock, I'd believe them. Little wonder that starting in 2015, the BJCP guidelines grouped the two together in the same category, Category 9: Strong European Beer. These two types of beer are prime candidates for a style blind tasting challenge.

Club members gathered again, and, as usual, we first compared the two styles. As mentioned, they share similar body, dark fruit flavors, and smooth alcohol warmth. Their differences are nuanced. For example, doppelbocks tend to have off-white foam and no roast, whereas Baltic porters can have tan foam and a schwarzbier-like roasted flavor.

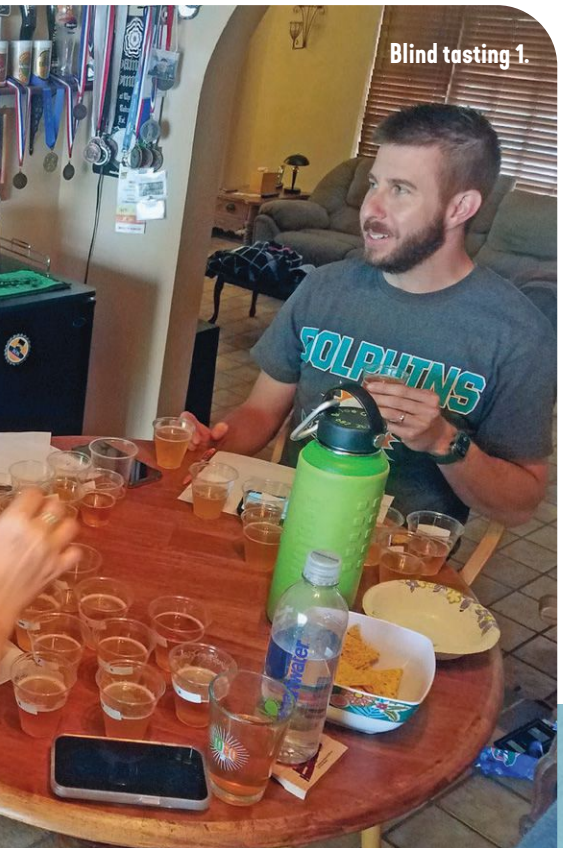
For this challenge, I was only able to put seven samples in front of the participants due to the limited availability of these two styles where I live. Participants did a little better identifying the correct style this time as compared to the porter/stout challenge, but not much better. I did throw one slight curveball in the mix by including a pour of a weizen doppelbock. That was the only sample the participants could confidently say was not a Baltic porter. Is your palate clever enough to distinguish between Baltic porter and doppelbock?

TABLE 1: STYLE COMPARISON FOR PALE GERMAN BEERS

Helles	Festbier	Kölsch	Helles Exportbier (Dortmunder)	Geman Pils
Aroma: Grainy sweet, low herbal hop	**Aroma:** moderate malt, doughy, impression of sweetness, low herbal hops	**Aroma:** low grainy sweet, subtle fruit optional, low herbal hops	**Aroma:** Moderate sweet malt, med-low to med herbal hops	**Aroma:** Low to med grainy sweetness, moderate to high herbal hops
Appearance: pale yellow to gold, clear, white head	**Appearance:** pale yellow to gold, clear, white head	**Appearance:** pale yellow to gold, clear, white head	**Appearance:** yellow to gold, clear, white head	**Appearance:** straw to deep yellow, clear, white head
Flavor: malty, sweet, grainy, med-low bitterness, dry but not crisp, low herbal hops	**Flavor:** malty, light bread, doughy, med-low bitterness, attenuated and crisp	**Flavor:** balance between malt, fruitiness, bitterness; low to high herbal hops; slightly crisp	**Flavor:** balanced malt and hops w/supporting bitterness, med-dry finish	**Flavor:** initial malt overcome by hop flavor and bitterness, crisp finish
Mouthfeel: Med body, med carbonation, smooth	**Mouthfeel:** Med body, med carbonation, smooth	**Mouthfeel:** Med-light to med body, med to med-high carbonation, smooth	**Mouthfeel:** Med to med-full body, med carbonation, smooth	**Mouthfeel:** Med-light body, med to high carbonation, may be minerally, sharp

Pale German Lager Challenge

The third and final session of this style challenge series would prove to be the hardest. The previous challenges pitted just two styles against each other. For the Pale German Lager Challenge, there would be five. No longer just a coin flip! Perhaps, like me, you've long noticed how the Pale German lager descriptions in the BJCP guidelines reuse many of the same adjectives. Lots of nuances between these styles. I chose five styles for this challenge, but yes, one might argue I could have chosen more. Styles included were German Pilsner, Helles, Kölsch, Festbier, and German Helles Exportbier (but I'm stuck in the past and will continue to refer to Helles Exportbier as Dortmunder!).



Blind tasting 1.

Club members once again gathered, and we compared the style descriptions prior to the presentation of 10 samples. Enthusiasm was high, but confidence level…not so much. After a vigorous round of tasting and dissecting the attributes of each sample, participants recorded their verdicts. The results, as expected, had significantly lower scores. Many participants only correctly identified the style 20 percent of the time. The best score was 60 percent. How would you do in this type of challenge?

There were some interesting side observations. Channeling the spirit of the classic Coke/Pepsi challenge of my youth, I inquired about everyone's favorite Pilsner. In the ten samples, four were German Pilsners. The crowd favorite pilsner was Weihenstephaner Pilsner. I agreed. The second-place favorite Pilsner was—remember, this was a blind tasting—St. Pauli Girl! I thought they were nuts for that choice, but they stood by it. The overall crowd favorite beer of all ten samples was Reissdorf Kölsch. I couldn't ding them for that. Good Kolsch!

BLIND TASTING #2 KING OF THE PIL(S) RANK CHALLENGE

This type of easy, fun challenge can produce interesting results. The premise is simple: rank your favorite Pilsners. Place different Pilsners in front of each participant, the job of whom is to rank their favorite samples by rearranging the order of the sample cups from best to worst. Except, you tell them a bit of a white lie. You claim all samples are different, but two of the samples are the same beer.

The first time I hosted this challenge back in the 2000s, I used several samples, two of which were Budweiser (Bud Heavy, in today's parlance). Before we proceeded, I had one club member remind me that he was from St. Louis and Budweiser was one of his faves. You don't often hear a homebrew club member say such things out loud, but there you go.

The game was afoot, and we proceeded with the challenge. After I revealed what each cup contained, how did Capt. St. Louis do? Of the six samples, his top-ranked Pilsner was…Budweiser. And his second-ranked beverage was…Budweiser! One may scoff at his predilection, but I admire his consistency! Compare that to another club member who was in the same challenge session. This member's top-ranked choice was Budweiser, and their least-favorite choice was Budweiser. Clearly this member needed more training for a consistent palate! How do you think your ranking would turn out? Would your ranking have the two identical beers side by side?

BLIND TASTING #3 BJCP TROUBLESHOOTING CHALLENGE

Many people have hosted or attended a BJCP troubleshooting tasting. You've probably participated in one yourself. The host will often use an off-flavor kit, or perhaps do some homemade doctoring, to create flawed beer. You can do your own research to see various options of how to doctor beers yourself, so I won't go through all that here. What I do want to describe is a particular troubleshooting blind tasting variation I once hosted.

For this BJCP Troubleshooting Challenge, I first briefly went over the BJCP off-flavor flash cards that describe several off-flavors' taste and smell, what beer styles they may be acceptable in, how they can arise, and how they can be avoided. I then poured the first sample, un-doctored, as a baseline (I usually use Coors or something similarly light and neutral tasting). Before continuing I instructed the participants to dissect the next samples quietly (no talking) and write down the observations their palate tells them. We then discussed what each person perceived.

The game was afoot and we did several samples where each participant had to guess the off-flavor. Some samples were easily guessed correctly by most of the participants, but there were many samples where the participants had guesses all over the place. Finally, I poured the last sample. One participant started making a guess aloud. I was about to remind them to write their observations quietly but decided to let this play out. It was so long ago that I don't remember the exact guess this participant was blurting out, but it was probably something like "solvent." One by one, each of the other participants started yapping out loud and agreed the off-flavor tasted like solvent. Soon they were all convinced what it must be.

I revealed that the final sample wasn't doctored at all. It was exactly like the first sample and was just the base beer. If you're about to say, "Maybe Coors tastes like solvent!", well, let's give Coors a little bit of credit, eh? It didn't have the off flavor the crowd was claiming. So why did they get convinced it did?

Because this was an off-flavor blind tasting, perhaps participants assumed there must be a doctored off-flavor in this cup. But I also think the big contributor was the first participant who started yapping out loud and planted the idea in everyone's head. Instead of getting everyone's honest impression (when judging the sample quietly), several participants got influenced by someone else's outspoken opinion.

German Pale Lager Challenge Evaluation Sheet

Check the box of the style you think the sample is.

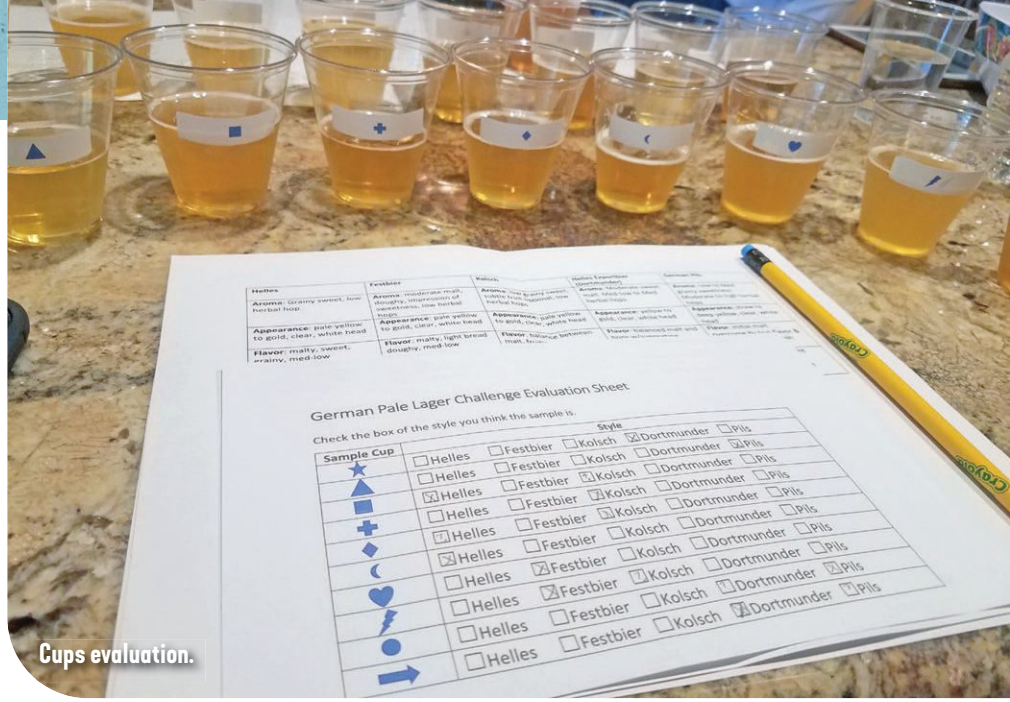
Sample Cup	Style				
★	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
▲	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
■	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
✚	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
◆	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
☾	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
♥	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
⚡	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
●	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
➡	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils

German Pale Lager Challenge Evaluation Sheet

Check the box of the style you think the sample is.

Sample Cup	Style				
★	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
▲	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
■	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
✚	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
◆	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
☾	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
♥	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
⚡	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
●	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils
➡	☐ Helles	☐ Festbier	☐ Kolsch	☐ Dortmunder	☐ Pils

Blind tasting 2.



Cups evaluation.

I pointed out the lesson that when judging in an actual BJCP competition, it's important that all judges in a flight be able to write down their honest impressions first without undue outside influence (by another judge or steward) so that a proper evaluation and discussion can occur after. What's your take? Keep it quiet while writing, or chat through the whole process?

BLIND TASTING #4 THE QUEST

This final blind tasting challenge occurred in my early homebrewing days and is worthy on many levels! The Quest wants to find out what happens when several homebrewers are given the same recipe and the same ingredients. A blind tasting of the resulting beers is needed to answer two questions: whose sample was best, and could the brewers pick out their own beer?

Theoretically, all the beer samples should taste the same, but we know that won't happen in a real-world demonstration due to the differences in each brewer's process and equipment. But how much of a difference? For this particular Quest challenge, everyone brewed an Irish red ale. After a couple of months, each brewer handed in two bottles and sat around a table for a blind tasting of everyone's samples.

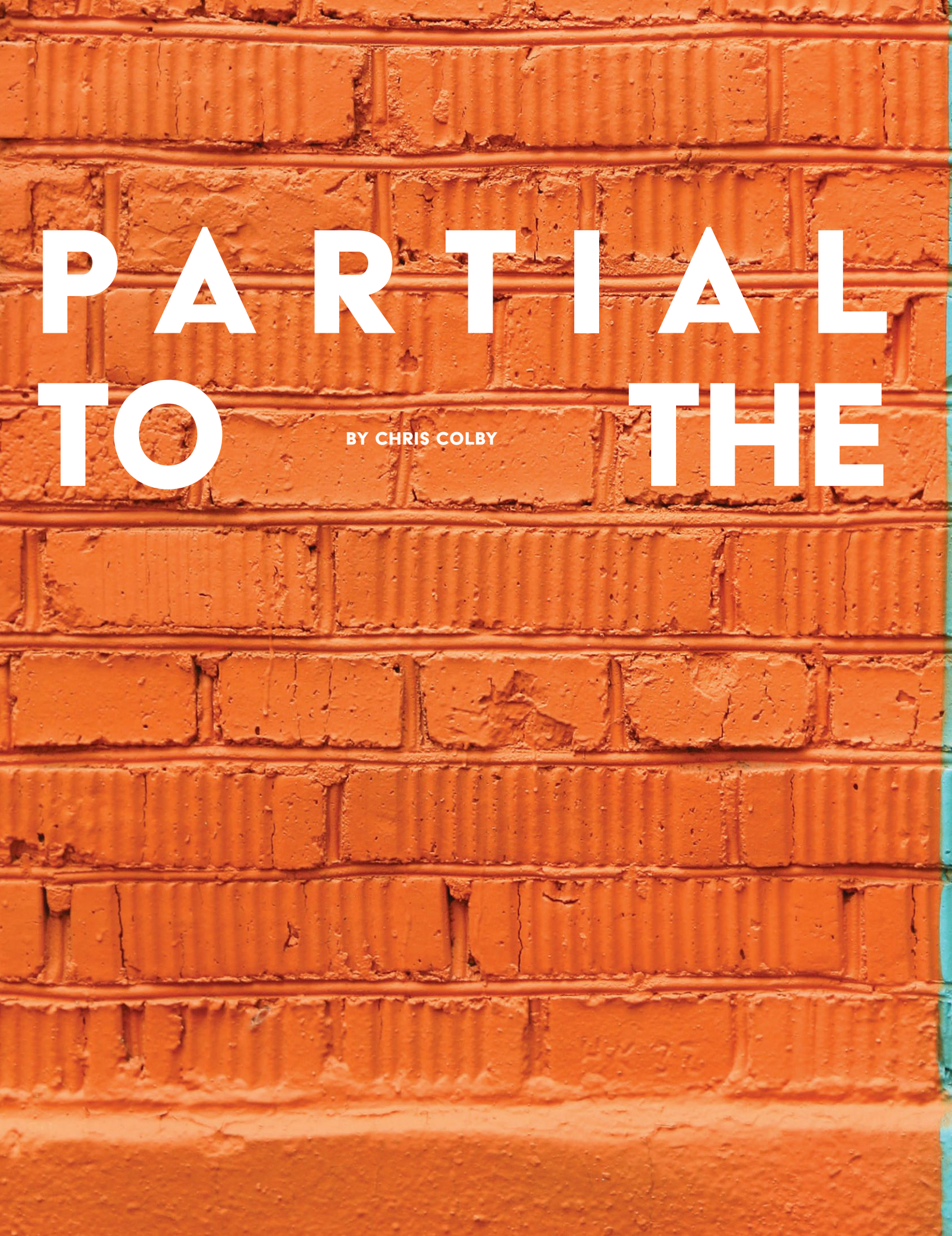
The Irish red I brewed was not amazing, I felt, but probably above average and certainly enjoyable enough. Fairly sure I can pick it out. The game was afoot, and we poured samples from each brewer (about eight or ten participated, as I recall). The first few were pleasant and clean tasting. One tasted familiar; it was probably mine. But a few had a detectable off-flavor. Not offensive, but noticeable that they were not hitting the mark. One had a slight twang in the aftertaste. Another seemed a bit lifeless. A couple of others were out of balance. So, about half the homebrewed samples were worthy, the other half not so much.

Finally, they revealed whose sample was whose. And…mine was the one with the slight twang. Nuts! Very humbling. This was among my first introductions to the idea of *house palate*, by which you develop a blind spot to your own beer's flaws. That's one reason I don't get upset these days when I enter a beer in a competition and the judge feedback claims they tasted an off flavor. It's quite possible I either didn't catch the flaw, or the flaw developed in the bottle over time in transit in warm storage. But participating in blind judging did help me focus and dissect individual characteristics that you don't necessarily detect when casually drinking. Could you pick out your own brew (and its flaws) among identical style samples in the Quest?

THE PAYOFF

These types of blind tasting challenges are great, not only because they're fun ways to test your beer palate that can reveal a surprising twist, but they're easy to set up for any homebrew club without too much cost or drain on resources. Take inspiration from one of the challenges mentioned or design your own and see if you and your fellow brew sleuths get tripped up. Odds are you'll enjoy the payoff!

Ron Minkoff has been brewing in the comfort of his driveway since 2003. He is a past president of the Hogtown Brewers (2016 Radegast Club of the Year) and a BJCP Certified judge. If his hometown of Gainesville, Fla., had a more diverse choice of Baltic porters, he would not complain.



PARTIAL TO THE

BY CHRIS COLBY

MASHING RESCUE

Most homebrewers identify as either extract or all-grain brewers. Partial mashing is not unheard of, of course, but comparatively few use it as their primary method. However, there are a variety of circumstances for which partial mashing is an excellent choice.

Partial mashing is a form of brewing that involves fermenting beer from wort made from two sources—wort collected from mashed, malted grains and wort made from dissolved malt extract. There are many differences between wort made from malted grains and wort made from malt extract. Most notably, wort from malted grains can be lighter in color, depending on the grist, and is generally more fermentable than comparable wort made from malt extract. It is also cheaper to make wort from malted grains.

PARTIAL MASHING FOR APARTMENT DWELLERS

If you live in an apartment or your brewing is otherwise relegated to a small space, partial mashing is an attractive option. You can make excellent 5-gallon (18.9-liter) batches of beer in cramped quarters and avoid clutter by using smaller vessels.

For 5-gallon batches, one approach would be to mash 4 to 6 pounds (1.8 to 2.7 kg) of grain in a 2- to 3-gallon (8- to 12-liter) beverage cooler. From this, you would collect about 2.6 to 3.9 gallons (10 to 15 liters) of wort. This volume of wort is then easily brought to a boil on most kitchen stoves in a standard 5-gallon stock pot or dedicated brew kettle. Boil the wort down to 2.5 gallons (9.5 liters) and add malt extract. After the boil, dilute the chilled wort with water to yield 5 gallons in the fermenter.

A typical 5-gallon all-grain setup consists of three 10-gallon (37.9-liter) or larger vessels—a hot liquor tank (HLT), mash/lauter tun, and kettle. The partial-mash configuration above whittles this down to an HLT of 3 to 4 gallons, a 2- to 3-gallon mash vessel, and a 5-gallon brew pot.

PARTIAL MASHING FOR ALL-GRAIN BREWERS

There are several situations in which an all-grain brewer would benefit from partial mashing. The most obvious is when brewing a strong beer. Normally, to brew a strong beer, the brewer would need to add a large amount of malted grain to their mash tun. Then they would need to collect a correspondingly large volume of wort and take the time to boil it down to the target volume and original gravity. (Of course, the brewer also has the option of not sparging the grain bed completely and only boiling high-gravity run off, but this requires more malted grain and results in a lowered extract efficiency.)

Alternatively, the brewer could reformulate the recipe. Adding malt extract could allow them to mash less malt, sparge the grain bed completely, and collect a smaller volume of wort. Ideally, they could collect a volume that could be reduced to the target volume in 60 to 90 minutes. The addition of malt extract near the end of the boil could then boost the original gravity to the target value.

As an example, a brewer making 5 gallons of strong beer could mash 10 pounds (4.5 kg) of malt, collect 6.5 gallons (24.6 liters) of wort, and boil it down to 5 gallons within 90 minutes. The specific gravity of this wort would depend on extract efficiency, but the grain bed would be fully sparged. The brewer could then add malt extract to reach any desired original gravity. See the accompanying Lines on the Map Strong Ale recipe for a recipe that uses this approach.

Malt extract can also be used to brew a sweeter beer with a fuller body. Wort made from malt extract tends to be less fermentable than wort made using all-grain methods. Thus, if you'd like to brew a beer that finishes at a higher final gravity (FG), adding some malt extract will help. Keep in mind that mashing at a high temperature (and not letting the wort cool as it is collected), adding maltodextrine or crystal/caramel/Cara-whatever type malts to your recipe, and choosing a low-attenuating yeast strain will also help in this regard.

The fermentability of malt extracts varies considerably. So, when using malt extract to make a sweeter beer, look around and pick an extract with a low fermentability. Malt extracts that come in the "can and a kilo" kits are usually the least fermentable, as the sugar these kits call for will increase the fermentability of the wort.

Like many all-grain brewers, I use a propane burner to heat my strike water and boil my wort, which means brewing is an outside endeavor. But sometimes the weather outside is frightful, and the amenities inside—especially heat or air conditioning—are delightful. Partial mashing allows a brewer to come in from the cold (or heat) and brew a beer on the stove.

A brewer can make a mash from 4 pounds of grain in a 2-gallon beverage cooler lined with a nylon steeping bag. This yields around 2.6 gallons of 1.040 wort, depending on extract efficiency. This can easily be brought to a rolling boil on most home stoves. (A 3-gallon cooler can be used to mash 6 pounds of grain and yield 3.9 gallons of wort.)

For a 5-gallon batch, a brewer can produce 2.5 gallons of wort near the target original gravity. This wort should contain twice the IBUs of the intended beer. The brewer can then add malt extract to make the thickness of the wort twice the intended original gravity as well. Diluting the chilled wort in the fermenter to 5 gallons would yield wort at the target gravity and bitterness, all from the comfort of the kitchen.

CONVERTING ALL-GRAIN RECIPES TO PARTIAL MASH

To convert an all-grain recipe to this type of partial mash, keep the specialty malts in your formulation as they are, and reduce the amount of pale malt such that the total weight of the grains is however much you intend to mash. Keep the hop amounts the same. Add light malt extract to compensate for the pale malt you subtracted—and that's it. As an option, you may want to mash the grains that require mashing and steep any grains that can be steeped. This increases the amount of grains in the recipe and lowers the amount of malt extract required. All this requires is a second nylon steeping bag. Steep the steepable grains in your brewpot after you have collected the wort from your mash.

PARTIAL MASHING FOR EXTRACT BREWERS

Partial mashing is a greay way for extract brewers to explore the variety of base malts available. Malts can be separated into two types—malts that can be steeped and malts that must be mashed. Among malts that must be mashed (base malts), there are a wide variety, and very few have malt extract equivalents. For example, there are malt extracts for Pilsner and Munich malts, but there are many different Pilser and Munich malts available—all with slightly differing characters. Exploring partial mashing allows an extract brewer to try out these malts.

It can be challenging or impossible to incorporate many unmalted adjuncts into an all-extract beer, but partial mashing offers a solution. Flaked maize (corn), raw wheat, rice, and more can be converted with some base malt in a small mash and then augmented with malt extract to make up the difference.

MAKE A DRIER OR PALER BEER

You can make wort that is more fermentable and lower in color by mashing malted grains than you can by dissolving malt extract. So, extract brewers who would like to make a drier beer, or one that is lighter in color than they can achieve with malt extract alone, can turn to partial mashing.

Simply substituting pale or Pilsner malt for light dried malt extract will yield a drier, lighter beer than you could make from malt extract alone. However, you can take an extra step to further increase fermentability. When you collect the wort from your mash,

Photo © Getty/ozina (bricks)

LINES ON THE MAP

(PARTIAL MASH)

English strong ale

Recipe by Chris Colby

This is a strong dark ale with a moderately roasty character. It is reasonably dry considering its high original gravity, and the malt, hops, alcohol, and roast character are all in balance. It is meant to seem like an English ale, but it is not an atempt to clone any commercial brand or mimic any classic beer style. For best results, make an appropriately sized yeast starter so you are pitching actively fermenting yeast, and hold the fermentation temperature as constant as you can manage. If you can't find fresh Goldings, feel free to use any other English hop variety you like.

Batch volume:	5 US gal. (18.9 L)	**Color:**	35+ SRM
Original gravity:	1.090 (21.6°P)	**Bitterness:**	56 IBU
Final gravity:	1.022 (5.6°P)	**Alcohol:**	8.7% by volume

MALTS & ADJUNCTS

9 lb.	(4.1 kg) English pale ale malt, approx. 3°L	3 oz.	(85 g) black malt, 500°L
6 oz.	(170 g) crystal malt, 60–80°L	4 lb.	(1.8 kg) light liquid malt extract
5 oz.	(150 g) chocolate malt, 350–400°L	8 oz.	(230 g) sucrose (cane sugar)

HOPS

3 oz. (85 g) Goldings, 5% a.a. @ 60 min
1 oz. (28 g) Goldings, 5% a.a. @ 0 min
1 oz. (28 g) Goldings, 5% a.a., dry hop

YEAST

3 qt. (3 L) starter attenuative English ale yeast

WATER

Carbon filter and adjust with distilled water and $CaSO_4$ as needed for roughly 70 ppm carbonates and 150–200 ppm Ca.

ADDITIONAL ITEMS

0.5 tsp. Irish moss (or other fining agent) @ 20 min
0.5 tsp. calcium chloride (optional)
4.5 oz. (130 g) corn sugar for priming bottles to 2.3 vol. (4.6 g/L) CO_2

BREWING NOTES

Make your yeast starter 2–3 days ahead of time. Mash grains at 150°F (66°C) for 60 minutes, stirring every 10 minutes. (Add boiling water or heat mash tun to maintain temperature after stirring, if needed.) Mash out to 170°F (77°C) and recirculate wort. Collect roughly 6.5 gal. (24.6 L) of wort. Boil for 90 minutes to reduce volume to just over 5 gal. (18.9 L).

For the final hour of the boil, stir in roughly 1 lb. (450 g) of malt extract every 15 minutes. Add the bittering hops for the final 60 minutes of the boil. Stir in cane sugar in final 5 minutes. Add second dose of hops at knockout.

Chill wort to 68°F (20°C) and rack to fermenter. Aerate wort and pitch yeast. Ferment at 70°F (21°C). Avoid letting the fermentation temperature climb. After fermentation is complete, add dry hops. Leave dry hops in contact with the beer for 5 days, then keg or bottle.

do not mash out to 170°F (77°C). Leave the wort at 150° to 158°F (66° to 70°C) and stir in the malt extract. Let this sit for about 5 minutes, enough time for the enzymes in your malted grain wort to modify carbohydrates from the malt extract. For best results with regards to picking up as little color in the boil as possible, perform a full-wort boil.

The recipe for Freya's Locks that accompanies this article demonstrates how to make a dry, light-colored ale using partial mashing.

LOWER YOUR PER-BATCH COST

Malt extract is made from wort, which is in turn made from mashing malted grains. Wort destined to be turned into extract is treated to remove most of the water. Due to this extra step, malt extract costs more than malted grains on a "gravity points per pound per gallon" basis. As such, switching from extract brewing—with or without steeping grains—to partial mash brewing will save you a few bucks.

TEST THE WATERS OF ALL-GRAIN BREWING

Finally, partial mashing can provide an excellent transition into all-grain brewing. You can try partial mashing without obtaining all the vessels you need to start all-grain brewing. And you can still boil the wort on your stovetop, obviating the need to get a propane burner or other equipment capable of a full-wort boil. Then, once you gain some confidence with mashing—it's a lot easier than it is sometimes made out to be—you can upgrade your brewing setup. You can also make smaller all-grain batches using a typical partial mash brewing setup.

Chris Colby has been a homebrewer since the early '90s, when he studied molecular evolutionary genetics at Boston University. After receiving his PhD in 1997, he briefly worked in educational publishing before becoming a beer writer and editor. He is the author of Methods of Modern Homebrewing *(2017),* Home Brew Recipe Bible *(2016), and the Brewers Publications® title* How to Make Hard Seltzer: Refreshing Recipes for Sparkling Libations *(September 2020). He lives in Bastrop, Texas, with his wife and many cats.*

Brew This!

FREYA'S LOCKS (PARTIAL MASH)

Blonde ale

Recipe by Chris Colby

This blonde ale is lighter in color and drier than could be made with malt extract alone. The beer is not meant to be the driest or lightest possible, but simply on that end of the spectrum. (For an even drier, lighter beer, swap sucrose for some of the malt extract.) Use fresh malts and malt extract—and pay extra attention to cleaning and sanitation—to get the best bready malt character balanced by the hop aromatics. A superior beer to enjoy while grilling and clicking your tongs.

Batch volume: 5 US gal. (18.9 L)
Original gravity: 1.044 (11°P)
Final gravity: 1.010 (2.6°P)
Color: 6–7 SRM
Bitterness: 21 IBU
Alcohol: 4.5% by volume

MALTS

2.9 lb. (1.3 kg) Pilsner malt, 2°L
0.75 lb. (340 g) Vienna malt, 3°L
0.33 lb. (150 g) light crystal or "Cara" malt, 10°L or lighter
3 lb. (1.4 kg) light liquid malt extract

HOPS

0.33 oz. (9.4 g) Summit, 17% a.a. @ 60 min
0.5 oz. (14 g) Willamette, 5% a.a. @ 0 min

YEAST

2 qt. (2 L) yeast starter — neutral, attenuative ale yeast (any "Chico" strain should work great)

WATER

Carbon filter and adjust with distilled water and $CaCl_2$ as needed for less than 50 ppm carbonates and 100–150 ppm Ca.

ADDITIONAL ITEMS

0.5 tsp. Irish moss (or other fining agent) @ 20 min
0.5 tsp. calcium chloride (optional)
0.28 oz. (8 g) Polyclar AT (PVPP, optional)
4.75 oz. (135 g) corn sugar for priming bottles to 2.6 vol. (5.2 g/L) CO_2

BREWING NOTES

Make yeast starter 2–3 days ahead of time. In your brew pot, heat 5.5 qt. (5.2 L) brewing liquor to 161°F (72°C). Place crushed grains in a large steeping bag and submerge in brew pot. Mash at 150°F (66°C) for 45 minutes, stirring and heating briefly every 10 minutes to maintain the mash temperature. In a separate pot, heat 5 qt. (4.7 L) water to 170°F (77°C).

When the mash is done, do not conduct a mash-out step. Lift bag above brew pot and let it drip until you can move the bag of grain to a 2-gallon beverage cooler without splattering too much. Scoop or pour the wort from the brew pot into the cooler. Recirculate the wort until it clears a bit, then run off.

Sparge steadily over 60 minutes. To do so, collect about a cup (250 mL) of wort from the cooler every 90 seconds, then add the same volume of hot water to the top of the grain bed. Once you have collected about 10 qt. (9.5 L), add roughly half of the malt extract to your brew pot, and let the wort dissolve it. Once the extract is completely dissolved, hold the temperature near 150°F (66°C) as you collect the rest of the wort. Add about 2 qt. (1.9 L) of water to the brew pot to yield about 3.5 gal. (13.3 L) when you're done collecting the wort.

Bring wort to a boil. If hot break does not appear big and fluffy after 5 minutes, add 0.5 tsp. calcium chloride. Add the bittering hops and boil wort for an additional 55 minutes. Add Irish moss with 20 minutes left in the boil. Don't let boil volume dip below 3 gal. (11.4 L) during boil. Add boiling water to top up, if needed. Stir in the remaining malt extract in the last 10 minutes of the boil.

Chill wort to 68°F (20°C), rack wort to a fermenter, and add water to yield about 5 gal. (18.9 L). Aerate the wort thoroughly and pitch sediment from the decanted yeast starter. Ferment at 68°F (20°C). After fermentation stops, rack to a secondary fermenter and hold for three days. Fine with PVPP for clarity, if desired (see below), before racking beer to keg or bottling bucket. Carbonate to 2.6 vol. (5.2 g/L) of CO_2.

FOR CLEARER BEER (OPTIONAL)

After fermentation and conditioning, dissolve 8 g PVPP in roughly 2 fl. oz. (60 mL) of hot water and gently stir into top layer of beer. Let settle overnight, then rack beer to keg or bottling bucket.


THE
WORLD'S
BEST
PORTER?

A HOMEBREW CHALLENGE

By Steve Ruch

After recently exploring how to brew with minimal equipment in "Homebrew on a Budget" (May/June 2022), I started contemplating a possible follow-up article, but wasn't quite sure just how to approach it.

I'm very satisfied with the beer I brew with minimal equipment and using low-level techniques and I thought about doing a piece detailing a normal brewday with basic equipment, but that probably wouldn't be of much interest to most *Zymurgy* readers. I then had a (rare) brilliant idea: comparing a recipe brewed on minimal equipment with the most basic technique against the same recipe brewed on an elaborate brew setup with all, or most of, the bells and whistles.

Fort Wayne's MASH homebrew club was established in 2000 and currently has about 50 active members. The club's mission is to promote education and knowledge of the art of brewing. In addition to regular monthly meetings at which club members share and critique their creations, there are also special "Partial Mash" meetings that focus on the educational side of homebrewing.

Through a series of five competitions throughout the year, winning brewers get to brew a commercial batch of their winning recipe at a local brewery, and Mad Anthony Brewing Co.'s early support offers a clue to the club's original name, Mad Anthony Serious Homebrewers. Last year MASH won the homebrew club of the year award at the Indiana Brewers Cup and garnered the Bill Friday award, which is given to the homebrew club that receives the highest average number of points scored by the total number of club entries. MASH plainly knows what it's doing.

I got on MASH's Facebook page and issued a "homebrew challenge" to one and all. I explained my concept and then sat back and waited. My challenge was soon answered by Jed Lengerich, brewer extraordinaire, man amoung men, gentleman and scholar, and a good drinking partner (too much?). Currently serving as the club's president, Jed is an active, engaged member who is always happy to share his homebrew. Jed recently scored a third place at the Drunk Monk Challenge in the Pilsner category and, combined with the success of the entire club membership, I began to feel like someone who accidentally jumped into the deep end of the pool.

We arranged with two of MASH's certified judges to sample my beer at home after the next meeting and to involve the rest of the group to do a triangle test. We settled on a porter recipe (see accompanying recipe for World's Best Porter). I mashed my normal 3-gallon brew-in-a-bag (BIAB) batch and boiled it on my kitchen stove, then down to my cellar to no-chill overnight to 62°F (17°C). I transferred the wort to my plastic bucket the next morning, put it in a corner of my front room at 60°F (16°C), and pitched the yeast. I bottled after 14 days. →

STEVE'S WORLD'S BEST PORTER

Batch volume: 3 US gal. (11.4 L)
Original gravity: 1.046 (11.4°P)
Final gravity: 1.012 (3°P)
Bitterness 25 IBU
Color: 28 SRM
Alcohol: 4.5% by volume

MALTS
3 lb. (1.36 kg) Munich malt
1.5 lb. (.68 kg) pale ale malt
6 oz. (168 g) chocolate malt
4 oz. (113 g) victory malt
4 oz. (113 g) crystal 40 malt
2 oz. (57 g) brown malt

HOPS
0.8 oz. (22.4 g) Willamette, 5.7% a.a. @ 30 min

YEAST
1 sachet (11 g) Nottingham

ADDITIONAL ITEMS
2.75 oz. (77 g) sugar for bottle priming
1 tablet Campden

BREWING NOTES
Treat 4 gal. (15.1 L) water with a Campden tablet. Mash grains for 40 minutes at 152°F (67°C) using a mash thickness of 1.5 qt/lb (3.1 L/kg). Sparge with enough water to collect 3.3 gal. (12.5 L) of wort. Bring to a boil, add the hops, and boil for 30 minutes. Turn off the heat, remove the hops, let the wort naturally cool overnight to 60°F (16°C), and pitch the yeast. Bottle after two weeks.

Jed prepared his 5-gallon batch in an Anvil Foundry. His wort chiller got it down to 62°F (17°C), after which he transferred it to a Spike Flex stainless steel fermenter and put that into a temperature-controlled chamber set at 60°F (16°C). Jed's batch was kegged.

I sure hope Jed's brew day went better than mine. First off, I misread my recipe and had to quickly unpack my grain mill and mill another 3 ounces of chocolate malt. Then, in the process of adding the additional chocolate malt, some ended up on the floor. I then spilled some water while rinsing out the bucket into which I had milled the malt. And, of course, after taking a gravity sample, I misjudged where my hand was (getting older is such fun) and accidentally knocked over my hydrometer tube and broke my hydrometer. But even with a rough go on brew day, I was quite happy with the results when I bottled two weeks later.

On March 19, MASH held its monthly meeting at Ambrosia Orchards, a 12-acre farmstead just south of Fort Wayne in unincorporated Hoagland, Ind., which has a meadery and cidery on the premises. Jed and I arrived early to set up the triangle test, and then as members arrived, we steered them to the small room that was set apart from the main meeting area to participate in the triangle test prior to the official meeting.

Of the 19 triangle test participants who took part, 16 (84 percent) successfully picked my batch as the one that was different. Ten of the 19 participants (53 percent) preferred Jed's version, while six (32 percent) preferred mine, and three (16 percent) didn't have a preference. The bottom line to me is that nearly half of tasters either pre-

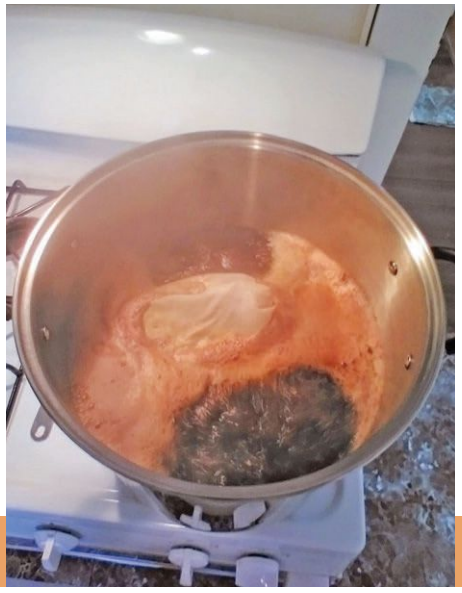


Photo © Getty/bieshutterb (trophy background)

ferred the beer brewed with minimal equipment and simple techniques or rated it equal to the batch brewed on the fancy rig.

Mike Heckman and Corwin Minerd, both certified judges, took bottles of my beer home to judge. Corwin judged using BJCP Category 13C. English Porter. He scored it 38, saying, "Excellent English porter with great nutty malt character" and "Earthy English hop character complementing the malt well." Mike went above and beyond the call of duty and judged it against both the English and American Porter (20A) guidelines, scoring it 34 as the former and 40 as the latter. "Closer to American porter due to intensity of roastiness," he commented, "although American porter is usually more aggressively hopped." Both Mike and Corwin called it very drinkable.

When I devised my recipe, I didn't specifically aim for an English- or American-style porter but instead went with what ingredients I had on hand that I thought would make a good beer.

I'm grateful to Corwin Minerd, Adam Wolford, Edison Bender, Mike Heckman, Tom, Greg, D.H., and all the other MASH members who participated anonymously. And a special thanks to Jed for accepting my challenge and brewing a darn good batch of porter. I'm proud that my effort compared with his as favorably as it did.

I definitely recommend connecting with a homebrew club in your area if one is available, especially if it's as good as MASH. If not, start one.

Steve Ruch is a frequent Zymurgy contributor from Fort Wayne, Ind.

Photos courtesy of Steve Ruch; Jed Lengerich

Brew This!

JED'S WORLD'S BEST PORTER

Batch volume:	5 US gal. (18.9 L)
Original gravity:	1.048 (11.9°P)
Final gravity:	1.012 (3°P)
Bitterness:	25 IBU
Color:	28 SRM
Alcohol:	4.7% by volume

MALTS

6.75 lb. (3.07 kg) Munich malt
2.25 lb. (1.03 kg) pale malt
14 oz. (392 g) chocolate malt
9 oz. (252 g) crystal 40 malt
9 oz. (252 g) Victory malt
3 oz. (84 g) brown malt

HOPS

1.6 oz. (45 g) Willamette, 5.7% a.a. @ 30 min

YEAST

1 sachet (11 g) Nottingham

ADDITIONAL ITEMS

1 tsp. Irish moss @ 15 min
0.5 tsp. yeast nutrient @ 10 min
3 g beta glucanase in mash
0.5 tsp. amylase enzyme in mash

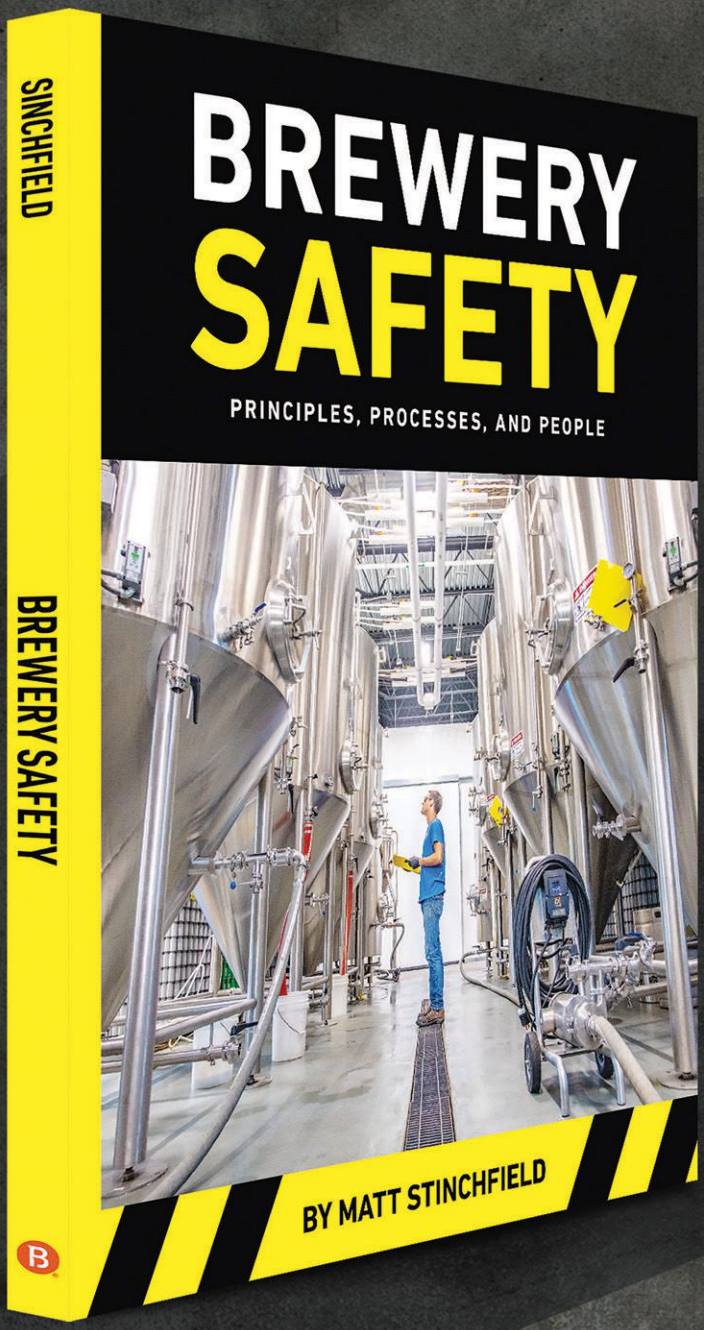
WATER

Ca 49 ppm, Mg 8 ppm, Na 33 ppm, SO_4 71 ppm, Cl 56 ppm, HCO_3 88 ppm

BREWING NOTES

Collect 7.25 gal. (27.4 L) of brewing liquor and heat to 160°F (71°C). Dough in milled grains, and mash at 152°F (67°C) for 60 minutes, targeting a mash pH of 5.36. Recirculate wort for 50 minutes and mash out at 168°F (76°C) for 15 minutes. Lift brew basket or brew bag and allow grains to drain into kettle while heating wort to a boil. Add hops and boil for 30 minutes. Chill to 62°F (17°C) and transfer to fermenter. Oxygenate for 1 minute and pitch yeast. Ferment at 60°F (16°C). Keg after two weeks and force carbonate.

ON SALE AUGUST 22



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The Essence of Style

Understanding Beer Styles

By Gordon Strong

Beer styles are part of a structured method for categorizing and describing beer. They are intended to be a convenient shorthand for discussing beer, and to allow all who taste the beer to be able to describe it using a common framework and language. A beer style is simply a structured definition of a certain type of beer that may have originated in a certain country, region, or city, or be known by its color, strength, ingredients, process, or flavor profile. It's the quick response given when someone asks you, "What kind of beer is this?"

Beer style descriptions are typically organized into a comprehensive set of *style guidelines*, which can add another layer of structure by categorizing the styles into related groupings. The most common set of guidelines for homebrewers is the BJCP Style Guidelines, which are used in most homebrew competitions. The Brewers Association publishes guidelines for commercial competitions it sponsors, and several beer-rating websites (such as Beer Advocate) maintain their own guidelines. Beer writers often have their own categories; in fact, most modern style guidelines are based on the early writings of Michael Jackson and Fred Eckhardt.

In subsequent discussions, I'm using the BJCP Style Guidelines as my frame of reference since they are the most widely used beer guidelines for homebrewers. Those guidelines don't describe every beer style made in the world but do include those most entered in homebrew competitions. The guidelines are based on currently acknowledged, world-class commercial examples, historical references to styles no longer brewed, and writings of noted beer researchers and journalists.

THE PURPOSE OF BEER STYLES

Most style guidelines are created with a purpose in mind. The guidelines of the BJCP and the Brewers Association are designed to assist competitions by providing a frame

of reference for brewers and judges, and by grouping together similar beer styles for judging purposes. Without beer styles, competitions would be nearly impossible to conduct. Judging would simply become a hedonistic event, where judges would pick beers according to their own personal preferences. The outcome would be totally arbitrary and would depend on the background and whims of those who judge the beers—not a desirable situation.

Style guidelines from consumer-oriented organizations are meant to provide an easy way to discuss beer and to compare similar commercial examples. Beer writers group beer so they can tell a story, usually discussing how styles were developed and how they are currently made. Whichever set of guidelines are chosen as a reference, be sure you understand why they were created and try to use them for their intended purpose. Problems arise when this advice is not followed.

For some professional brewers (and even homebrewers), even mentioning the subject of beer styles is like waving a red flag in front of a bull. Some beer enthusiasts support the idea of beer styles but strongly disagree with particular style descriptions or sets of guidelines. These strong responses are generally either based on a misunderstanding of the purpose of the guidelines, on observations of them being used incorrectly, or on a dislike of the person or group making the guidelines. These contentious issues are what led me to call beer styles a misunderstood necessity.

Some professional brewers look at the style guidelines as limiting, as if they are telling them how and what to brew. Nothing could be further from the truth; style guidelines are an attempt to categorize what brewers are brewing or what has historically been brewed. The guidelines take in the range of world-class examples and the characteristics that make these beers taste so good. Most individual beer styles have quite a wide range and allow for significant brewer creativity.

Guidelines naturally evolve over time as consumers' tastes and commercial examples change. New styles emerge, while others tend to fade away and be forgotten. Some brewers continually push the envelope and try to create new and unique beers. Those are best judged on their own individualistic merits as Specialty Beers,

the catch-all category in the style guidelines where creativity is king.

Even if the notion of style guidelines is not something you accept, understand that most craft beer aficionados will use beer styles to communicate. If you ask a bartender in a good pub, "Do you have any IPAs?" you should expect him to tell you about his hoppiest beers. If you go to a beer store and ask, "Can you recommend a stout?" then you should expect to be led to the dark beers. If you go to Belgium and ask for a *tripel*, you should ask if they got your order right if they hand you a glass of brown beer. Styles exist, even if people just think of them as "type of beer."

UNDERSTANDING BJCP TERMS

The BJCP Style Guidelines use some specific terms with specialized meanings that might not be immediately obvious; the most important terms are *Category*, *Subcategory*, and *Style*. When thinking of beer, mead, and cider styles, the *subcategory* is the most important label—subcategory means essentially the same thing as style and identifies the major characteristic of one type of beer, mead, or cider.

The larger style categories are arbitrary groupings of beers, meads, or ciders, usually with similar character or historical ties. However, some subcategories are not necessarily related to others within the same category. If there is ever any confusion about inferring some attribute by how a beer is categorized, always defer to the specific descriptions for each subcategory.

The purpose of the structure within the BJCP Style Guidelines is to group styles of beer, mead, and cider for competition purposes—*do not attempt to derive additional meaning from these category groupings.* Seemingly unrelated beers may be grouped according to sensory impact. They don't all have historical or regional ties, yet they are judged together so as to minimize variation in palate impact that judges would experience.

THE 'NARROWNESS' OF STYLES

Some styles are quite well known, others are historical notions, while still others are artificial creations for the purpose of categorizing relatively unique beers or

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Editor's Note: *This excerpt from* Brewing Better Beer: Master Lessons for Advanced Homebrewers *by Gordon Strong has been lightly edited for length and style.* Brewing Better Beer *and many other Brewers Publications titles are available for free until December 31, 2023, with purchase or renewal of an AHA membership. See HomebrewersAssociation.org for details.*

for grouping similar beers for judging purposes. That said, there is a notion of narrowness of style that applies to the variation between commercial examples within a style. Some styles are based on a small number of examples (e.g., California Common), while others may have explicit requirements (e.g., Kölsch)—those are narrow styles. Other styles embrace multiple stylistic variations (e.g., Foreign Style Stout, Old Ale), and hence are broader. Some styles allow a great degree of creativity on the part of the brewer, and therefore are wide open (e.g., Mild, Belgian Dark Strong Ale). All of these factors contribute to styles being handled differently.

The nature of the research into the styles is another factor. Some styles have many commercial examples; these styles are relatively easy to describe. Some styles are historical, have few sources, or are not widely available; these styles may be less fully described. Styles also tend to evolve, and descriptions may describe variations over time. In some cases (e.g., English IPA), the styles describe beers the way they used to be made more than the way they are currently made. This allows the historic heritage of a style to be preserved and the beer to be brewed by homebrewers, even if most commercial brewers no longer make it that way. Styles may be rediscovered (e.g., Porter, *Witbier*) and be revived in their historical context. It is a judgment call on the part of the BJCP to decide how best to handle a style. Beers tend to be described in the way that they were when they were the most authentic and popular.

THE STYLE SPACE

I like to think about the style space a beer occupies—that is, which styles of beer are closest to the style you are discussing, and which variables are different. For example, an American Pale Ale fits between a Blonde Ale and an American IPA in hoppiness and strength. Back off on the hops (and maybe the strength) and you have a Blonde Ale. Increase the strength (and maybe the hops) and you have an IPA. Tweak the malt-hop balance to favor the malt a bit more, and you have either an American Amber Ale or an American Brown Ale (add more crystal malt for an amber, add some chocolate malt for a brown). Play around with the varieties of malt, hops, and yeast while keeping the strength and balance the same, and you have an English or Belgian Pale Ale.

The style space also comes in handy if you're interested in making a specialty beer. The gap between styles is fertile ground for identifying "out-of-style" beers that could be described by their own style. Black IPAs are an example of a gap in the styles. There are dark pale ales but not dark IPAs. American Stouts are dark, strong, and hoppy, but the roast character, body, and balance are different. If you can change a few variables and make a new style, then you have something you can enter as a specialty beer. There are black IPAs but no black pale ales; decrease the gravity of a black IPA and you have another style.

If you're judging beer (even your own beer), it helps to know the nearest neighbors in the style space. If you think a beer is out of style, then maybe it's a better fit in an adjacent style. Each different characteristic in beer (gravity, bitterness, color, flavor, body, etc.) is a potential vector in the n-dimensional style space. If you determine your own beer hits an adjacent style better before entering it in a competition, you may wind up with a higher score, since you'll be judged against a different style description that may be a better match. If you're judging in a competition, you may be able to give the brewer better advice on how his or her beer tastes if you can refer to another style by name.

Some people have attempted to map the style space graphically (I sometimes see charts like this when a brewpub is trying to explain its lineup). Such an exercise is difficult, because beers typically have more dimensions than are shown on the graph. You can show a few attributes, like color and strength, but those don't fully model the profile of the beers. They only show you a small part of the actual difference between the styles. Those limited models may be helpful if you are only concerned about the balance between two

> “Styles exist, even if people just think of them as “type of beer.”

of the variables (for instance, graphing bitterness versus gravity shows the relative hop intensity of a beer).

A better way to illustrate the style space is to focus on one style and then show only its nearest neighboring styles. This type of chart could show the attributes which, when changed, result in the adjacent styles. That's much easier to understand and use in the general case, but it doesn't show you the full landscape of beer. You would have to compare multiple charts (or use spider graphs) to get that type of information.

HOW TO READ AND APPLY THE STYLES

As someone with a keen interest in improving the BJCP Style Guidelines, I've observed countless times how the descriptions are used in practice. Most people generally understand how to use them properly, but I've also seen many get confused and wind up with poor results. I'd like to cover the practical use of the style guidelines and how to identify what is important to know when brewing beer, entering competitions, and judging beer.

Here are my lessons learned in how to properly read and apply the guidelines:

- Don't overfocus on a single phrase in the style description. You may be giving it more importance than it is due. For example, if a *hefeweizen* is described as “may have a tart character,” don't think you have to add lemons or acid malt in order to generate this impression. It's a natural component that can come out in some beers; don't force it.
- Pay attention to the order and intensity of the descriptors; this will give you an idea of the overall profile. Try to map out primary, secondary, and background components. Your idea is to capture the balance; if you change the priority and intensity of the style components, then you are describing a different beer.
- Understand what is required versus optional in a style. For example, old ales and barleywines may have an oxidized character; don't penalize beers if they don't. IPAs require a hoppy aroma; if it is missing, then it's not right.
- Avoid the halo effect of a single commercial example defining the entire style for you. For example, not all American pale ales will taste like *Sierra Nevada Pale Ale*. That doesn't mean they aren't good examples. Styles aren't meant to be a clone beer exercise.
- Understand the range of the style (how narrow or how broad it is, as described in the “narrowness” discussion). This defines how much creativity a brewer can apply and still be within style. Don't make a style more narrow or broad than it is; think about the overall style space.
- Avoid looking at the details without looking at the overall impression. The various attributes of beer styles have some range to them (for example, the allowable bitterness or hop flavor). It's possible to choose values for each of these attributes that seem to fit the style definition yet create a beer that doesn't fit the style at all. When in doubt, the overall impression and balance trump the individual style attributes. The beer as a whole has to make sense for the style.

These factors help you understand what is important for the style. As you can tell, I'm trying to get you to envision the *essence of the style*, the overall impression and balance of the components present, to know what must be present for the style to be valid and what separates it from other styles. That is how a style is defined; by the big picture.

Gordon Strong, author of* Modern Homebrew Recipes: Exploring Styles and Contemporary Techniques *(Brewers Publications, 2015) and* Brewing Better Beer: Master Lessons for Advanced Homebrewers *(Brewers Publications, 2011), is the only three-time winner of the coveted National Homebrew Competition Samuel Adams Ninkasi Award. He is president emeritus and highest-ranking judge in the Beer Judge Certification Program, and principal author of the BJCP Style Guidelines and the BJCP Mead Exam Study Guide.

home FERMENTATION DAY

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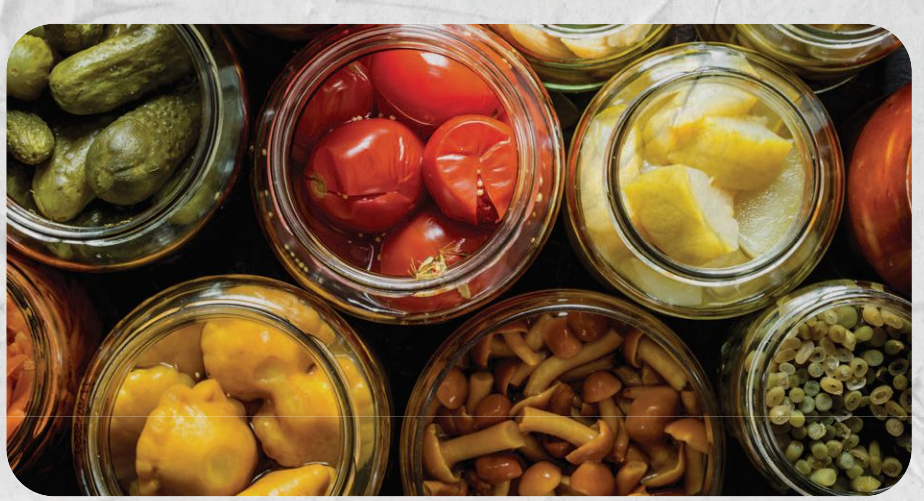

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LAST Drop

BY DREW BEECHUM & DENNY CONN

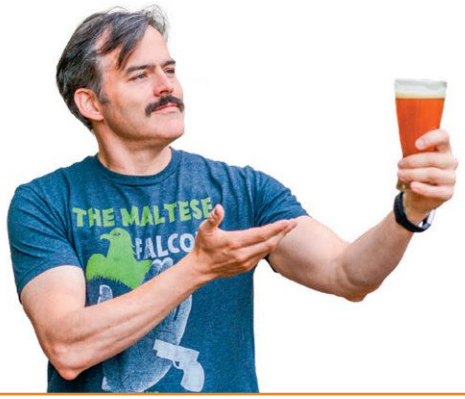
But, That's Not How the Pros Do It!

In their attempts to perfect their process, a common refrain we hear from homebrewers when we advocate for simplicity or breaking from tradition is "Hey, that's not how the big breweries do it!"

Let's get real for a moment. For all of our flights of fancy—our dreams of manning the giant kettles to supply supreme suds to society—we aren't pros. (And, for the record, neither of us have any desire to turn pro.) While we strive for a certain level of efficiency like professional brewers do, what we do at home is fundamentally different from what any commercial brewery does.

Breweries are often trying to solve problems that we, as homebrewers, don't have. We shouldn't expect our techniques and needs to be the same. You don't cook meals for a restaurant full of customers the same way you make dinner for your family. They are radically different.

It's the same with brewing. When it comes to quality, there's less difference between what we make at home and what you get from a professional brewery than what we see between home cooking and a multi-Michelin-starred restaurant. Yes, we have echoes of the same processes and the same basic techniques, but it's far less important for us to emulate the pros to get great results than if you're trying to match, say, James Beard–award-winner Thomas Keller's food.



If cooking's not your thing, how about these examples: you wouldn't build a car at home in the same way an auto factory does; you wouldn't build a chair the same way a factory producing a hundred thousand units would. We can go on.

The truth is that everything changes when you scale and when your goal is to produce the same beer over and over and over again. Drew can make a pretty damn fine Pilsner at home without needing to obsess over a mashing detail like "endosperm mashing" a la Trumer Brauerei in their Austrian and Californian breweries.

Homebrewers can use more malt and sparge less to reduce tannins because we're not trying to shave every penny we can from our costs. We can go brew a massive beer and give it endless amounts of time to ferment and age, because, hey, if we need a new fermenter we can just go get a new bucket, carboy, or whatever. Try doing that with a commercially sized stainless tank.

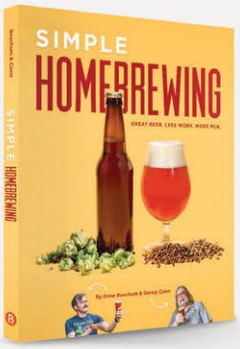
Alternative processes, like BIAB (brew-in-a-bag) and no-chill brewing (where brewers skip the post-boil chill step in favor of a gradual overnight chill) work because our scale is smaller, weights are less, and the thermodynamics are more forgiving.

Seriously, we have so much freedom, it's not even funny. Every brew can be a new idea, every batch can be an experiment. Try doing that when your batches are your profits. We don't have the moral dilemma that comes from dumping a bad batch down the drain, because it's only a few dollars, not a few thousand.

That's another reason why the battle cry "But that's not what X does," is terrible. Almost all of that beloved research that people love to wave around about various magical reactions that can make or break your brew was done at the behest of massive lager corporations for their specific needs: the lowest cost, highest shelf stability, a longer sales period, and shorter fermentation time.

We're now in a time of science-minded homebrewers and craft brewers who are tackling brewing in their own way to efficiently produce flavorful, quality beers. The technical precision needed to make a great IPA is looser than an industrial lager, but there are new questions not answered by existing lager-powered research. We are finding out that we can be less rigid, less formal, and still produce great beer. That's because once you know what the science is and how it works, you can decide what applies to you in your own home brewery and how you want to implement it. Ain't life grand?

Drew Beechum and Denny Conn are cohosts of the* Experimental Brewing *podcast and co-authors of* Simple Homebrewing, Experimental Homebrewing, *and* HomeBrew All-Stars. *They live in Pasadena, Calif., and Noti, Ore., respectively.



Editor's Note: *This excerpt from* Simple Homebrewing: Great Beer, Less Work, More Fun *by Drew Beechum and Denny Conn has been lightly edited for length and style.* Simple Homebrewing *and many other Brewers Publications titles are available for free until December 31, 2023, with purchase or renewal of an AHA membership. See HomebrewersAssociation.org for details.*

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