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THE HOW-TO HOMEBREW BEER MAGAZINE

MARCH-APRIL 2024, VOL. 30, NO. 2

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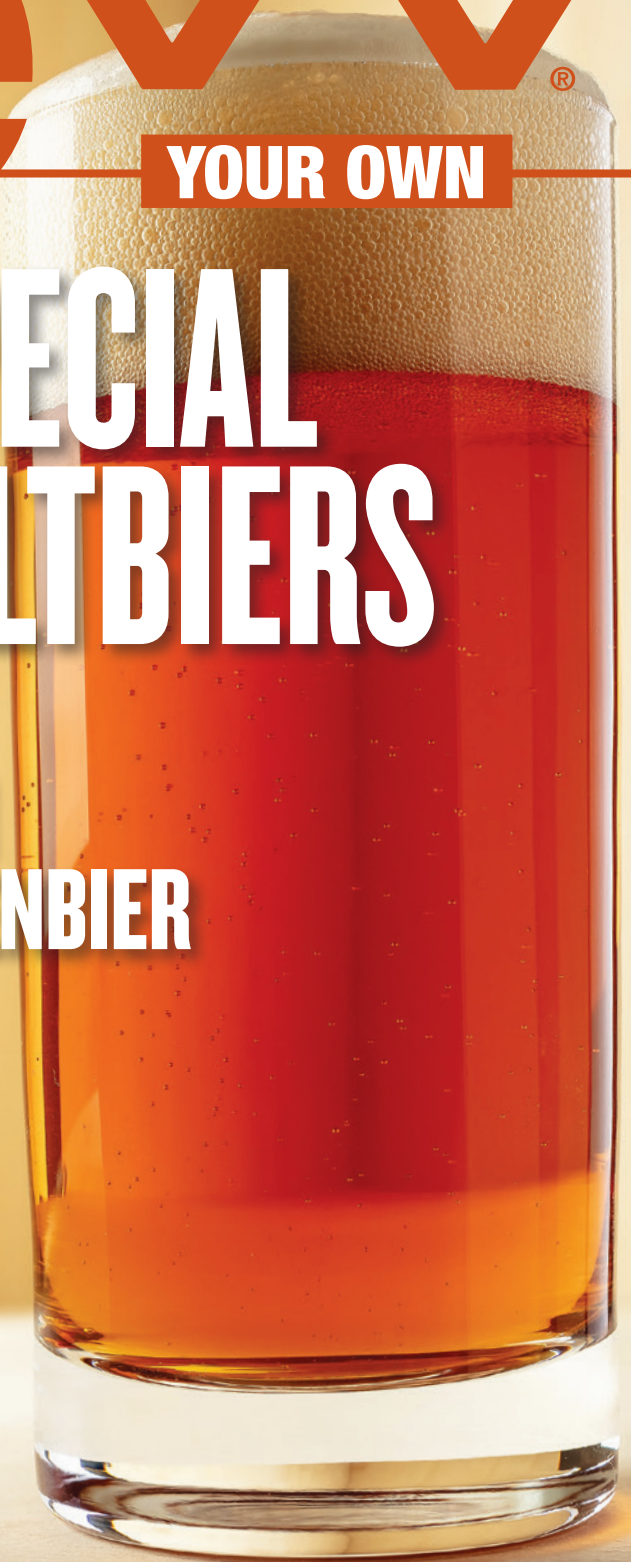

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WHY WE BREW WITH BRIESS

When we asked Rob Tod and Jason Perkins at Allagash Brewing Co. why they brew with Briess they replied, **"It's the technical support and the consistency of their malts that allow us to hit the quality we want in Allagash White and the rest of our beers."** From our growers to our experienced technical teams we work hard to make sure **you get the highest quality, most consistent specialty malt every time.**

Watch Rob and Jason tell their story
BrewingWithBriess.com/Allagash

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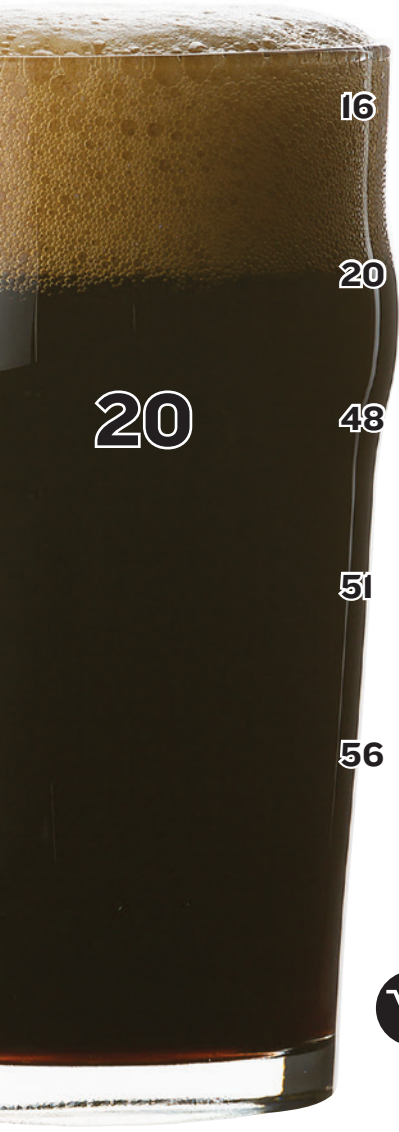

where to find it

RECIPE INDEX

RECIPE STANDARDIZATION

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

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

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

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

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

Brew Your Own — THE HOW-TO HOMEBREW BEER MAGAZINE

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Cover Photo:
Charles A. Parker/Images Plus

Q What's your favorite cask-served beer style?

Saison. Kidding! The real answer is anything made properly — lower in alcohol with just enough flavor to be interesting but not so much as to be overly demanding of my attention. It should be the beer you drink with a conversation and not the conversation itself. (And sometimes, just maybe … a lower alcohol IPA with fresh dry hops would be welcome!)

It's got to be a dark mild. Rich, full-bodied, and yet refreshing. A pint of cask mild on a rainy day in a country pub with a crackling wood fire … there's nothing better.

Without a doubt, there is only one cask- and gravity-dispensed beer for me. It was my default brew when I grew up. Still today, when you order a beer in my hometown, this is what you get: An altbier. As you may know, I wrote the Classic Beer Style book titled *Altbier* and won a GABF bronze medal for my own commercial altbier in 2000. Altbier is an unassuming and much underrated brown ale.

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suggested pairings at BYO.COM

Das Altbier

Altbier is the famed beer of Düsseldorf that translates to "old beer" in English. But this old beer is nothing like an English old ale. Learn its distinguishing traits and pointers to brew your own altbier at home. www.byo.com/article/das-altbier-germanys-old-school-style/

Figuring Out Off-Flavors

Getting to know and recognize off-flavors is somewhat difficult for the average homebrewer without significant monetary resources. With some guidance, even the casual beer geek can set up an affordable off-flavors tasting panel with friends. Stone Brewing Co.'s Quality Assurance Supervisor discusses how to set up a proper off-flavors panel at home. www.byo.com/article/figuring-out-off-flavors/

Double Pipe Wort Chiller

In double pipe heat exchangers, one fluid flows inside a pipe and a second fluid flows in another pipe that surrounds the first in a concentric tube construction. It is similar to the commonly used coiled counterflow chiller, but instead of using a continuous length of a double pipe, the length of the heat exchanger is split in short, straight sections that can be cleaned with a pipe brush and mild chemicals. www.byo.com/project/double-pipe-wort-chiller/

Multi-Purpose Fermentation Chamber

While there are tons of designs for fermentation chambers to be found, this build incorporates smart design, a clean look, and repurposed equipment to create a unique system. www.byo.com/project/multi-purpose-fermentation-chamber/

MAIL

NO-BOIL pH TARGET

I really enjoyed the "Skip the Boil" article in the January-February 2024 issue on brewing a no-boil hazy IPA. I see that the clone recipe for UNboiled from Ghost Monkey Brewery calls for acidulated malt (or lactic acid in the extract with grains version). What is the target pH for this recipe?

Philipp Pöml • *via email*

Glad to hear you enjoyed the no-boil story. According to Ghost Monkey's Head Brewer Khoi Nguyen, they typically look for a mash pH of 5.0–5.3. Hope that helps!

BUILDING A KEG WASHER

I've been a subscriber for years. Love the magazine and I always read the "Projects" column. Not being a welder or electrician though, many of the projects are beyond my abilities, but the December 2023 issue had a design for a Corny keg washer that looks right in my wheelhouse.

One question though, what is a zip ball and where do I acquire it? Perhaps a little more explanation in the parts list would help in this case. I was able to google "John Guest connector" and that was good, but googling "zip ball washer" or variations thereof lands me on numerous unhelpful web pages. Any help you can provide is greatly appreciated.

Gordon Maxwell • *via email*

That was a translation error on our end as English is not the author's primary language. If you were to search on the internet for "CIP spray ball" then you will get a lot more hits. You will find that there are many versions of them — including spray balls designed for large breweries to homebrew-sized spray balls, so just be sure that you follow the guidelines from the build for the correct "CIP" (Clean-In-Place) ball. Best of luck with the build. A good keg washer is a huge benefit for homebrewers.

A BEER WORTH AGING

Hello and congrats for all the beautiful work and articles in *BYO*. I was reading the May-June 2023 issue and I saw in the "Suggested Pairings" column the "Brewing Beers to Cellar" ar-

contributors

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

In addition to his "Style Profile" column on sweet stout that starts on page 20, Gordon also wrote the feature on common homebrewing faults that begins on page 24 in this issue.

Jamil Zainasheff is an award-winning brewer, author, beer judge, and podcaster. He has brewed every style recognized by the Beer Judge Certification Program, amassing first place or best-of-show awards for every style of beer, mead, and cider. Jamil has published approximately 100 articles and has co-authored two highly acclaimed brewing books, *Brewing Classic Styles* and *Yeast: The Practical Guide to Beer Fermentation*. Jamil has also hosted shows on The Brewing Network for the past 16 years. In 2021, Jamil retired from Heretic Brewing Company, the 37-barrel Fairfield, California, brewery and distillery he and his wife started in 2010. Jamil is currently writing *Modern Homebrewing* with his friend Andy Parker to be released by CAMRA in late 2024.

Jamil visited Düsseldorf, Germany, last fall in time for the annual releases of three special altbiers from traditional altbier breweries. He details those beers and how to brew them beginning on page 32.

Drew Jackson started homebrewing in 2009. After three years making extract beers, he joined forces with another brewer and spent the next three years brewing all-grain beers on a one-barrel (117-L) system. He then scaled down to a 5-gallon (19-L) induction cooktop system with an Igloo cooler mash tun and a 10-gallon (38-L) brew pot and never looked back. Drew lives and brews in Mendocino on the coast of Northern California. He is a forager and big proponent of farmhouse brewing techniques. He aspires to make beers that taste like the beautiful place he lives.

Beginning on page 42, Drew shares how he uses a few inexpensive yet extremely versatile tools for temperature control in numerous facets of the homebrewing hobby.

MAIL

ticle (www.byo.com/article/brewing-beers-to-cellar). Intrigued, I went to the website and read it. What an amazing piece!

In the article, author Jon Stika mentions something about a beer he forgot about and after 13 years it tasted like liquid brownie. Would he be so kind to share that recipe, if it still exists, so I could try the cellar method?

Tasos Trachanas • *Athens, Greece*

Glad you enjoyed the story on brewing beers to age. Jon passed along a response that the liquid brownie recipe he was referring to was his doppelbock recipe, the gist of which for a 5-gallon (19-L) batch is provided below:

Ingredients

15 lbs. (6.8 kg) Vienna malt
1.5 lbs. (0.68 kg) Special B® malt
1 lb. (0.45 kg) crystal malt (60 °L)
0.5 lb. (0.23 kg) wheat malt
4.6 AAU Hallertau hops (90 min.) (1 oz./28 g at 4.6% alpha acids)
5.7 AAU Hallertau hops (30 min.) (1.25 oz./35 g at 4.6% alpha acids)
White Labs WLP830 (German Lager) yeast

Step by Step

Mash at 152 °F (67 °C) until conversion is complete. Sparge at 168 °F (76 °C) to collect 6.5 gallons (24.6 L) in the boil kettle. Boil for 90 minutes, adding hops as indicated. Chill and pitch yeast. Ferment at 54 °F (12 °C) and then raise the temperature for a diacetyl rest at the tail end of active fermentation. Package when fermentation is complete and age for weeks (or even 13 years).

OAK ALTERNATIVES

I just read the article "Beyond the Barrel" (www.byo.com/article/beyond-the-barrel) by Andrew Reudink and wanted to tell you it is absolutely spot on. I'm 75 years old, live in the country, make all my own stuff — beer, wine, whiskey, gin, apple brandy, Poire Williams, pumpkin liqueur, grappa, et al. The various woods (oak and apple) make my stuff noteworthy. People I share it with say "you made this? Wow." I use small, 10-L (2.5-gallon) barrels and many of these alternative products. I really enjoyed reading this article!

Bob Prust • *via email*

WRITE TO *BYO*

Have a question about something you've seen in *BYO*? Want to show off your latest DIY homebrewing gear or recipe? We're also taking requests for clone recipes for our "Replicator" column if you've got a favorite craft brew you've always wanted to try your hand at recreating. Write to us at: edit@byo.com, find us on Facebook: www. facebook.com/BrewYourOwn, Instagram: @brewyourownmag, Threads: @brewyourownmag, or reach out to us on X (formerly Twitter): @BrewYourOwn. BYO

BEGINNER'S BLOCK

BY DAVE GREEN

YEAST FLOCCULATION

It's a simple process with a not-so-simple explanation. Experienced brewers know how to encourage (or discourage) it and it can be highly impactful on the flavor experience of the finished beer. Flocculation is an active process when yeast start clumping together after they finish their job of fermentation. Typically, yeast collect on the bottom of our fermenters along with trub.

When you start to dig into the process of yeast flocculation, you quickly realize that some yeast strains are better at it than others. Yeast suppliers will use terms like, "a highly flocculant yeast strain" in their descriptions. So, what does make a yeast strain better at the process of flocculation? Simply put, some cells are more prone to stick together. The larger these yeast clump aggregates become, the heavier and more prone they are to gain the necessary critical density to overcome Brownian motions that are keeping cells afloat in our beer.

WHY DOES FLOCCULATION MATTER?

Yeast flocculation matters for a few reasons. First, there are reasons brewers don't want suspended yeast in their beer as it does affect beer flavor. Brewers may choose a more highly flocculant yeast strain to rapidly clarify their beer from yeast. (It's important to note that yeast is only one piece of the greater hazy beer phenom. For example, it's typically suspended protein-polyphenolic compounds that cause the cloudiness in hazy IPAs and not yeast.) A brewer may want to turn a beer around in a week and will use a strongly flocculant yeast strain to produce a clear, bright beer in such a short timeframe.

On the other hand, brewers might choose a less flocculant strain for other reasons. Highly flocculant strains are better known to drop out of suspension too soon if not handled properly, leaving an unfinished fermentation and an overly sweet beer. Less flocculant yeast strains are typically known to finish fermentation strong. Also, certain styles of beer call for some yeast in suspension. German wheat beer and Belgian witbiers are two prime examples. Some brewers instruct the drinker to swirl the bottom dregs of the bottle to resuspend the yeast for consumption. In these low-hop beers, the yeast can provide a nice, rounded mouthfeel to the beer.

PROMOTING FLOCCULATION

Besides yeast selection, there are other ways in which brewers can promote the yeast to fall out of suspension upon completion of fermentation. Yeast nutrients are an easy way to promote flocculation. Calcium is the major player in this dynamic by activating compounds known as lectins on cell walls of yeast. Once activated, the lectins can adhere to other yeast cells and begin the flocculation process. Be sure to follow the manufacturer's instructions for usage rates and timing of any yeast nutrient addition.

Proper oxygenation/aeration of the wort when using a liquid strain (new or re-using a strain) is another key to achieving stronger flocculation from yeast. An aquarium pump attached to a HEPA filter with a 0.5- to 2-micron sinter or diffusion stone is a cheap and easy way to aerate wort.

Temperature is another key factor in promoting the process. While certain yeast strains, especially some lager strains, may flocculate better if warmed after fermentation, when chilled to near-freezing temperatures, most yeast cells will eventually fall from suspension. Allowing yeast to get too cold too early in the fermentation cycle is a prime reason that highly flocculant yeast may stall out and not finish fermentation.

Post-fermentation treatments such as clarifying agents and/or filtration are another way yeast can be removed from suspension. There are many clarifying agents available for different purposes, so you just need to be sure you choose one that is for yeast sedimentation.

GETTING GEEKY

It can be deduced from earlier sections that not all brewing yeast strains are created equally. Highly flocculant yeast cell walls appear differently than low flocculating yeast strains under a scanning microscope. For yeast that don't actively flocculate, it turns out they appear to lack the lectins necessary to promote flocculation and have smooth cell walls instead. Highly flocculant yeast have more of a Velcro appearance to their cell walls.

What triggers the lectins to start to attach to compounds on other yeast cells is still just a theory, but we do know that different strains have different genotypes, which have different signals to begin the flocculation process.

Another important aspect to understand is that the genes that code for yeast flocculation are highly susceptible to gene mutations. Brewers who repitch the same yeast from one batch to the next find that flocculation tendencies can change quickly. A strain that cleared within a week on batch #1, may take a month to clear by batch #3. More advanced brewers can select for properly flocculating cells by choosing which layer of yeast sediment to harvest.

CONCLUSION

What's most important to understand is that yeast cells will eventually drop out of suspension from your beer when given enough time. The speed at which it happens is dependent upon many factors, most notably which yeast strain is used. Understanding how to control the other factors is key to getting the beer to look and taste like you want it to.

CHANGING MASHING PROTOCOL TO MAXIMIZE SORGHUM

Photo courtesy of Shutterstock.com

Sorghum has been used for years to produce beer for people with a gluten intolerance, such as folks who suffer from celiac disease. But the problem is that brewer's wort made from mashing sorghum grains traditionally has yielded fewer gravity points when compared to wort produced from barley or wheat. But a new study published in the *Journal of Proteome Research* found that it may be the approach brewers have been using to mash sorghum that is the problem.

The study confirmed that sorghum indeed possesses the necessary enzymes needed to convert starch into sugars that are fermentable by brewer's yeast. But as the researchers found, the cereal grain yielded far few alpha and beta amylase enzymes, which led to less maltose production. What it does have in more abundance than barley malt is alpha glucosidase enzymes that produce a higher percentage of glucose sugar molecules. Alpha glucosidase does have slightly different optimum mash parameters than standard amylase enzymes, such as a preference for slightly lower pH levels (4.7 is optimum) and cooler mash temperatures (similar to beta amylase). This runs counter to other parameters when dealing with sorghum, such as the high gelatinization and protein solubilization temperatures. The goal of the study was for brewers to gain better brewhouse efficiency from sorghum and produce a higher-quality beer. So, we may see new brewhouse protocols in the future to maximize the handling of this grain. www.acs.org/pressroom/presspacs/2023/november/making-gluten-free-sorghum-based-beers-easier-to-brew-and-enjoy.html

WHAT'S NEW

MODERN LAGER BEER

Modern Lager Beer is an exploration of the world of lager beers and the detailed development and techniques used in their production today. Authors Jack Hendler and Joe Connolly explore the Bavarian and Bohemian origins, followed by an examination of the many significant ways that the modern perception of lager styles has been shaped by a myriad of techniques used to produce them. Many traditional methods once employed in lager beer production can be used by the savvy brewer to create unique and delicious lager beers. *Modern Lager Beer* covers practical methods, processes, culture, and recipes from some of the world's great lager craft breweries. From details of decoction programs to philosophies of fermentation tank geometry, much of the minutiae of the world's most popular beer category is explored. www.brewerspublications.com/products/modern-lager-beer

WINEMAKER GUIDE TO HOME WINEMAKING

This new book from the editors of our sister publication *WineMaker* magazine is built to be a first-time winemaker's companion, explaining the entire process from start to finish with helpful photography. Yet it has plenty to offer those who are more experienced as well, including advanced techniques for blending, testing, creating sparkling wines and fruit wines, and barrel aging. Inside the book you'll find keys to better winemaking including: Maceration, fermentation, and blending; a variety of recipes; a deep dive on wine-related ingredients; and troubleshooting winemaking errors. The book covers winemaking with fresh grapes, juices, kits, concentrates, and country fruits. www.winemakermag.com/product/winemaker-guide-to-home-winemaking

Upcoming Events

MARCH 15, 2024
2024 National Homebrew Competition Entry Deadline
Open enrollment is February 27–March 15. Maximum 10 entries per entrant. This competition is for AHA (American Homebrewers Association) members only and cost per entry is $29. To learn more visit: www.homebrewersassociation.org/national-homebrew-competition/

MARCH 15, 2024
Entry Deadline For the WineMaker International Amateur Wine Competition
Enter your wines, meads, and ciders to compete for gold, silver, and bronze medals in 50 categories awarded by a panel of experienced wine, mead, and cider judges. You can gain international recognition for your skills and get valuable feedback on your wines, meads, and ciders from the competition's judging panel. www.winemakermag.com/competition

BYO HOP PROFILE

NECTARON®

Since its release in 2020, Nectaron® has quickly found its way into the hearts of many craft brewers and homebrewers. It's a hop that took 17 years before being released by NZ Hops. Anyone looking to add intense passion fruit, peach, pineapple, and grapefruit elements to a hop-forward beer will want to give this hop a try. It is best when added post-boil in either the whirlpool or as a dry hop to retain the delicate aromatics that the thiols and esters of this hop provide.

One of the key elements to its success is the complexity it can provide as a single-hopped beer, but it also plays well with others when used in a hop blend. NZ Hops recommends the following hops to potentially pair with: Citra®, Mosaic®, Nelson Sauvin™, Motueka™, Riwaka™, El Dorado®, Amarillo®, Equanot®, Wai-iti™, Superdelic™, and its sister Waimea™.

The styles it is recommended for should not surprise any of our readers as it includes IPAs, double IPAs, pale ales, and hoppy lagers. Just don't be shy with your dosing of Nectaron® and don't leave the beer on the hops too long to avoid over extracting green elements. A SMaSH (Single Malt and Single Hop) beer would be a great way to introduce your senses to this newer variety, and with alpha acid levels from 10–14 percent it is capable of providing the bitterness to create a balanced beer on its own.

Photo courtesy of NZ Hops

DEAR REPLICATOR, Subversive Malting & Brewing showed me something fresh: A brewery that's malting all of their own grain. The beers were delicious and felt different. Seemed like a brewery really putting their heart into it. I particularly enjoyed their Dark Harvest stout, which I thought was very well balanced . . . the way a classic stout should be. Not only would I love to see the recipe for such a unique beer, but I would also be greatly interested to hear about the malting process and how they handle that side of the business as well.

Mike Mordente
Brooklyn, New York

SUBVERSIVE MALTING | BREWING

For much of craft beer's reign in the modern era, experimentation and extremes have been the name of the game. Breweries raced to out-hop and out-flavor just about every style — but for every action (and every trend), there is always an equal and opposite reaction.

In recent years we have seen drinkability and balance emerge as some of the key trends in craft beer, with a focus on lower ABVs and styles that showcase nuance above intensity. And so, after a decade of domination by Reinheitsgebot-defying pastry stouts, drinkers are once again in the mood for a classic, well-balanced stout or porter.

Catskill, New York-based, Subversive Malting & Brewing is no slouch when it comes to adventurous brewing — they just get started earlier in the process. Founded by longtime friends Max Ocean and Zane Coffey, Subversive was envisioned as a brewery with a timeless ethos: Malt is the soul of beer and by malting one's own grains, a brewer can maintain the highest degree of control.

While the farm brewery movement of the past decade has returned much-needed attention to the importance of local agriculture, few craft breweries have taken this extra step of founding their own in-house malting operation. The reason is, ultimately, simple: Running a malthouse is genuinely a whole other business with all of its own quirks, pitfalls, and complexities. The real secret of Subversive Malting & Brewing, therefore, may simply be how Coffey and Ocean manage to find time for it all.

"The great thing about doing the malting, kilning, and roasting in-house is that it can function as an extension of the brewing process and the feedback loop is very, very short," Coffey explains. Rather than tweaking percentages in recipes, Coffey says, they're able to tweak the very grain making up the recipe itself. "I can say, hey this beer performed great in the brewhouse, we got lovely conversion, it lautered well, but we had a little less color than I wanted, or we got a higher extract than anticipated. Then we can go back and look at our malting process to see what happened on that side of production."

While extra control knobs to tweak in the brewing process would excite almost any brewer — after all, why do most of us get into the hobby if not the quest of experimentation and refinement? Coffey notes that malting one's own grains opens an additional benefit — and a significant one at that.

"The biggest thing that performing the malting process in-house gives us is wildly fresh malt, which I haven't experienced anywhere else," Coffey says. "It's hard to overstate the impact on our beer. And Dark Harvest is the beer where I think the freshness of the malt really shines."

To fully capture the impact of brewing with ultra-fresh malt, Coffey and Ocean try to time their brews so that the malting is done just weeks or even days prior to a brew day.

"All of those volatile aromatic compounds haven't just been blowing off for two years while the malt sits in a warehouse," Coffey says. "Whenever we have a chance to smell and taste some of the mass market roasted malts, they often smell flat and rather astringent by comparison."

As for Subversive's Dark Harvest stout, the brewers use roasted barley, chocolate malt, and caramel malt to hit the desired color and flavor. Coffey notes that a more traditional recipe might use a higher roast level for the "super dark" portion of the grain bill, such as incorporating black patent or debittered black malt. But in-house malting creates restrictions as well as opportunities, and from restrictions come creative nuance.

"We can't quite hit high levels of roasting on our equipment as the fire danger is not worth the risk, so we put in a few percent more (roasted barley) to make up for the lower color, as well as layering in chocolate malt for depth of flavor and color contribution. The final piece in the flavor map is a fair portion of caramel malt. I feel it helps to smooth over some of the angles and bitterness of the highly roasted malts and leads to a nice, well-integrated flavor profile."

Working so closely with malt has also steered Coffey and Ocean's view of the overall brewing process, particularly when it comes to recipe

creation. One of the chief barriers for homebrewers, in Coffey's opinion, is simply the perception of complexity that's assumed to be required at every step along the way.

"I think a lot of things in the homebrew world are made more complicated than they need to be, and that was something that I was frustrated with as I was homebrewing, trying to learn as much as I could," Coffey says.

The longer Coffey has worked in the professional brewing world, he says, the simpler a lot of the processes and recipes he calls upon have become. "As people go, we are good at making things complicated, but just speaking personally I found that simplicity is the key to a lot of things. Homebrew recipes often have these laundry lists of malts and hops to try and layer flavors together and achieve complexity, and I remember being super daunted by the idea that I couldn't make a pale ale without buying six different malts. But I couldn't find a good reason that they all needed to be in there."

The KISS (keeping it simple) mindset is a good approach when it comes to brewing as well. Coffey stresses that everyone's process is different, and if a brewer loves putting together an elaborate and complicated grain bill, there's nothing wrong with it. Every brewer should do what works best for them, but don't feel a need to complicate things.

"Do what you love, at the end of the day. But commercially I tend to use one, maybe two malts in a recipe. Stout is the most complex grist bill in our lineup, coming in at five. The malts themselves are complex and I found that there's a threshold where they just start to get muddled."

Coffey and Ocean started out as homebrewers and, though they don't sell their malt, they recommend that other brewers begin to play around with this little-touched dial of experimentation too. Even a small countertop coffee roaster will be enough to get started at home, Coffey says.

"We did this as we were getting going just out back of our apartment and it was such a cool extra step to really make the beer pop."

SUBVERSIVE MALTING & BREWING'S DARK HARVEST CLONE

(5 gallons/19 L, all-grain)
OG = 1.068 FG = 1.017
IBU = 30 SRM = 36 ABV = 6.8%

INGREDIENTS

11 lbs. (5 kg) pale malt
1.5 lbs. (0.69 kg) flaked oats
1 lb. (0.45 kg) chocolate malt (300 °L)
0.5 lb. (0.23 kg) caramel malt (40 °L)
0.5 lb. (0.23 kg) roasted barley (350 °L)
10 AAUs Centennial hops (60 min.) (1 oz./28 g at 10% alpha acids)
SafAle US-05, Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

With the goal of creating a moderately dextrinous wort, mash in with 2.75 gallons (10.4 L) of 165 °F (74 °C) strike water to achieve a rest temperature of 152 °F (67 °C). Hold at this temperature for 60 minutes.

Sparge with water at 170 °F (77 °C) and collect about 6.5 gallons (25 L) of wort. Bring wort up to a boil. At start of boil, add one ounce (28 g) of Centennial hops, then boil for 60 minutes. A kettle fining agent can be added, if desired.

Chill wort to slightly below fermentation temperature, around 66 °F (19 °C). Pitch yeast. Ferment at about 68 °F (20 °C) for one week, then allow a week for settling. Keg and force carbonate to 2.4 v/v or bottle and prime.

SUBVERSIVE MALTING & BREWING'S DARK HARVEST CLONE

(5 gallons/19 L, extract with grains)
OG = 1.068 FG = 1.017
IBU = 30 SRM = 36 ABV = 6.8%

INGREDIENTS

7 lbs. (3.18 kg) golden light dried malt extract
1 lb. (0.45 kg) chocolate malt (300 °L)
0.5 lb. (0.23 kg) caramel malt (40 °L)
0.5 lb. (0.23 kg) roasted barley (350 °L)
10 AAUs Centennial hops (60 min.) (1 oz./28 g at 10% alpha acids)
SafAle US-05, Wyeast 1056 (American Ale), or White Labs WLP001 (California Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Steep the specialty malts in a muslin bag in 2 gallons (8 L) of water at 152 °F (68 °C) for 30 minutes. Afterwards, place the grain bag in a colander over the kettle and wash with 1 gallon (4 L) of warm or hot water. Then add water to reach a total volume of 6.25 gallons (24 L). Bring liquid to a boil, then turn off heat. Stir in the dried malt extract and continue stirring until fully dissolved. Return to a boil, add the hops and boil for 60 minutes.

Chill wort to slightly below fermentation temperature, around 66 °F (19 °C). Pitch yeast. Ferment at about 68 °F (20 °C) for one week, then allow a week for settling. Keg and force carbonate to 2.4 v/v or bottle and prime. BYO

Photo by Lucy Bohnsack

BY ASHTON LEWIS

SCAVENGING OXYGEN

Also: A propane heating system and water chemistry

Q IF YOU'RE ADDING PRIMING SUGAR WHEN BOTTLING, WILL ANY OXYGEN THAT GETS INTO THE BOTTLE BE SCAVENGED BY THE RESIDUAL YEAST DURING BOTTLE CONDITIONING? DO YOU HAVE TO WORRY ABOUT OXYGEN CAUSING YOUR BREW TO BECOME STALE?

MICHAEL ROTH
EVANSVILLE, INDIANA

Many homebrewers these days have taken an anti-rack position because of concerns about oxidation.

Photo by Charles A. Parker/Images Plus

While it's very hard for homebrewers to bottle their beer without picking up some oxygen, bottle conditioning does have benefits for storage.

A Oxygen is a problem for beer at all stages of the process following the early stages of fermentation because many of the flavor-active compounds created by yeast are changed, i.e., chemically oxidized, when exposed to oxygen. Unfortunately for us brewers, these oxidation reactions are very fast and many of the products of oxidation are easily detected. It's also a bit of a bummer that yeast typically do not mop up oxygen faster than it can react with beer flavor compounds.

When I was a young brewing student in the early 1990s, the most common method used to measure air in packaged beer was with a Zahm and Nagel headspace gizmo. These setups have a piercing device that allows for the measurement of pressure and temperature in bottles and cans; pressure and temperature are then looked up in a Zahm and Nagel chart to determine how much carbon dioxide is dissolved in the beer. The Zahm and Nagel device can be equipped with a separate apparatus that allows gas to literally be shaken out of the beer sample where it flows into a special glass burette filled with sodium hydroxide. Carbon dioxide is consumed by the sodium hydroxide but nitrogen and oxygen (not much present in beer because of its reactivity) remain in the burette and are measured as headspace air.

In the early '90s, it was not uncommon for packaged beer to contain 0.5 mL, and often more, of headspace air. This equates to about 400 parts per billion (ppb) of dissolved oxygen (DO). Today, brewers become concerned when their package DO is above ~30–50 ppb of DO. Packaging technology has made enormous strides over the last 30 years, as have methods used to measure DO.

I tell this story because homebrewers have become hyper-concerned about oxygen because commercial breweries are hyper-concerned with DO. Our concerns as homebrewers are like those of commercial brewers, except for one main difference; homebrewers don't have to worry about our beers sitting in some unknown place at some unknown temperature for extended time periods waiting to be picked from the shelf. I think it is very important for homebrewers to keep that fact in mind when worrying (or not worrying) about certain brewing details.

Empirically, it does seem that bottle-conditioned beers taste oxidized less often than other beers. This observation is well-documented in the homebrewing and commercial literature and is usually attributed to yeast being able to scavenge oxygen. I have never been sold on this explanation because oxidative reactions are faster than oxygen uptake by yeast. Indeed, research over the last 20 years or so provide clearer explanations of these empirical observations. A study by D.

Saison, et al., in 2010 titled "Decrease of Aged Beer Aroma by the Reducing Activity of Brewing Yeast" where aged beer containing aged beer aromas was almost entirely stripped of these staling aldehydes during refermentation (*Journal of Agricultural and Food Chemistry* 2010 58 (5), 3107-3115). A more recent study in 2023 by De Clippeleer, et al., related to non-alcoholic and low-alcohol beer (NABLAB) production, showed that yeast selected for NABLABs biochemically reduce wort aldehydes associated with worty and stale aromas, thereby greatly reducing these off-aromas ("An In-Depth Comparative Study between Commercial Alternative Brewing Yeasts in Low-Alcohol and Alcohol-Free Beer Production," ASBC Meeting Abstracts, 2023).

I recently tasted three NA (non-alcoholic) experimental beers brewed at the Fermentis Academy in Lille, France. The control beer was fermented with SafBrew LA-01, a maltose-negative yeast (it doesn't ferment maltose sugar). The first experimental beer was first kettle-soured with *Lactobacillus plantarum* before wort boiling and fermentation using the maltose-negative strain. The second experimental beer was produced by adding fruit aromas to the kettle-soured NA. The control beer had a perceptible wortiness, however, both beers that were kettle-soured lacked worty aromas associated with wort aldehydes, demonstrating that lactic acid bacteria also reduce aldehydes.

OK, time to wrap these tidbits of information into something useful. For starters, I am not suggesting that dissolved oxygen is not a problem in beer. Focusing on methods to minimize oxygen pick-up after the start of fermentation are, without argument, important to brewing. Many homebrewers these days have taken an anti-rack position because of concerns about oxidation. I use simple methods, including a carboy fermenter and a keg for my secondary. It's very easy to fill a keg with sanitizer, blow it out using CO_2, recover the sanitizer for later use in the soon-to-be cleaned carboy, and rack beer from the carboy into the secondary without worrying about oxygen pick-up. I usually cold crash this beer after whatever time at fermentation temperature is required to finish the beer, store for a few days, and rack into another keg for serving. Up until now, minimizing oxygen pick-up has been relatively easy.

For those of us who bottle, there are a few options for filling. My preferred method is using a counter-pressure filler, even when my plan is to bottle-condition, because these fillers allow for beer containing CO_2 to be filled with minimal foaming, intentionally foamed or fobbed after filling to push gas out of the headspace, and then capped with minimal oxygen pick-up. Commercially available bottle-conditioned beers are usually filled with about 2.2 volumes of CO_2 so that fobbing before capping is possible. High package airs occur when this step of the filling process is not properly performed. This is where homebrewers tend to deviate from commercial norms.

Most homebrewers use something like a BeerGun® or a flexible hose that can be pinched to stop flow to fill bottles with still beer from a carboy, bottling bucket, or Corny keg. Still beer contains too little CO_2 to fob and always leaves headspace gas, which is 20% oxygen, in the top of the bottle. While it's tempting to leave minimal headspace in the bottle, that trick often results in bottle breakage. We're now back to the beginning of this story where bottled craft beer in the early 90s often had very high package airs. I drank my fair share of great microbrewed beer back in that time and enjoyed more fresh beer than oxidized beer. The game changed as more beers started to show up on warm shelves, in places further and further from the brewery, and sat for longer and longer time periods. You can control this at home.

The other thing homebrewers without sophisticated bottle fillers can do is dose fresh yeast with priming sugar before packaging. Fresh yeast will not only carbonate your beer faster than whatever happens to be hanging around after fermentation and aging, but it will be in a better metabolic state to reduce staling aldehydes that develop as oxygen reacts with alcohols. Most bottle-conditioned beers contain about 500,000 yeast cells per mL, roughly 10–20 times less than wort pitch rates, and brewers wanting to dose fresh yeast need not go overboard. This last bit is the key that recent research explains; active yeast converts staling aldehydes back to the compounds, primarily alcohols, they were prior to oxidation like an oxidation eraser. Thanks for the great question that led me to some interesting references!

Q I HAVE BEEN BREWING FOR SEVERAL YEARS AND UTILIZING THE BIAB (BREW-IN-A-BAG) METHOD. MY QUEST HAS BEEN LOOKING FOR A WAY TO USE MY PROPANE SYSTEM TO HOLD MY MASH AT THE DESIRED TEMPERATURE DURING THE ENTIRE MASH. I THINK A PROPANE CONTROLLER HOOKED UP TO A THERMOMETER THAT IS IN THE MASH OR THERMOWELL WOULD WORK. I HAVE SEEN "CAMPING" PROPANE WATER HEATERS THAT USE BATTERIES WITH A DIGITAL TEMPERATURE SET TO MAINTAIN A SPECIFIC WATER TEMPERATURE. BUT TWO PROBLEMS ARE 1) THE SETUP CAN'T GET TEMPERATURE UP TO MASH TEMPERATURES AND 2) I DON'T WANT TO RUN MASH THROUGH THE TUBES. DO YOU HAVE ANY IDEAS OR ADVICE?

BOB WESCHLER
BUMPASS, VIRGINIA

A I think I have a solution to your quest that will work well without costing much money. All you need for this project is your propane burner, a pot, an immersion wort cooler, a temperature controller, such as an Ink Bird or a Baylite unit with a heating output plug, and a submersible water pump rated for high-temperature applications. You may have most of these gizmos laying around already. The pot can be your brew kettle or a smaller pot dedicated to mash heating, the immersion cooler can be used both for mash heating and wort cooling, and the temperature

controller can be used for other brewing functions like keezer control. The only item that may fall into what Alton Brown of "Good Eats" calls a mono-tasker is the submersible water pump; the good news is that these little dudes are easy to find out on the interweb for about $50.

The basic setup uses your propane heater to heat a pot filled with water, the submersible pump to deliver hot water to the immersion coil (use high-temperature, braided hoses connected to the coil using hose clamps for safety), and the temperature controller to turn the pump on and off (pump must be plugged to the outlet designated for heating and the heating differential set to about 2 °F/1 °C). A good way to conserve water is to use the same water for mash heating and sparging. The water temperature is not critical if it's about 10 °F (5 °C) hotter than your mash temperature set-point. You can either set your propane burner on the lowest fire to continuously heat the water or you can fire it on and off as needed.

In practice, consider using something like a metal grate to prevent the submersible from touching the bottom of the kettle and consider heating your water pot and immersion coil before mashing-in so that you don't cool the mash with a cool coil. After your water and coil are hot, mix mash water and malt in your grain bag, let the mash sit for about 10 minutes to allow some mash thinning from enzyme activity, gently wiggle the immersion coil into the mash so that the coil is immersed, and drop the temperature sensor (make sure it is totally sealed and able to be dropped into liquid) into the mash.

Assume you start your mash at 149 °F (60 °C) and you have your controller set to 149 °F (60 °C) with the heating differential set at 2 °F (1 °C). When the measured mash temperature drops to 147 °F (55 °C), the pump will turn on and pump water through the immersion coil until the measured temperature is 149 °F (60 °C). Two practical problems with this design are short cycling of the pump and temperature stratification within the mash. The best way to address short cycling is to keep the differential setting to about 2 °F (1 °C) or greater. And the simplest way to deal with stratification is to gently stir the mash when the heating pump is turned on.

This basic setup keeps things simple without pumping wort or mash through a heater. It also closely mimics how commercial systems heated with steam operate. Hope this helps you get to where you want to go!

Q I HAVE BEEN AN ALL-GRAIN HOMEBREWER FOR ALMOST 15 YEARS NOW. I TYPICALLY START WITH REVERSE OSMOSIS (RO) WATER AND ADD CA^{+2}, MG^{+2}, NA^{+}, HCO_3^{-} AND CL^{-} AS NEEDED, DEPENDING ON THE BEER THAT I AM BREWING. I MEASURE MASH pH AND AM NORMALLY WITHIN THE RECOMMENDED RANGE OF 5.2 TO 5.5. WHAT I WOULD LIKE HELP WITH IS A FORMULA FOR CALCULATING/ESTIMATING MASH pH SO THAT I CAN MAKE APPROPRIATE PRE-MASH ACID/BASE ADJUSTMENTS VS. TRYING TO CATCH UP AFTER THE FACT. I HAVE USED THE BRAUKAISER SPREADSHEET BUT WOULD LIKE TO SEE A SUMMARY OF THE ACTUAL FORMULAS AND SUPPORTING DATA USED/NEEDED TO MAKE REASONABLE PRE-MASH pH ESTIMATES. I AM AN ENGINEER BY TRAINING, SO I'LL GLADLY LABOR THROUGH THE MATH.

DENNIS SOPCICH
LOVES PARK, IL

A Being able to predict mash pH based on brewing water composition and grist bill is something of great practical use to brewers. Clearly not all beer styles brewed in Munich, for example, are a good fit with the alkaline water in Munich without some adjustments and having some way to guide these tweaks before a brew is the general aim of many water calculations. The fact is that all such calculations are approximate because there are simply too many variables that affect mash pH, including water, malt, mash profile, boiling duration for decoction mashing, and mash thickness. I have spent a fair amount of time digging into your question and can provide some answers, so read on!

The most recent version of Kai Troester's water calculator I could find on the Braukaiser website is version V1.58 dated September 16, 2012. The bad news is that this spreadsheet is password protected and the formulas are hidden. That's probably why you submitted this question. The good news is that I am persistent with Excel and was able to find a tool to remove the password! Sorry Kai, but I had to pick your lock.

Let's start with a summary of how Kai's water spreadsheet is written. This tool is based on the work of Paul Kolbach that was first published in 1951. The translated title of his work is "The Influence of Brewing Water on the pH of Wort and Beer." A.J. Delange translated pieces of this work collected by John Palmer and some of the German text was cleaned up by Kai Troester for translation. The translated document is not dated, but can be found at www.themodernbrewhouse.com/wp-content/uploads/2016/11/DeLange-1953-Kolbach-Translation.pdf. Kolbach developed the brewing concept of residual alkalinity (RA), expressed in terms of equivalents of calcium oxide, and came up with an easy-to-use factor equating +/- 10 units of RA to +/- 0.3 pH units. Let's assume we produce wort using distilled water for mashing and sparging and our post-boil wort has a pH of 5.6. If we repeat the same brew with water with RA = +10, the predicted post-boil wort pH is 5.9. The same logic can be applied to mash pH estimation.

In Troester's tool, he begins by calculating RA and applies a correction factor for mash thickness to account for the differences between predicted wort pH and mash pH (see www.byo.com/mr-wizard/using-softened-water/ for a review of how to calculate RA). Troester references his excellent white paper titled "The Effect of Brewing Water and Grist Composition on the pH of the Mash" published on his Braukaiser website where he provides extensive data related to the general topic, including specifics about mash thickness, mash pH, and how these relate to Kolbach's wort pH rule. The takeaway here is that RA =

> **Because distilled water has no RA, mash thickness does not affect predicted mash pH and the value that is returned is based solely on color and a big assumption about all pale malts.**

+/- 10 °dH (degrees of German hardness) equates to a +/- 0.2 mash pH change when mash thickness is 4 parts water to 1 part malt (wt/wt). That's a bit on thin side for most homebrewing (3:1 is more common), but as the data in Table 1 shows, mash thickness only has a minor effect on predicted mash pH.

Troester's tool also calculates the predicted pH of mash using distilled water where RA = 0. This is where things become a little odd. Because distilled water has no RA, mash thickness does not affect predicted mash pH and the value that is returned is based solely on color and a big assumption about all pale malts. When color is set to 2 SRM, the predicted pH of mash produced from distilled water is 5.57. Not only does the pH of mashes made from different pale malts vary quite a bit, but it's usually higher than 5.57. Most North American pale malts these days have a reported pH based on ASBC (American Society of Brewing Chemists) congress mashing of around 5.9. The easy way to use this information is to increase his estimates based on known values obtained from current malt analyses. You can see from the data in Table 1 that the predicted pH changes based on wort color and mash thickness are linear over the range shown, so the adjustment can also be linear.

Troester's 2009 white paper takes a deep and very interesting dive into the topic of color, but incorporating the results of his mash trials into a single calculation is not simple because pale malts, crystal malts, high-kilned, and roasted malts all affect mash pH differently. In his Braukaiser calculator, he uses a single term combining beer color, % roasted malt, and % non-roasted malt as the way to bring specialty malts into his prediction of mash pH. Note that on a beer color basis, non-roasted malts, assumed to be crystal malts used in his pH shift calculation, are more acidic than roasted malt. This term is calculated by the following:

pH Shift from Color = (-) {(Beer Color in SRM) x [(0.21 x % non-roasted malt) + (0.06 x % roasted malt)]}/12 °Plato.

Although the Braukaiser pH shift from color term appears to be based on solid data, it seems to overestimate the effect of malt color on mash pH. Table 2 shows predicted mash pH at a single mash thickness using alkaline water (RA = 10 °dH) over a range of colors and their corresponding roasted malt component. Troester's plots of mash pH versus beer color in his white paper don't fall below about 5.1 when color is derived from roasted malt, yet the predicted mash pH from the combination of 10% roasted malt and 90 SRM is 4.35.

What does this all mean? In my opinion as someone who has written lots of spreadsheets, any review of a spreadsheet is likely to find some oddities. I noted a few because you asked how this tool is written. It's also my opinion that Kai Troester developed a user-friendly, predictive tool to help navigate the deep topic of water chemistry. If I were to edit this tool, I would "unbury" the pH from base malt and make that an editable variable. I would also spend more time looking at the pH shift from color because it doesn't pass the sniff test; other references coupled with my own brewing experience are not aligned with that metric.

It's weird; every time I remove a liter from the brewing water well, it has more water when I return! This review is a good reminder that these types of tools are predictive and are never perfect. Users must be prepared to take notes and adjust their subsequent brews based on the results of the present. That's my view on the meaning of this exploration.

And back to you, Dennis. Engineers like to understand their tools. Your question sent me on a fun quest that included watching numerous YouTube videos on how to unprotect Excel sheets when you don't have the password, reading multiple articles about water, and digging into a complex spreadsheet. If you want to learn more, start with figuring out how to sneak past the lock! BYO

Table 1: Predicted Mash pH Using Water with -2.5 °dH of Residual Alkalinity

Process Application	5:1	4:1	3:1	2.5:1
2 SRM @ 0.00% Roast	5.48	5.49	5.51	5.52
10 SRM @ 1.11% Roast	5.34	5.35	5.37	5.38
20 SRM @ 2.67% Roast	5.17	5.18	5.20	5.21
30 SRM @ 4.23% Roast	5.00	5.02	5.04	5.05

Table 2: Predicted Mash pH Using Water with +10 °dH of Residual Alkalinity and 3:1 Mash Thickness

Color	Predicted Mash pH
0 SRM @ 0.00% Roast	5.81
5 SRM @ 0.25% Roast	5.72
12 SRM @ 1.00% Roast	5.61
47 SRM @ 5.00% Roast	5.03
90 SRM @ 10.00% Roast	4.35

BY GORDON STRONG

SWEET STOUT

Lactose in stouts was once a radical idea

Unfermentable to brewer's yeast, the sweetness and flavor of lactose remain in the finished beer, where it adds to body, sweetness, and flavor . . .

SWEET STOUT
BY THE NUMBERS

OG:	1.044–1.060
FG:	1.012–1.024
SRM:	30–40
IBU:	20–40
ABV:	4–6%

Photo by Charles A. Parker/Images Plus

It might sound strange today, but there was a time when lactose wasn't added to every beer style. In fact, the concept was once so innovative that it was patented in England. This directly led to the creation of milk stout, which is what sweet stout was called in England before lawyers got involved. I guess people could be confused when their beer didn't look like a white Russian. The Dude definitely does not abide.

Lactose is a naturally occurring sugar in milk (the real kind from mammals, not the substitute kind from soybeans, almonds, or other plants). Commonly called milk sugar, it is a two-molecule sugar made of glucose and galactose and is a byproduct of cheesemaking. Unfermentable to brewer's yeast, the sweetness and flavor of lactose remain in the finished beer, where it adds to body, sweetness, and flavor, as well as being an extra source of calories. Early advertisements said that a pint of milk stout contained as many energizing carbohydrates as a 10 oz. (300 mL) glass of milk. Quite the opposite of a "lite" beer.

Humans digest lactose with the help of the lactase enzyme; and those with a deficiency of this enzyme are known as lactose intolerant. Lactose is fermentable by bacteria that produce lactase, which explains yogurt, sour cream, cheese, and other milk-derived fermented products. But these bacteria are not typically present in beer brewing, except when making certain wild or sour styles. This is just a technical point for those who say that lactose is an unfermentable sugar . . . it's just unfermentable by brewer's yeast.

Once quite popular in England, the style fell from favor but survived long enough to be described by Michael Jackson, which pretty much guaranteed that U.S. craft brewers would learn of it. Some of the best examples today, such as Left Hand Milk Stout, are widely available in the U.S. Milk Stout from Lancaster Brewing Co., in Pennsylvania, is another solid example. I'm also quite fond of Bell's Special Double Cream Stout, but it is stronger than most examples. The BJCP (Beer Judge Certification Program) places sweet stout in Category 16, Dark British Beer, as style 16A. Other members of this category are oatmeal stout, tropical stout, and foreign extra stout.

HISTORY

Sweet stout has a well-documented origin story as beer styles go, due to the patent I mentioned. William Melhuish received several patents between 1908 and 1912 for applying lactose to malt-based beverages, including stout. Mackeson, a brewery dating back to 1669 as the Hythe Brewery, acquired the original patent and launched its first milk stout based on it in 1909. It also licensed the patent to other breweries who would develop their own products with the provision that the stouts had to contain an appreciable amount of lactose. The patents were tested in court as unlicensed imitators appeared, but the patents were upheld. The Mackeson brewery was acquired by Whitbread in 1929, which gave the beer a wider distribution. It grew to be Whitbread's largest selling brand by the 1950s.

Around the start of the 20th century, nutritional beers had a popular following in the British Isles. Marketed as having additional health benefits, beers like oatmeal stout, oyster stout, and milk stout were popular among people looking for an alternative to Irish (and English) stout. The calories and carbohydrates found in milk were seen as healthy and sustaining for working people, but also as restoratives for invalids and nursing mothers (surprisingly, this wasn't the legal complaint . . .).

British breweries voluntarily stopped calling their products milk stout in the 1940s after complaints that the products contained no milk (despite the fact that original advertisements clearly stated that it had carbohydrates from milk, not actual milk). Mackeson changed their product to Mackeson Stout, later Mackeson XXX Stout as an export product. Once brewed in Cincinnati, Ohio, for the U.S. market, it is now made by Carib Brewery in Florida.

Mackeson became exclusively a bottled product in the 1930s, and ultimately suffered a decline in sales by the 1970s, like many once-popular darker beers (porter, mild, brown ale). Fortunately, it had successfully been exported as a style and became established in the developing craft beer scene in the U.S. and other countries. English examples saw the inevitable decline in gravity and alcohol in the same way as most other styles. However, it was not always a weak beer. Modern export strength versions are more like those from the early parts of the 1900s before world wars and taxes took their toll.

In the modern craft era, the style often seems to be interpreted as the stronger variety. This makes sense to me as lower-strength versions (often below 3%) could easily be confused with the sweet London brown ales. I find the sweetness tastes different, but the strength and color are often similar.

SENSORY PROFILE

Sweet stouts are almost self-descriptive — it's a stout and it's sweet. Expect a dark brown to black color, usually opaque, with a creamy, tan to brown head. The flavor balance tilts sweet, sometimes with a bittersweet note not unlike strong coffee with cream. The body is medium-full to full, with a creamy texture. It is an average-strength beer, 4–6% ABV, with American examples often near the high end. The export strength Mackeson example was about 4.9%, not far off from the pre-WWII domestic strength.

Lactose can impart a subtle milk- or cream-like flavor, as well as adding to a creamy mouthfeel sensation (which is one reason why this style is sometimes called cream stout). The sweetness and richness soften the finish and temper

SWEET STOUT

(5 gallons/19 L, all-grain)
OG = 1.054 FG = 1.017
IBU = 25 SRM = 36
ABV = 4.8%

INGREDIENTS

7 lbs. (3.2 kg) mild malt
12 oz. (340 g) flaked oats
8 oz. (227 g) flaked barley
12 oz. (340 g) crystal malt (60 °L)
5 oz. (142 g) Carafa® Special III malt
5 oz. (142 g) chocolate malt
10 oz. (283 g) roasted barley
1.5 oz. (43 g) black patent malt
12 oz. (340 g) lactose sugar (15 min.)
7.5 AAU Golding hops (60 min.) (1.25 oz./35 g at 6% alpha acids)
Wyeast 1968 (London ESB), White Labs WLP002 (English Ale), or Mangrove Jack's M15 (Empire Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

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

Mash the mild malt and flaked oats and barley at 151 °F (66 °C) for 60 minutes. Add crystal and dark grains, increase mash temperature to 168 °F (76 °C) using direct heat or infusion, and recirculate for 15 minutes. Sparge with 170 °F (77 °C) water, collecting 6.5 gallons (25L) of wort.

Boil the wort for 75 minutes, adding hops at the time indicated in the recipe. Add the lactose with 15 minutes left in the boil.

Chill the wort to 68 °F (20 °C), pitch the yeast, and ferment until complete. Rack and package the beer, or rack and clarify the beer (if desired) with finings before packaging. Prime and bottle condition, or keg and force carbonate to 2.4 v/v.

SWEET STOUT

(5 gallons/19 L, extract with grains)
OG = 1.054 FG = 1.017
IBU = 25 SRM = 36
ABV = 4.8%

INGREDIENTS

5 lbs. (2.3 kg) Maris Otter liquid malt extract
8 oz. (227 g) Carapils® malt
12 oz. (340 g) crystal malt (60 °L)
5 oz. (142 g) Carafa® Special III malt
5 oz. (142 g) chocolate malt
10 oz. (283 g) roasted barley
1.5 oz. (43 g) black patent malt
12 oz. (340 g) lactose sugar (15 min.)
7.5 AAU Golding hops (60 min.) (1.25 oz./35 g at 6% alpha acids)
Wyeast 1968 (London ESB), White Labs WLP002 (English Ale), or Mangrove Jack's M15 (Empire Ale) yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Use 6 gallons (23 L) of RO (reverse osmosis) water in the brew kettle; heat to 158 °F (70 °C). Steep all the grains in a mesh bag for 30 minutes, then remove and sparge gently.

Turn off the heat. Add the malt extract and stir thoroughly to dissolve completely. You do not want to feel liquid extract at the bottom of the kettle when stirring with your spoon. Turn the heat back on and bring to a boil.

Boil the wort for 60 minutes, adding hops at the time indicated. Add the lactose with 15 minutes left in the boil.

Chill the wort to 68 °F (20 °C), pitch the yeast, and ferment until complete. Rack and package the beer, or rack and clarify the beer (if desired) with finings before packaging. Prime and bottle condition, or keg and force carbonate to 2.4 v/v.

the impression of bitterness in a manner similar to adding cream to coffee. Because of the desire for a smooth finish, the base stouts are usually not aggressively roasty or burnt tasting. Chocolate and coffee flavors are typical, with the lactose often giving these a milk chocolate or mocha impression. Some background malt complexity is possible but isn't a major driver of the style.

The fermentation character can be neutral to fruity. Some examples can have trace buttery diacetyl, which can be associated with dairy products, but this isn't required. Hop flavor and aroma are optional, but are typically low if present and usually have a floral or earthy English character. The bitterness level is moderate at best, particularly when considering the balancing sweetness. The aftertaste is rich, full, and creamy with bittersweet roasted flavors.

The sweetness and roast levels are somewhat variable with a range of interpretations possible. In the best examples the sweetness and roast are in a pleasant combination. Remember, you have to perceive a lactose sweetness, but it shouldn't be over the top like in a pastry stout. It shouldn't seem sugary-sweet or rummy-sweet like in a tropical stout, and it shouldn't have a super complex malt profile like that often found in an imperial stout.

BREWING INGREDIENTS AND METHODS

The most important thing to remember about this style is that the residual sweetness in the beer is obtained from adding lactose. The sweetness must not only come from other types of sugar, crystal malts, or residual extract from fermentation, although those may be present. An early lawsuit testing the original patent failed in part because the imitator did not use an appreciable amount (that is, something perceivable by the drinker) of lactose. The original patent described 20% of the grist being lactose, but I find a target more in the neighborhood of 10% to be more common in modern versions.

The lactose can be added at various points in the brewing process. English brewers that parti-gyled their beers would add the lactose post-boil, so as to only include it in the milk stout variant. If you are making a single batch, you can of course add it during the boil. If you sterilize the lactose (boil it with water for at least 5 minutes), you can add it post-fermentation. This would allow you to increase the sweetness level to your personal taste, which is something I might do to test variations of a recipe even if I use the other methods. Since the lactose doesn't ferment, you can really add it any time you like, just don't infect the beer when you do it. When reviewing recipes, understand when the lactose is added since that affects the gravity parameters of the beer — I find it helpful to look at ABV first rather than OG (original gravity).

The base beer is a typical stout, using pale malt with malts (and other grains) to provide a dark color. Pale ale malt is common, particularly those that are somewhat dextrinous (like mild malt). It's not necessary to use a highly flavorful pale malt like Maris Otter, since those flavors will be covered up by the sweetness and roast. Starchy adjuncts like flaked barley, oats, or corn can be used, as can fermentable sugars (refined or not). Traditional English recipes might use dark invert sugar syrups and caramel coloring, although these aren't typical homebrew ingredients that might use a variety of crystal malts instead. Some English recipes might also use traditional porter and stout ingredients like brown malt.

The darker ingredients can include the usual suspects, like roasted barley, black malt, chocolate malt, and their debittered (huskless) brethren. Just remember that we are trying to avoid too much of a roasty or burnt flavor. Mash as you would any other stout; single infusion is traditional. This is an English-style ale after all. Mashing at higher temperatures can provide more body, but if you are adding other character-building adjuncts or sources of dextrins, this isn't necessary.

English-type hops are common, but any relatively neutral bittering hop should work fine. Avoid hops that you would use in a modern IPA since you don't want citrusy, piney, dank, tropical, or "New-World" flavors. Likewise, a neutral American or fruity English yeast is fine, just as you would use in other stouts. A warm-fermented lager yeast could also work but wouldn't be as traditional. This is not a yeast-driven style, so a wide range of solutions is possible, but I think an English yeast is most traditional.

HOMEBREW EXAMPLE

While I enjoy the stronger American craft versions, this example is more like the Mackeson's I remember — closer to 5% than 6. I also keep the IBUs down, around 25, since I don't want the bitterness to stand out against the sweetness.

For base malt, I use mild malt since I like the dextrinous character, but pale ale malt could also work. Flaked oats and barley are used to increase the mouthfeel and body. Lactose provides the sweetness, added late in the boil, along with crystal malt. With all the flaked grains, there is no need to mash this at higher temperatures. A single infusion mash is sufficient; and I'll use 151 °F (66 °C) as a reasonable temperature to encourage fermentability.

The color and flavor come from a mix of dark grains including roasted barley, chocolate malt, Carafa® III malt, with just a touch of black patent malt. I have often made this recipe cold-steeping the dark malts and adding the strained liquid at the end of the boil, but this recipe uses them more traditionally.

If you want to explore the cold-steeping method, finely grind the dark grains separately and place them in a pot or large glass jar. Cover with at least a gallon (3.8 L) of cold RO (reverse osmosis) water, cover, and let stand at room temperature for at least 24 hours. Strain the grain, collecting at least a half-gallon (1.9-L) of liquid. Add this liquid in the last five to ten minutes of the boil. Do this process instead of adding the dark grains to the mash.

Staying with the English theme, I'll use Golding as my bittering hop and Wyeast 1968, White Labs WLP002, or another "Fuller's" strain as the yeast. The yeast will give a smooth palate with a gentle fruitiness that complements the darker malt flavors.

While this beer can be used as a base for experimentation, please try the standard beer first. Avoid the desire to turn this into a session pastry stout. The dark grains have a wonderful flavor on their own, and don't need extra sweetness or spices to be delicious. BYO


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Photo by Gordon Strong

RETHINKING BEER FAULTS

Diagnosing common homebrewing mistakes

by Gordon Strong

When I judge in competitions, people often ask me about memorable beers. I think they expect me to mention the exceptional homebrews that could pass as award-winning commercial examples. However, I'm more likely to describe the truly awful ones that leave a lingering memory. Judging in more than 400 competitions over 25 years has given me plenty of examples of both. Hopefully, judges help brewers graduate to the more favorable type of memory.

Great beers stand out immediately. Bad beers are fairly obvious. But the wide range of intermediate beers require the most thought since their problems are rarely simplistic. They may involve problems with the style interpretation, or they could be actual brewing faults. Faults could be single or occur in combination. The problems could happen throughout the brewing process, starting with the original concept and continuing through the handling, storage, and service processes where the beer is consumed.

I used to think about faults as individual elements to detect, but they are really part of the larger framework of the entire sensory experience of the beer. Beers are rarely perfect except for one noticeable fault. More often, there are multiple faults of varying degrees that help the judge determine what underlying problems caused them. This diagnosis then provides the most useful assessment for the brewer.

Photo by Charles A. Parker/Images Plus

Sulfury flavor is a beer fault that is popping up more often, which may be due to some modern hop varieties containing sulfur compounds. Using caution in regard to combinations of water profiles and hop and yeast selection is important to avoid this flaw that some tasters are more sensitive to than others.

SOURCES OF FAULTS

The more I judge, the more I start thinking about where problems are introduced. I like to break up the brewing process into four phases where mistakes may happen to cause problems in the finished beer:

1. Recipe formulation and ingredient selection
2. Brewing and hot-side processes
3. Fermentation and cold-side processes
4. Packaging, storage, and handling processes

If I can isolate problems to these stages, it lets me focus on a smaller subset of possible faults rather than thinking about the entire universe of brewing issues.

Recipe and Ingredient Problems

These often produce beers that don't match style profiles well. Contaminated or stale ingredients can lead to noticeable flavor defects. The choice of certain ingredients could clash with each other, producing unpalatable results. Sometimes this effect is cumulative, like when gypsum in water combines with sulfury dank hops or sulfur thrown off by lager yeast to create an objectionable amount of sulfur in the finished beer. Newer hop varieties can have complex profiles, and some competing hop combinations can be unpleasant. Sometimes problems are traced to changing ingredients. Different maltsters produce crystal malts with different flavor profiles, even if they have similar color. As municipalities change water sources during the year (sometimes during the course of a day), they may be making different treatments (like adding additional chlorine that could persist enough to cause a medicinal chlorophenolic flavor under certain conditions).

Hot-Side Problems

The hot side of brewing involves mashing and boiling. Style-related problems could be introduced here, including problems with body, fermentability, and sweetness levels. Process-related problems like incorrect mash temperatures, not having a proper pH during the mash or boil, or scorching the wort can produce significant impacts.

Cold-Side Problems

This is where yeast issues are typically introduced. Fermentation problems can produce significant off-flavors, but yeast performance can also lead to a beer not matching its expected parameters. I also include lagering and conditioning in this phase since many beers have temporary problems that can be reduced or eliminated during the maturation process. Beers that have some kind of post-processing, like barrel aging or mixed-fermentation maturation, can be impacted by these additional steps.

Packaging and Storage Problems

This phase is where oxidation and age-related issues are often produced or exacerbated. Sometimes the brewer has no control over the outcome, like when a beer is cellared past its prime. But sometimes the foundation for the problems is laid when the beer is packaged, like excessive dissolved oxygen in solution or bacterial contamination.

COMMON FAULTS TODAY

Recently, I've judged in both commercial and homebrew competitions in the

U.S. and several other countries. Faults are sometimes regional, perhaps tied to ingredients, equipment, or knowledge common in the area. Other problems seem to be more universal, and are often related to the experience of a brewer. To follow are some of the more common ones I've seen recently.

Oxidation

This problem shows up almost everywhere, and is typically associated with packaging problems (too much oxygen in the package when it is sealed). Oxidation of ingredients can be seen with hoppy beers, or in some places where the malt is not well kept. But I almost never see the paper or cardboard oxidation that is tied to excessive oxidation during the hot side. Cold-side problems are much more common. I perceive these as dull, muted flavors, often with a sweetness and fruitiness. Some malt flavors are caramelly or honey-like, and the bitterness develops a harsh quality.

As a homebrewer, I try to control these issues by purging the packages with CO_2 as well as making sure transfers aren't splashing. If you are unsure of your packaging skills, storing your beers cold and consuming them quickly can minimize the oxidation that can occur by slowing the rate of oxidation.

Fermentation Problems

Incomplete, interrupted, or unhealthy fermentations produce beers containing excessive yeast byproducts, since the normal yeast metabolism processes don't fully finish. **Acetaldehyde** is probably the most common problem, but it rarely shows up to me as green apple. It often just seems dirty. In some cases, I've perceived it as fresh-cut pumpkin or latex paint. But a general dirtiness is what happens most often. Brewers can control this by providing a healthy environment for yeast to ferment, including supplying micro-nutrients. Yeast gets the blame but often the root cause is the fermentation environment lacking in proper nutrients to support a healthy fermentation.

Diacetyl shows up less often, and is usually the result of prematurely separating the yeast from the beer (racking too soon, cold crashing, or otherwise not letting the yeast complete fermentation). While diacetyl has many other causes, I usually focus on the most likely problems first, unless there is some other evidence present (like indications of an infection or hop creep). Diacetyl rests can be used as a control, but I think letting the fermentation temperature free rise towards the end of the fermentation in general allows yeast to complete fermentation, reach final attenuation, and clean up their metabolic byproducts. Just don't be too quick to remove the beer from the yeast. Professionals dump the trub and the yeast that has fallen out soon after the start of fermentation, but they let fermentation finish fully before transferring off the yeast.

Fusel alcohols are a solventy, burning type of alcohol produced from an unhealthy fermentation. This is not just a problem with ethanol not smoothing out with time, as fusels don't really go away. Managing the fermentation in a controlled, healthy way can reduce their production. Trying to ferment too warm or too fast is often the problem. Fusels can cause annoying headaches, so this is one fault I hate to encounter.

Phenolic compounds are sometimes from yeast, typically the POF+ (phenolic off-flavor positive) yeast strains. They can come from wild

Photo by Shutterstock.com

A wide range of faults can be introduced if proper care is not given to your fermentation.

yeast infections as well, and often have the Band-Aid or electrical fire flavors. Phenols are a large family of compounds and can come from other sources like the malt. But I look for the plastic-like flavors in conjunction with other markers for infection (like a chunky appearance and sourness) as one cause. Yeast strain selection is another, but that can be style-dependent. German wheat beers and some Belgian styles depend on a phenolic profile.

Husky Astringency

I'm not sure why I'm seeing this more frequently than in the past, but it has shown up recently. Perhaps lower quality barley is being used by some maltsters, in which case the advice would be to use well-known and trusted suppliers. Harsh astringency can come from multiple sources, but husky astringency is usually a problem with how grain is crushed, or how the mash is sparged. Using higher pH sparge water can extract astringency, but a husky flavor is usually based on pulverizing grain husks or leaching too much of this flavor from the grain during the sparge.

Homebrewers can mitigate this problem by making sure the husks are not pulverized during milling, to adjust the pH of the sparge water to below 6, and to avoid excessive rinsing of the grain (sparging) after the mash is complete.

Age Problems

Related to oxidation and high FAN (free amino nitrogen) concentration in the finished beer, this usually is perceived as a dullness in the beer when it is aged too long. If lactic or acetic acid bacteria are present in the package then aging too long can also result in sourness. This is more like a spoilage problem than oxidation, really. Beers that are excessively aged often seem thin as the proteins drop out. In this case, you really just need to drink the beer when it is fresh and ready, and to not forget about it in the cellar. I like to age beers, and sometimes this produces wonderful results. But the price you pay is the occasional dud.

Not all age problems are due to excessive age. Some beers are too young. People who want to make big beers often don't take the time to let them mature sufficiently, so the alcohol winds up hot and burning on the palate. Beers like this often seem overly bitter because the alcohol is perceived as a bitter or biting flavor. Combined with the higher hopping rates often used for big beers, the bitterness can be too much when not allowed some time to age. In this case, relax and let the beers mature until ready. I often suggest brewing a smaller beer whenever making a big beer so you have something to drink while you wait. Another tip I follow when making bigger beers is to make the bitterness on the high side knowing that it will reduce when it is aged.

Sulfury Flavors

Many modern hop varieties have sulfury compounds present. Understand that not everyone enjoys these flavors, and individuals can have varying flavor thresholds. If you are using other ingredients containing sulfur, these can combine to result in beers that, well, stink. While some people seek these flavors, others will find them revolting. If you are brewing for competition, perhaps rethink your hop choices or how you use these hops in conjunction with water and yeast to constrain the sulfur load in the final beer. This is one reason why cold IPA is more popular than India pale lager was — the lager fermentations are often warmer, which helps drive off more of the sulfur. Control the sulfur content of your beer through understanding your water profile (use fewer sulfates), hop variety selection (avoid dank, onion/garlic, diesel, and similar profiles), and yeast selection (don't use lager yeast, or ferment it on the warm side).

Lack of Smoothness in Lagers

I welcome the trend of brewers making more lagers, but many brewers are misled into thinking there are no differences in making lagers and ales. People trying warm-fermented lagers under pressure can produce a beer with reduced esters, but they often lack the smoothness and flavor profile typical for the style since actual lagering isn't taking place. Rushing the lagering stage often makes a beer seem rough and green, with elevated sulfury yeast flavors. Beers that have a yeast bite often will smooth with proper lagering. Personally, I really enjoy the smoothness of lagers on the palate, a sensation that goes away when the lagering is insufficient. I like to choose lager strains that don't produce excessive sulfur, manage the fermentations to be as healthy as possible, and then take the time to lager the beer until it is ready. Don't be afraid to taste the beer and then put it back into lagering if it seems too rough. Lager at as close to freezing (even slightly below freezing) to maximize the impact.

Style and Balance Issues

Beers that are too bitter or hoppy for a style, are too roasty, or otherwise don't have the desired flavor profile are most common. Even if well-brewed, an example that doesn't exemplify the style will not do well in competition. If you aren't competing, this isn't a problem. If you are competing, understand the guidelines the judges use to evaluate your beer, and enter the category where your beer best fits the profile.

If a beer has excessive body, this can come from too many dextrins, a problem with the mash schedule especially if starchy adjuncts are used, or from mashing at too high a temperature. If multiple batches and recipes have this problem, the root cause could be something as simple as an improperly calibrated thermometer or taking temperature samples in an unrepresentative way. Maybe the mash isn't sufficiently stirred to have a consistent temperature, for instance.

If beers are fuller bodied and sweet, particularly if somewhat cloudy, this can indicate the beer is not fully fermented. Sometimes this is a yeast problem, but often it is that the mash schedule hasn't produced a good mix of fermentable sugars. If yeast are leaving too much sugar behind, it's because they weren't healthy or in an ideal situation during fermentation and somehow stopped

working. Seek to understand the source of the fermentation problem in order to get the yeast to finish their job. But don't overlook mashing as the root cause — I often seek to produce a very fermentable wort using mash techniques and add body back through dextrinous malts, rather than trying to tightly control the mash temperature. Also understand that the temperature gradient across the mash bed can vary quite a bit unless you are thoroughly mixing (don't whip air into it, though!).

Some style issues are related to choosing malts for their color contribution more than their flavor contribution. A beer can have a proper color but taste completely wrong. Often this happens when people are making German lagers and use overly roasted malts, thus making beers that taste more like porters and brown ales than schwarzbiers and dunkels. The same is true when using highly toasted malts, which can give a bite and harshness to the finish instead of the smooth maltiness expected.

Style-Specific Problems

Beers using an excessive amount of hops often have problems like hop burn or hop creep. These are more modern problems that developed as highly hopped IPAs became more popular. Sometimes the sheer volume of hops used produces sensory effects beyond the expected aroma and flavor contributions. Tactile sensations from the hops can be unpleasant and is not just another type of bitterness. Hop creep is where enzymes in the hops cause the beer to over-attenuate, producing a thin, over-carbonated beer, often tainted with diacetyl related to yeast activity following dextrin degradation. The root cause of both these problems is the excessive use of hops. Choose wisely.

Many styles have their own unique issues when they are using ingredients differently than most other beers. There is a whole category of fermentation problems that can happen in mixed fermentation beers or in kettle sours. Wheat beer yeast acts quite differently than other ale yeast, including having its own requirements for oxygenation. This is where experience helps; just be aware that not all ingredients are interchangeable, and that they often have their own idiosyncrasies.

PUTTING IT ALL TOGETHER

Diagnosing problems with a so-so beer is difficult. Hopefully this framework has given you a way of thinking about how to approach faults. I think breaking down the problems by where they were produced allows you to consider a smaller set of potential causes. Of course, having some brewing experience where you have seen these problems before is extremely helpful, which is why brewers can make the best judges if they understand the science behind brewing (or, vice versa, judges can make the best brewers). Brewers also need the sensory skills to recognize what characteristics are present in their beer, so they can use this assessment as inputs to their diagnostic process. BYO

Photo by Gordon Strong

There is a reciprocal relationship between brewing and judging beer: The more knowledge you have of one, the more it will help you with the other.

BYO's Vermont Brewery, Bike & Hike Tour

Brew Your Own Publisher Brad Ring had the chance to show a group of readers some of his favorite spots to play and drink in *BYO*'s home state of Vermont during the height of fall foliage colors. With stops at 15 breweries, the group was lucky to experience the incredible craft beer scene in the Green Mountain State firsthand during *BYO*'s Vermont Brewery, Bike & Hike Adventure in mid-October 2023. We visited an amazingly broad spectrum of breweries from one of Vermont's largest, Von Trapp Brewing (yes, that same family from *The Sound of Music*) to one of the smallest, nanobrewery Simple Roots Brewing. All along the way we had the chance to experience the fall colors Vermont is famous for while sipping on local beers often only available in the state.

Plus, each day we also took to scenic hiking trails or country roads and paths for great bike rides to earn that next flight of Vermont craft beer.

Vermont brewers rolled out the red carpet for some truly special experiences. We spent almost two hours walking the brewery floor with John Kimmich at The Alchemist and sampling their famous Heady Topper served on a hand-pulled beer engine. Steve Parkes of the American Brewers Guild gave us a beer evaluation seminar in his classroom usually filled with aspiring pro brewers. We visited fan favorites like Lawson's Finest Liquids for a maple stout pulled from the brite tank just before bottling and wrapped up a ride on the Lake Champlain bike path with a fresh pint of beer from Foam Brewers in Burlington.

We also explored other fermentations including tours of Aqua ViTea kombucha and Appalachian Gap Distilling both located in Middlebury.

And it was a week made all the more special by sharing it with fellow homebrewers passionate about brewing and exploring the beauty and craft beer in *BYO's* backyard of Vermont.

Our 2024 schedule of *BYO* trips to the Czech Republic, Oregon, and Ireland are sold out, but we're working on our 2025 locations. Details on future trips can be found at byo.com/trip. We hope you can join us on a future beer adventure. Cheers!

The Special Altbiers of Düsseld

Recreating the annual releases: Stike, Sticke, & Latzenbier

by Jamil Zainasheff

It had been a long train ride and my friend, Jason Ledford (True Symmetry Brewing in Suisun, California) and I had just arrived in one of my favorite cities, Düsseldorf, Germany. We were tired and hungry. A short walk took us to Brauerei Schumacher and we were excited to see that we had stumbled onto their special Latzen release. We found a couple empty seats at a table and enjoyed a wonderful evening of *Schweinshaxe* (delicious, fall-off-the-bone pork knuckle with a fried, crispy skin) and their fabulous Latzenbier.

These days craft breweries around the world often have at least one special release every few months. In Düsseldorf, four of the five remaining classic altbier breweries have annual special releases that they have been celebrating for a long time: Füchschen, Schlüssel, Schumacher, and Uerige. These special beers are all bigger versions (5.5–6% ABV) of the delicious altbier that they brew and serve every day. The story goes that historically beers like this were created by brewers brewing a special batch and secretly sharing it with those in the know. In fact, the word *"sticke"* and *"stike"* are said to be derivations of the Plattdeutsch (or low German) word *"stickum,"* meaning "secretly." Latzen, on the other hand, seems to be derived from the first brews of this beer being stored in the cellar *"op de Latt,"* or up on the racks.

After such a wonderful time at the Latzen release, I knew I had to be there for the other special releases and a plan was hatched to attend the Schumacher Latzen, Uerige Sticke, and Zum Schlüssel Stike releases in the fall of 2023.

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Photo by Charles A. Parker/Images Plus

Inside Uerige, patrons are always willing to scoot over to fit one more at a table, which gets crowded during the special Sticke release.

I won't say attending any one of these is difficult, but since the closest they are all ever scheduled to each other is about a month apart, it does take some planning, dedication, and an understanding spouse to attend all three. I did think about trying to add the fourth special release, Füchschen's Weihnachtsbier (Christmas beer), but being in Düsseldorf on Christmas Eve will have to wait for a future adventure.

Each brewery's taproom/restaurant is spectacular. Housed in old buildings, they feature lots of gorgeous wood, arched ceilings, and tile. Uerige, a favorite with many travelers, has a complex of smaller rooms with upturned barrels serving as tables. Each of these breweries has some outdoor space as well and during the special releases it can get crowded inside and out. However, this being a friendly and welcoming city, there always seems to be room to squeeze in a few more people. If you see some empty space at a table, just ask and the wonderful people of Düsseldorf will welcome you with a smile. Many of the tables will seat (or stand) eight or more people, so it makes sense to share. It is a wonderful way to meet new people. I have never been to one of these breweries without making new friends and during the special releases the crowds, the bands, and the wonderful beer make for an even more jovial atmosphere.

People frequently ask me which altbier is my favorite, which is hard to choose. I drink a lot of Schlüssel and Schumacher when I am there. If forced to pick one as the best, I would go with Schlüssel, although Schumacher is a very close second and has one of my favorite *Köbes* (traditional waiter), Fabio. Yet, Marlon at Schlüssel is excellent too. Of all the *Köbesse* in Germany, these two are the best, ensuring your glass is never empty, expertly timing the delivery of your next altbier just as you finish the last, and doing so with a great sense of humor. A great *Köbes* really adds to the experience, which is why I love both Schlüssel and Schumacher.

DÜSSELDORF ALTBIER

Düsseldorf altbier is a well-balanced, lagered, top-fermented beer with a rich and complex malt character. The flavor and aroma often have bready, nutty, and caramel notes. A firm hop bitterness balances the malt and good examples range from balanced to firmly bitter. Even though some can be bitter, the hop character is never stronger than moderate. Altbier is more about the flavors of fermentation, malt character, and balance. It is never a very hop-forward beer, apart from the dry-hopped Uerige Sticke. In all cases, malt and fermentation character are the focus of this style. Fermentation is very clean for an open fermentation beer with some fruity notes. While it should have a medium body, the finish should still be more dry than sweet. As for the special release beers, they tend to be bigger with a touch more malt character than the everyday altbier. You might not think that a beer brewed with 1% more alcohol (6% versus 5% ABV) is a big deal, but that is 20% stronger than normal and can have quite an effect when it is so easy to drink.

Schlüssel Altbier, the most award-winning altbier in Düsseldorf, is chestnut brown at an SRM of

18 (35 EBC). The beautiful red highlights twinkle in the taproom lights under a tight, creamy white head. It has a nutty and bready malt character with some very slight caramel notes in the background. It is smooth and rich, yet finishes dry. Noble hops at 32 IBU balance out any residual malt sweetness and provide a lovely, delicate hop note in the finish. Fermentation is flawless, providing a clean, lager-like beer, but with the character and esters from open fermentation. At 5% ABV, it is easy to quickly consume liters of this beer before you realize it. Their Stike Altbier is similar to their everyday beer, but bigger, richer, and just a tiny bit sweeter up front, balanced by a higher 38 IBU. At 6% ABV, this beer is also flawlessly fermented, keeping the alcohol almost imperceptible.

Schumacher Altbier, the oldest altbier brewery in Düsseldorf, pours with a dense, creamy foam over the top of clear, deep golden-amber beer. Notes of caramel, toffee, bready malt, and noble hops predominate, with a clean character, but with yeast notes from the top fermentation done in open fermenters. They use a decoction mash and brew to 4.6% ABV and approximately 40 IBU, giving it a more bitter impression than the Schlüssel Altbier. Latzenbier, at 5.5% ABV, is a bit more malty than their everyday Altbier, yet still nicely balanced toward the bitter.

Uerige Altbier, dark amber with highlights of rosewood, has the distinction of being the most bitter of the group, but the overall impression is not wildly bitter, as some might lead you to think. It is just slightly more bitter than the Schumacher Altbier, yet the Schumacher Altbier tends to have a little more hop aroma and flavor. The use of a Caramalt seems to temper the reported 45–50 IBUs down to a more mellow overall balance. The initial impression is soft and sweet, followed by the bitterness. Notes of honey and biscuit are predominant, and a very slight roasted note can be found in the finish. Their Sticke Altbier at 6% is dry hopped, giving it the boldest nose of these three special altbiers. Uerige also brews a Doppelsticke 8.5% ABV version, which they export to the USA.

Carbonation on all Düsseldorf altbiers, although moderately high (around 2.8 volumes) in the barrel, ends up around 2.3 volumes of CO_2 in the glass due to the aggressive gravity dispense and large foamy head. The result is a malt-forward beer with a creamy mouthfeel.

ALTBIER BREWING PROCESS

The brewing of altbier at Schlüssel, Schumacher, and Uerige share many common processes. All use step mashing, but only Schumacher still uses decoction. The steps generally start with a protein rest. For example, Schlüssel starts at 133 °F (56 °C) and ends at 169 °F (76 °C) through several steps. The grist at Schlüssel is simply Pilsner and Carafa® Special II from Weyermann. Uerige uses Pilsner, Carafa® Special I, and caramel malt. Schumacher Assistant Brewmaster Christian Lastowski confirmed for me that they do not use any dark roasted malts. I believe they use only Pilsner and caramel malt.

After vorlauf, these brewers may lauter for an hour or more into the kettle and then boil for 50–70 minutes. Hop additions are traditional hops such as Hallertau Tradition, Perle, and Spalt done during the boil. The original gravity of the wort is around 1.046–1.050 SG (11.5–12.5 °P). The beer is cooled at Schumacher and Uerige using a coolship and what they call a "drip-cooler" (aka a Baudelot chiller) where the wort cascades down the outside of a series of horizontal pipes that have chilled water running through them. Uerige says their wort

Photo by Jamil Zainasheff

Fabio at Schumacher, one of the best Köbes *(traditional waiters) in Düsseldorf.*

goes into fermentation at 68 °F (20 °C), while Schumacher says their fermentation is at 72 °F (22 °C). At Schlüssel, due to the space constraints of the building, they use a more modern plate chiller and can cool their wort down to 63 °F (17 °C) for fermentation. I do think this lower initial temperature is one of the factors that makes Schlüssel my favorite of the Düsseldorf altbiers.

All use open fermentation with their own strain of a top-fermenting yeast and get a new yeast pitch every 6–12 months. Fermentation in the open fermenters is quick and violent, producing a giant rocky head that lifts the *braun hefe,* or brown yeast, up to the top where it is either skimmed off or spills over the edge of the fermenter to a drain. Dirk Rouenhoff, Brewmaster at Schlüssel, points to removal of this type of trub as critical to getting a smoother bitterness in a higher IBU beer. If I were attempting to clone any of the great Düsseldorf altbiers, I would make sure I used open fermentation and skimmed off the *braun hefe.* At Schlüssel, they brew double batches to fill one of the 77-barrel (90-hL) fermenters, the first batch in tank at 63 °F (17 °C) and the second batch goes in warmer, matching the current fermentation temperature of the first batch. While the fermenters are usually located in the lower reaches of the buildings, where temperatures tend to be cooler, there is no temperature regulation on these open fermenters. Temperatures from fermentation can rise as high as 73 °F (23 °C) at Schlüssel. Fresh yeast for the next batch is skimmed off the top using a large perforated stainless paddle. The perforations allow any beer to run out of the yeast before it is moved to a stainless container for the next pitch. It is important to note that although the yeast used is *Saccharomyces cerevisiae*, they refer to their yeast and their beer as top-fermented, not as ale or lager. This is why you might find altbier referred to as using hybrid yeast or hybrid fermentation.

With healthy yeast, open fermentation, and no temperature regulation, the fermentation quickly reaches the stage where it is transferred to the maturation tanks. This usually happens within 2–3 days of filling the fermenter. In the case of Schlüssel, they transfer when the beer reaches 1.016 SG (4 °P). The still active yeast finishes fermentation in the sealed tank, naturally carbonating the beer. Due to the Reinheitsgebot Beer Purity Law of 1516, which they all adhere to, they are not allowed to force carbonate their beer. At Schlüssel, spunding the tank at 1.016 SG (4 °P) allows them to carbonate the beer to 5.5 g/L (2.8 volumes) of CO_2. Rouenhoff, who is also a sommelier, says that without enough carbonation, the beer loses its signature creamy mouthfeel. Depending on the brewery, after 10–28 days of maturation and lagering at 32–39 °F (0–4 °C), they centrifuge and then filter the beer to brilliant clarity and a very smooth flavor.

From there, the beer is either sent to bottling, kegging for other local bars to serve, or put in special wooden barrels for serving in the brewery taproom. The wooden barrels are lined with Durolit, a food-safe polyamide-based plastic coating, so there is no flavor from the wood. However, the barrels do serve a purpose other than looking pretty on the bar. It is very important that they serve the beer at the right temperature, ideally 41–44 °F (5–7 °C), emptying each barrel before the beer becomes too warm. The thick wood of the barrels provides some insulation, keeping the beer from warming up too quickly. At Schlüssel, they have a rule that the 26.4-gallon (100-L) barrel must not be on the bar for more than one hour. When busy, they can dispense and serve one of these barrels within

Photo by Jamil Zainasheff

Pouring Schlüssel Stike from Durolit-lined barrels. The beer pours a large foamy head, which is traditional of altbiers due to an aggressive gravity dispense.

Photo by Henry Kirk

Author Jamil Zainasheff and Schlüssel Brewmaster Dirk Rouenhoff viewing yeast harvesting.

17 minutes. It really is an impressive sight to see.

BREWING YOUR OWN ALTBIER

If you are going to brew your own version of a special altbier, your recipe can be simple or complex. However, the key to brewing altbier is using the proper yeast and, if possible, using open fermentation. Keep in mind that all German beers are easy-drinking and even though you might want rich malt character, you want to keep the beer from being too full and rich. The best way to achieve that great German malt character is with high-quality, full-flavored base malts and excellent fermentation practices. The bulk of the grist should be a continental Pilsner malt. You can experiment with different color German caramel malts and percentages, but approximately 5% of a mid-color (40 to 80 °L) malt is plenty. If you need a little more color, a small portion of a huskless dark malt such Weyermann Carafa® Special or Briess Midnight Wheat adds color without adding roasty notes. Roast character should be avoided in altbier.

Extract-only brewers could use a Munich malt extract. Most Munich malt extract is a blend of Munich and Pilsner (or other pale malts) in different percentages and most blends are close enough for a decent altbier.

If you want to truly replicate these special beers, a step mash, with or without decoction, is needed. You will not get the color necessary without getting excellent utilization of the malts. If you find your color is lacking, you can make a tea with some Carafa® Special and use it to bring the color up. If you must use a single-infusion mash, target 148–154 °F (64–68 °C). Use higher mash temperatures for lower gravity beers and beers with fewer specialty grains, and a temperature on the lower end of the scale for higher gravity versions and ones with larger amounts of specialty grains.

Hop character should be minimal to moderate in altbier, and most examples have some subtle background noble hop character that comes across as peppery or floral. In general, most of the hops are for bittering, and

Going to the Source

I urge you to go to the wonderful town of Düsseldorf to try authentic altbier for yourself. The rich history and the quality of the beer makes this an amazing destination for any beer geek. The friendliness of the people makes it even more memorable. You can easily visit the altbier breweries in town (Füchschen, Kürzer, Schlüssel, Schumacher, and Uerige) in an enjoyable afternoon/evening. Make sure to drink the beers at the breweries. As my friend Fabio says, "Beers are best experienced at the brewery." No truer words have ever been spoken. If you are staying near the *Hauptbahnhof* (train station) or arriving on the train, it is a short walk from there to Schumacher. The *Altstadt* (old town) is another 15-minute walk from Schumacher. Once at the *Altstadt*, you can wander between Uerige, Schlüssel, Kurzer, and Füchschen easily. Take the clean and quick metro back to the train station. It is just a couple stops and a few Euros.

If you are in Germany and do not have a few hours to spend on trying the breweries in Düsseldorf, Dirk Rouenhoff, Brewmaster at Schlüssel, created Altbier United to promote all of the in-town altbier producers. You can find stores in and around Düsseldorf (one next to Uerige) that sell a gift pack with all five Altbiers along with a special altbier glass and tasting notes. You can also order online for shipment within Germany at www.gutgebraut.de/

Photo courtesy of Shutterstock.com

then a moderate flavor hop addition during the last 15–20 minutes of the boil of ½ to 1 oz. (14 to 28 g) of noble hops for a 5-gallon (19-L) batch. Keep it subtle and use only classic German hops such as Spalt, Hallertau Tradition, Hallertau Mittelfrüh, and Perle. The balance of bittering versus malt sweetness can be even or firmly on the bitter side. The bitterness-to-starting gravity ratio (IBU divided by the decimal portion of the specific gravity) ranges from 0.6 to 1.1. I like to target around 0.9 for the brew day, because during the long lagering period after fermentation some of the bittering will settle out, leaving the beer less bitter than initially brewed.

Each of these brewers use open fermentation, which makes a significant difference in the finished beer. Getting the proper ester profile of altbier is tricky and this is the key. In the past I have used enclosed fermentation vessels for altbier. However, in my test brews for this article, I used an 8-gallon (30-L) food-grade, rectangular plastic bin without a lid. I used a frame of PVC piping to support some plastic sheeting about a foot above the bin, and this gave me room to scoop off the bits of *braun hefe* raised by the yeast. I used White Labs WLP036 Düsseldorf Alt for these tests and the results were excellent. I have tried lager yeast and clean American ale yeasts in the past, and the results have been very good. However, for *great* altbier your best choice is most likely White Labs WLP036 (Düsseldorf Alt), Wyeast 1007 (German Ale), or something similar. I pitch approximately 1 million cells/mL/°P, which is about 25% more than I do for most ales. I like to start fermentation cool, in the low 60s °F (17 °C) and then let the temperature ramp up toward the end of fermentation.

I prefer to wait until fermentation is complete, including any steps such as a diacetyl rest, before lowering the beer temperature. The yeast is far more active and able to reduce fermentation byproducts at higher temperatures. Once I am certain the yeast have completed every job needed, I use a period of cold storage near freezing. This time in storage allows very fine particulates to settle out and the beer flavors to mature.

Photo by Jamil Zainasheff

A look at the kettle-mash tun at Schlüssel.

Schlüssel Stike
Alt clone

(5 gallons/19 L, all-grain)
OG = 1.061 FG = 1.015
IBU = 38 SRM = 12 ABV = 6%

INGREDIENTS

12.4 lbs. (5.6 kg) Pilsner malt
2.5 oz. (71 g) Weyermann Carafa® Special II malt
8.6 AAU Hallertau Tradition hops (30 min.) (1.3 oz./38 g at 6.5% alpha acids)
10 AAU Perle hops (30 min.) (1.3 oz./38 g at 7.5% alpha acids)
1 tsp. Irish moss (15 min.)
White Labs WLP036 (Düsseldorf Alt), Wyeast 1007 (German Ale), or SafAle K-97 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

I currently use all Weyermann malts for my German beers. Feel free to substitute any high-quality malt of the same type and color from a different supplier. However, it is critical that the Carafa® Special only be substituted with another dehusked malt. Otherwise, the beer will turn out roasty. The Düsseldorf brewers often use whole hops, but pellets are seen more often these days. Just make sure that the hops you use are German-grown varieties.

The water profile in Düsseldorf favors chloride-to-sulfate at 1.26-to-1 and is moderately hard. If your water is soft, a bit of gypsum and calcium chloride will help.

A step mash is standard for altbier. The step mash for this recipe starts at 133 °F (56 °C) and then progresses through 144 °F (62 °C), 158 °F (70 °C), and 169 °F (76 °C). Keep the first rest short, just long enough to see that you hit your strike temperature. Then rest 20 to 30 minutes each on the next two rests and finally rise to the mash out temperature. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.75 gallons (25.5 L).

The total wort boil time is 90 minutes. Add the Hallertau and Perle hops with 30 minutes remaining in the boil. Add Irish moss or other kettle finings with 15 minutes left in the boil. Chill the wort to 63 °F (17 °C) and transfer to an open fermentation bucket or bin. Aerate thoroughly if using a liquid strain and then pitch the yeast.

The beer should warm with fermentation activity. If it appears to be fermenting too hot, above 73 °F (23 °C), you can move the fermentation to a cooler area. If fermentation seems sluggish at all after the first 24 hours, move fermentation to a warmer area. With healthy yeast, fermentation should be complete within a few days, but do not rush it.

If you wish to more closely mimic the real thing, you can rack the beer over to a keg with a spunding valve when it reaches 1.016 SG and let natural fermentation develop carbonation. Alternatively, ferment it out completely and then force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2.8 volumes. After a month or more of cold conditioning at near-freezing temperatures the beer should be ready to enjoy.

Extract with grains option: Replace the Pilsner malt with 7 lbs. (3.2 kg) of Pilsen dried malt extract. Begin by placing the crushed Carafa® malt in a muslin bag and steep it in 4 gallons (15 L) of water as it heats up to 170 °F (77 °C). Remove grains, allowing the liquid to drip back into the kettle. Remove from heat and stir in the dried malt extract. Stir until completely dissolved. Bring wort up to a boil and stir in the hops. Boil for 30 minutes.

After the boil is complete, chill to 63 °F (17 °C) and top up fermenter to 5.25 gallons (20 L) with water.

Follow the remainder of the all-grain recipe for fermentation and packaging instructions.

Photo by Jamil Zainasheff

Schumacher Latzenbier
Alt clone

(5 gallons/19 L, all-grain)
OG = 1.055 FG = 1.013
IBU = 42 SRM = 7 ABV = 5.5%

INGREDIENTS

10.5 lbs. (4.8 kg) Pilsner malt
12.5 oz. (354 g) Weyermann CaraMunich® Type I malt
5.6 AAU Hallertau Tradition hops (60 min.) (0.86 oz./24 g at 6.5% alpha acids)
3.2 AAU Perle hops (60 min.) (0.43 oz./12 g at 7.5% alpha acids)
4.3 AAU Spalt hops (20 min.) (0.86 oz./24 g at 5% alpha acids)
1 tsp. Irish moss (15 min.)
White Labs WLP036 (Düsseldorf Alt), Wyeast 1007 (German Ale), or SafAle K-97 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

I currently use all Weyermann malts for my German beers. Feel free to substitute any high-quality malt of the same type and color from a different supplier. The Düsseldorf brewers often use whole hops, but pellets are seen more often these days. Just make sure that the hops you use are German-grown varieties.

The water profile in Düsseldorf favors chloride-to-sulfate at 1.26-to-1 and is moderately hard. If your water is soft, a bit of gypsum and calcium chloride will help.

This beer should be made using a decoction mash. First infuse the mash at 133 °F (56 °C). Your first decoction should be approximately 4 quarts (3.8 L) of mash, boiled and returned to the mash tun for a rest temperature of 153 °F (67 °C). The second decoction would be approximately 5.5 quarts (5.2 L) to reach mash out at 169 °F (76 °C). Keep the initial infusion rest short, just long enough to see that you hit your strike temperature, then pull the first decoction. Then rest 40 minutes on the saccharification rest. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.75 gallons (25.5 L).

The total wort boil time is 90 minutes. Add the Hallertau and Perle hops with 60 minutes remaining in the boil and the Spalt with 20 minutes remaining. Add Irish moss or other kettle finings with 15 minutes left in the boil. Chill the wort to 68 °F (20 °C) and transfer to an open fermentation bucket or bin. Aerate thoroughly if using a liquid strain and then pitch the yeast.

The beer should warm with fermentation activity. If it appears to be fermenting too hot, above 73 °F (23 °C), you can move the fermentation to a cooler area. If fermentation seems sluggish at all after the first 24 hours, move fermentation to a warmer area. With healthy yeast, fermentation should be complete within a few days, but do not rush it.

If you wish to more closely mimic the real thing, you can rack the beer over to a keg with a spunding valve when it reaches 1.016 SG and let natural fermentation develop carbonation. Alternatively, ferment it out completely and then force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2.8 volumes. After a month or more of cold conditioning at near-freezing temperatures the beer should be ready to enjoy.

Extract with grains option: Replace the Pilsner malt with 6 lbs. (2.7 kg) of Pilsen dried malt extract. Begin by placing the crushed CaraMunich® malt in a muslin bag and steep it in 4 gallons (15 L) of water as it heats up to 170 °F (77 °C). Remove grains, allowing the liquid to drip back into the kettle. Remove from heat and stir in the dried malt extract. Stir until completely dissolved. Bring wort up to a boil and add first hop addition. Boil for 60 minutes, adding the second hop addition with 20 minutes remaining.

After the boil is complete, chill to 68 °F (20 °C) and top up fermenter to 5.25 gallons (20 L) with water.

Follow the remainder of the all-grain recipe for fermentation and packaging instructions.

Photo by Jamil Zainasheff

Uerige Sticke
Alt clone

(5 gallons/19 L, all-grain)
OG = 1.061 FG = 1.015
IBU = 64 SRM = 10 ABV = 6%

INGREDIENTS

12 lbs. (5.4 kg) Pilsner malt
3.7 oz. (106 g) Weyermann CaraMunich® Type I malt
2.2 oz. (64 g) Weyermann Carafa® Special I malt
6.3 AAU Hallertau Tradition hops (60 min.) (1 oz./28 g at 6.5% alpha acids)
4.4 AAU Perle hops (60 min.) (0.5 oz./14 g at 7.5% alpha acids)
9.7 AAU Spalt hops (20 min.) (2 oz./58 g at 5% alpha acids)
1 oz. (28 g) Spalt hops (dry hop)
1 tsp. Irish moss (15 min.)
White Labs WLP036 (Düsseldorf Alt), Wyeast 1007 (German Ale), or SafAle K-97 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

I currently use all Weyermann malts for my German beers. Feel free to substitute any high-quality malt of the same type and color from a different supplier. However, it is critical that the Carafa® Special only be substituted with another dehusked malt. Otherwise, the beer will turn out roasty. The Düsseldorf brewers often use whole hops, but pellets are seen more often these days. Just make sure that the hops you use are German-grown varieties.

The water profile in Düsseldorf favors chloride-to-sulfate at 1.26-to-1 and is moderately hard. If your water is soft, a bit of gypsum and calcium chloride will help.

A step mash is standard for altbier. The step mash for this recipe starts at 126 °F (52 °C) and then progresses through 144 °F (62 °C), 158 °F (70 °C), and 169 °F (76 °C). Keep the first rest short, just long enough to see that you hit your strike temperature. Then rest 20 to 30 minutes each on the next two rests and finally rise to the mash out temperature. Sparge slowly with 170 °F (77 °C) water, collecting wort until the pre-boil kettle volume is around 6.75 gallons (25.5 L).

The total wort boil time is 90 minutes. Add the Hallertau and Perle hops with 60 minutes remaining in the boil and the Spalt with 20 minutes remaining. Add Irish moss or other kettle finings with 15 minutes left in the boil. Chill the wort to 68 °F (20 °C) and transfer to an open fermentation bucket or bin. Aerate thoroughly if using a liquid strain and then pitch the yeast.

The beer should warm with fermentation activity. If it appears to be fermenting too hot, above 73 °F (23 °C), you can move the fermentation to a cooler area. If fermentation seems sluggish at all after the first 24 hours, move fermentation to a warmer area. With healthy yeast, fermentation should be complete within a few days, but do not rush it.

If you wish to more closely mimic the real thing, you can rack the beer over to a keg with a spunding valve when it reaches 1.016 SG and let natural fermentation develop carbonation. Alternatively, ferment it out completely and then force carbonate or rack to a bottling bucket, add priming sugar, and bottle. Target a carbonation level of 2.8 volumes. After a month or more of cold conditioning at near-freezing temperatures the beer should be ready to enjoy.

Extract with grains option: Replace the Pilsner malt with 7 lbs. (3.2 kg) of Pilsen dried malt extract. Begin by placing the crushed CaraMunich® and Carafa® malts in a muslin bag and steep it in 4 gallons (15 L) of water as it heats up to 170 °F (77 °C). Remove grains, allowing the liquid to drip back into the kettle. Remove from heat and stir in the dried malt extract. Stir until completely dissolved. Bring wort up to a boil and add first hop addition. Boil for 60 minutes adding the second hop addition with 20 minutes remaining.

After the boil is complete, chill to 68 °F (20 °C) and top up fermenter to 5.25 gallons (20 L) with water.

Follow the remainder of the all-grain recipe for fermentation and packaging instructions. BYO

Photo by Jamil Zainasheff

Photos by Drew Jackson

SIMPLE TEMPERATURE CONTROL

The versatility of a heat mat and temperature controller

by Drew Jackson

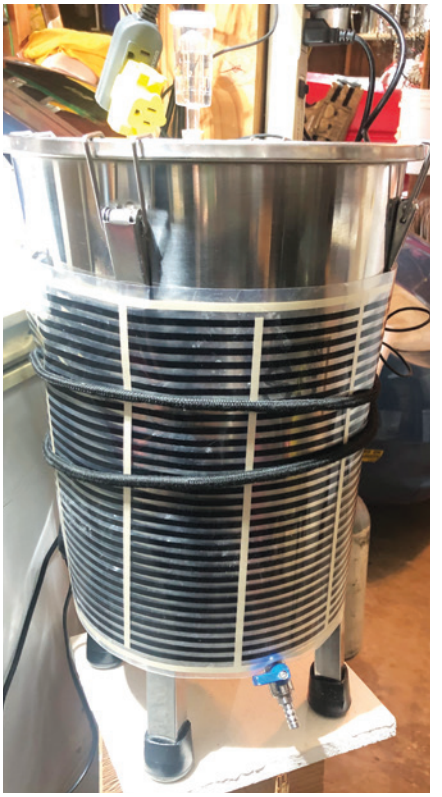
We brewers have a tendency to accumulate a lot of equipment. Most of the time, different pieces of equipment have very specialized and limited uses. I have tools to oxygenate wort that get used a grand total of two minutes on every batch of beer and then get stored away until the next brew day. What a wonderful discovery it is when I can find multiple uses for brewing equipment. I discovered this in the past few years with my heat mat and temperature control. I now use these tools for fermentation, yeast starters, drying yeast, drying hops, and even proofing bread.

FERMENTATION

When I got my first small chest freezer many years ago, I was excited to have a tool where I could finally control fermentation temperature. Most brewers I knew at the time were getting fridges to make kegerators. I wanted something that I could use to not only cool the kegs I was planning to get, but could also double as a fermentation fridge. The kegerators are cool — everyone wants their beer on draft like the pros. But I believed it was much more important to have a controlled fermentation temperature to make beers rivaling the pros in taste first, and then get or make a kegerator.

For my own temperature-control chamber, I used my seven-cubic-foot chest freezer, a FermWrap™ heat mat, InkBird 308 temperature controller, and small space heater. For less than $100 I had all of the heating tools and I was in business. All I had to do was learn how all the parts worked together. Care must be taken to ensure the refrigerator is not cycling suddenly and often (compressor delay protection) but otherwise it was an easy setup. The first beer I made this way was a lager that was the best light beer I had ever made. I have now used this same method for many years, and it has always worked seamlessly.

For fermenting, I use a 7-gallon (26.5-L) stainless steel fermenter.



FermWrap™ attached to a temperature controller and secured around the fermenter keeps the fermenter at a set temperature, which is just one of many uses for the heating equipment.

The wrap fits well on the outside and covers approximately two thirds of the total surface of the fermenter in cases where I want to ferment warmer than the ambient temperature in my cool basement. A big advantage of the wrap vs. a belt is it gives more even heating over a larger surface area. Using a bungee cord and tape, the wrap can be adhered directly to the fermenter, or it can be laid on the bottom of the freezer to heat the fermentation space.

Materials and Equipment

A heating wrap, small space heater, and temperature controller are all simple and essential tools for controlling the fermentation process. Here's a breakdown of how each of these components typically works in a fermentation setup:

1. **Freezer:** A chest freezer is a versatile piece of equipment for homebrewers. By using a temperature controller with your freezer, you can use it for both fermentation as well as keg storage during serving. For fermentation, the controller can be set to a temperature range that matches the yeast's ideal fermentation conditions.
2. **Heat Wrap:** A FermWrap™ heating wrap is an electric heating pad designed for fermentation. It can be placed under your fermentation vessel or taped to the side to provide gentle and controlled heating, especially in colder months when maintaining the right fermentation temperature may be challenging. I mostly make ales, so the refrigeration part is not as important for me.

   The manufacturer says you can increase the temperature of your fermentation from 5–20 °F (3–10 °C). I have found that the wrap can easily heat up a fermentation more than this. I typically ferment my kveik beers at 100 °F (38 °C) with an ambient temperature of around 64 °F (18 °C). Insulation will get you a long way towards higher temperatures than quoted by the manufacturer. I have also used this method with PET plastic fermenters, albeit at lower temperatures. (I wouldn't go any higher than 70 °F/21 °C with a plastic fermenter.) Don't be fooled by the low price of these wraps. They are well-built and will last a long time if cared for properly.
3. **Insulation Wrap:** I use insulation wrap around all my vessels to hold the heat in. I remember being surprised at how expensive a small sheet of this foil wrap was when I first purchased it, but I have used it many times over the past few years and I don't see it wearing out. Using an insulation wrap, or insulating the fermenter through other means, is how you can reach much higher temperatures with the heat wrap.
4. **Temperature Controller:** The Inkbird 308 is a temperature controller that allows you to set a target temperature for your fermentation. It can control both heating (attached to the heating wrap or a space heater) and cooling (attached

Insulation outside of a heat wrap will hold the heat in and provide even more warmth to the fermenter.

to the freezer), making it a crucial component for maintaining a stable and controlled temperature inside the chest freezer. Be sure to set the lag time for cooling so your freezer doesn't cycle on and off too much. Most recommend using the controller with a thermowell, but I am quite happy simply attaching my temperature probe to the outside of or underneath the vessel being heated.

5. **Small Space Heater:** The small space heater is used to provide additional warmth inside the chest freezer if the heat wrap alone isn't enough to maintain the desired fermentation temperature. This heater can be controlled by the temperature controller. Make sure your particular model of space heater will come on when power is applied and does not require a separate switch. Many inexpensive ones don't do this. As time has gone on, I use a space heater less and less since the wrap does quite well on its own.

Collecting yeast after fermenting a batch and then drying it with the assistance of a heat wrap is one way to store yeast for future batches.

YEAST STARTERS

Creating a yeast starter with temperature control is a critical step in brewing beer. Yeast is a living organism, and its activity and flavor profiles are greatly influenced by temperature. Controlling the temperature during the starter phase helps promote healthy yeast growth and fermentation.

I use a stir plate and a 2-L Erlenmeyer flask. My inexpensive stir plate does not have heating so I use my wrap and temperature control to keep the temperature within the manufacturer's recommendation for the particular yeast I am using. There are many experienced brewers who believe a stir plate is unnecessary. Their feeling is that periodic agitation of the starter is plenty for adequate yeast growth. Regardless of how you agitate, there is a significant benefit to maintaining the temperature of the starter. Using a wrap and controller to maintain temperature control is easily done.

Materials and Equipment

1. **Stir Plate:** Optional, but helpful for continuous aeration and yeast growth. If you don't have a stir plate, periodically give the flask a shake to maintain suspension of the yeast.
2. **Fermentation Vessel:** A glass flask, Erlenmeyer flask, or a sanitized mason jar.
3. **Wrap and Controller:** To control the temperature accurately.

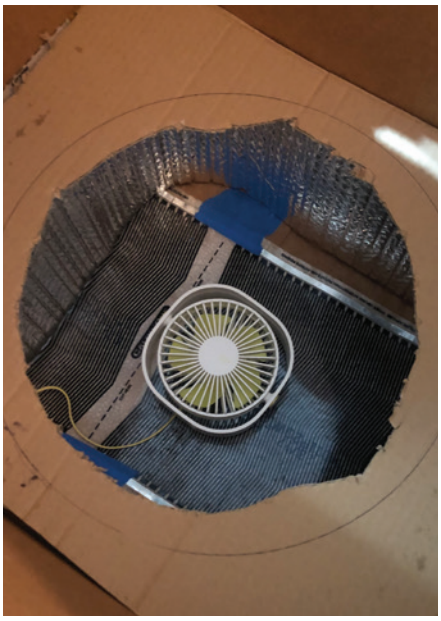
Similar to when fermenting, insulation wrap will require less running of the heating wrap and may come in handy if the ambient temperature is more than a few degrees cooler than the desired starter temperature.

DRYING YEAST

Drying yeast is a common method for preserving yeast for long-term storage. There are a few ways to do this, but one method is to dry yeast on parchment paper placed on a cookie pan with the heat mat underneath. I have used the oven set on a very low temperature, but I never liked having an oven tied up with such a small process that might take a few hours to complete. The wrap method is very effective at drying out small volumes in as little as a few hours.

It should be noted that I harvest and dry mostly kveik yeast strains, which have been harvested and dried for generations. Many commercial yeast strains will not tolerate the drying process — this is one of those trial and error things that you may need to test on your own.

I will also point out that some people are very particular about the purity of their yeast strains. Being a farmhouse brewer, I have never been overly concerned with this. My yeasts become proprietary almost immediately upon receipt. I spend little time worrying about how they change during this process and have nev-



An insulated cardboard box with a heat source and fan keeps warm air circulating to dry hops above the heated box. Four hours later and 1 lb. (0.45 kg) of wet hops spread on a false bottom are dried for storage.

Beyond brewing, heat wraps can be used for many other purposes from proofing bread, seed mats when starting vegetable plants indoors, and more.

er gotten a bacterial infection in my strains. If you are concerned about wild yeast infections during drying, you can place a small space heater near your drying pan. As the heat rises it draws air (and wild yeast) up and away from the surface, minimizing the chance of drawing wild yeast from the air.

I dry my yeast so I can take advantage of long-term storage. Once dried, it can last a very long time. I have dried yeast in my archive that has been there for two or three years and still works well. I always do a starter so if the yeast is no longer viable, I know before pitching.

This process isn't for everybody, but I have saved a significant amount of money by harvesting liquid yeast after a batch and then drying it for easy storage for future brew days.

DRYING HOMEGROWN HOPS

Drying hops is an essential step in preserving the cones for long-term use, especially in homebrewing. Fresh hops can mold in a very short time, so if you grow your own hops it is best to use them right away in a "wet hop" beer or dry them to store for a later use. Dried hops can be stored in a freezer for future use after removing as much air from the bag as possible (vacuum-packing in smaller sizes that you will use in one recipe is a great option).

A few years ago, I was leaving on a vacation right about the beginning of harvest time for my homegrown Cascade hops. I needed a plan for harvesting and drying. With a little bit of creativity and some familiar tools, I was able to dry my crop in just hours and use the hops when I returned.

Materials and Equipment

1. **Fresh Hops:** You'll need freshly harvested hops. The moisture content is typically around 75–80%. I grow a small crop and consistently get about 1 lb. (0.45 kg) of fresh hops. This translates to roughly 3 oz. (84 g) of dried product for brewing a "fresh hop" beer.
2. **Drying Equipment:** I needed a little more than just a heating mat and temperature control to do this job.

Amazon came to the rescue with some recycled cardboard boxes. By using these, I was able to build a cardboard kiln, or oast, that I could use for drying the hops.

3. **Air Circulation:** Adequate air circulation is essential to prevent mold. My small space heater did part of the job. I also used a small fan to get some additional circulation. I then cut out the bottom of the drying chamber and installed a false bottom. My heat wrap and insulation material made it possible to get the whole cardboard unit up to hop-drying temperature.

It took around four hours to dry the hops down to below 20% of their weight. I then bagged them, added a shot of CO_2, squeezed out as much gas as I could, and refrigerated. It made a fabulous fresh hop beer that I brewed a few weeks later.

BEYOND BEER: PROOFING BREAD

I am one of those 3+ million people that started making bread during the pandemic of 2020. At the time, I thought, "This should be easy. I understand fermentation and yeast and I know how to measure." Man, was I in for a surprise. It took me a few years to learn the "zen" of breadmaking and gain the skills to make great bread. One of the keys for me was proper proofing, or rising of the dough. Once I got into this, the wrap and temperature control really helped. Proofing bread with temperature control is essential to reliable results. Similar to brewing, temperature-controlled proofing helps control the fermentation process and adds consistency to the final product. Using this method, I can proof a loaf of bread in six hours (although I prefer overnight proofing in the refrigerator).

MORE IDEAS

I have covered just a few of the ways I use my FermWrap™ and a temperature controller. I have never used one as a seed mat to germinate plants in a greenhouse-like environment, though all of you gardeners out there could use these tools for that purpose as well. I am sure there are many other applications that I have not yet considered.

I live in a very small house on the north coast of California. My brewery is a two-car garage. Anything I own that can be used for multiple things is a real advantage because my storage and working space is very limited. A heat wrap and a temperature controller take up very little space and can be used for a multitude of tasks. I have really just started exploring the potential uses of these tools but I use them often enough that I now keep them readily available and don't pack them away with the rest of my equipment. These are versatile and inexpensive tools to add to your brewery. I'm sure the creative minds of the makers reading this magazine can find even more uses. BYO

BY DREW BEECHUM & DENNY CONN

CHILL OUT

Wort chilling advice

It's one of the fundamental rules of brewing that, "you must chill your wort!" Why? How? What do you need to do to make your beer the coolest in town?

Let's explore the benefits — why do all the texts insist that chilling your wort is what you need to do as a top-notch brewer? To start, you get to your yeast pitch that much faster. Less time without our yeasty buddies in play means less time for microbes to establish themselves. If for no other reason, getting your currently sanitized wort inoculated with yeast before anything else can be established is worth knowing how to quickly chill.

The second reason — break. Wort is a complex soup of sugars and proteins. In a perfect brewing world, we'd bring all the sugar and needed nutrients over to the fermenter and leave the extras behind — who needs them when they could be causing haze, staling, and other off-flavors and impacts. When you get a good strong boil going, you start seeing clumps and sheets of protein. A strong chilling phase can help set these protein globs and allow them to precipitate and not head into the fermenter.

There's a big debate about how assiduous to be about removing kettle break from the wort prior to fermentation. Some break going over to the fermenter is actually a good thing for yeast health. Some brewers even let it all flow. We both do what we can to get solid break formation and a relatively clear wort, but we certainly don't try and do anything weird to only grab sweet, crystal-clear wort!

As with all things brewing, there are about 101 different ways of accomplishing the goal of chilling your wort. They vary by cost and efficacy — all the way from the available to everyone to the "wow, you really like this hobby and want to spend money on it."

When you look around your home and think about making food cold, there are very few folks who wouldn't think first, "Hey, I've got a big dang fridge! Let's use that!" Don't! Your fridge is absolutely lousy at cooling down very hot things. Even commercial fridges are terrible at it. Air as a cooling mechanism is lousy with low heat capacity. We don't even recommend putting a batch of soup in the fridge to chill. Putting a whole 5-gallon (19-L) batch of wort in the fridge would yield an overworked fridge, softened butter, questionable food, and still-warm wort after hours and hours.

DON'T CHILL

Your first chilling thought as a new homebrewer may be "don't chill." Australian homebrewers have perfected the art of "no-chill" brewing where they transfer the still near-boiling wort to a heatproof container, seal the liquid in and then let it chill naturally overnight before transferring to the fermenter. The process works on the principle that hot wort in a sealed container will stay sanitary for a while. It's cheap, it's easy, and it requires little additional work/gear. You do have to think about your hop additions though as they will continue to add bitterness for several hours.

In a way, this is a neater version of the oldest method of cooling wort — letting it sit in a shallow pan overnight, exposed to the air (aka a coolship). At our volume scale, (e.g., 5 gallons/19 L) we can safely bundle everything up in an HPE water cube and let it sit. Can't do that at larger commercial sizes! (But it's great for holding wort warm for a kettle sour . . .)

There's a lot more to say about how to do no-chill, but suffice to say, it's very easy and it gets the job done. It has the advantage of speeding up your brew day (or just spreading out your hours) and is greatly advantageous from a water conservation angle since it uses no water

As with all things brewing there are about 101 different ways of accomplishing the goal of chilling your wort.

Photo by Michael Tonsmeire

An immersion chiller recirculating water from an ice bath is a great way for the final push to get down to lager yeast fermentation temperatures.

for cooling. But it has its downsides with regards to speed and hop utilization.

USE WHAT YOU'VE GOT

If you want to actively chill the beer instead of depending on the laws of overnight thermodynamics, then you're going to need a lot of cold water. Water has incredible heat density (but wort more), so you'll need a fair amount to make a dent in all those BTUs you pumped into the kettle. The easiest way to start is a big, ice-cold water bath.

When Drew first started brewing, he'd turn off the boil and pop his lidded boil kettle into a sink full of ice-cold water and give the kettle a shake for a bit until the wort was sufficiently chilled with the addition of chilled water to dilute (he was brewing strong batches with extract). Some folks have recommended adding ice directly to the beer, but ice isn't microbe free and the stuff from your freezer can pick up funky flavors.

Others opt for a big bathtub of water to serve as a heat sink, and this is perfectly workable. And given that Drew lives in Southern California, he knows plenty of folks who use their swimming pools (yes, really). If you live somewhere less pool-prone and more snow inclined — there are plenty of folks who use Mother Nature and a snowbank to cool. A word of advice though, snow actually works as an incredible insulator due to trapped air, so you'll want to move your pot around.

GETTING MECHANICAL

Given the problem of beer spoilage via coolships, you can imagine that as beer became big business, there was incentive to make the process faster, more efficient, and more surefire. One of the big innovations was the Baudelot Cooler created by Jean Louis Baudelot in the 1850s. It flowed boiling wort down a copper sheet that rippled over a set of chilled water pipes. As the wort cascaded over the bumps in a waterfall-like fashion, it rapidly cooled and was aerated.

Mechanical chilling, these days, is not quite as open a process, but it's kind of a shame because a Baudelot Cooler is a beautiful piece of equipment. Drew recalls De Halve Maan in Brugge, Belgium, having an old Baudelot, unused, in the brewery bar/tour area.

For homebrewers, there are two primary choices for forced chilling: Immersion or counterflow. There are lots of variations on the themes but those are your two primary means. The principle behind both remains the same — force cold water through a tube in contact with wort and let the metal piping conduct heat from the ultra-hot wort to the cold water. For homebrew use, we recommend copper for its ease of use and high thermal conductivity. Stainless steel is pretty and has high corrosion resistance, perfect for lots of use and cleaning, but copper is more thermally efficient and for our needs, we feel it's better.

Immersion coils (IC) are the easiest to use with loops of copper piping that sit in the wort and suck heat away.

> **Minimizing your chilling time with your selected gear comes down to two things — temperature delta and preventing thermal jackets.**

To prevent wort spoilage, just keep the copper clean and set it in the boiling wort for the last 15–20 minutes. From there, it's a matter of connecting your water hoses to feed cold water in and whisk hot water away.

Make sure the coil is sized to your brew pot — too much copper sitting above the wort doesn't do you much good! We've both been using chillers from JaDeD for years because they build much better gear than either of us could from the hardware store, but even the least expensive chiller will beat the pants off the sink/tub/pool/overnight methods. The immersion method of heat wins on ease of use, but it's not the most efficient.

Counterflow chillers (CFC), whether a coil with a copper wort tube running inside a water pipe or a plate chiller that feeds wort on one side and water on the other, work quickly on a small segment of the wort. The term counterflow is because the coldest water is injected into the chiller at the end where the cooled wort exits.

It's very efficient, but at the cost of additional maintenance and cleaning. The interior of a counterflow chiller, where you're pumping sticky and vulnerably cool wort is a perfect breeding ground for mold and microbes. You must rigorously clean it out to prevent contamination. It's part of the reason we both moved back to immersion chillers after years of using CFCs. We've never trusted plate chillers for homebrewers because you can't disassemble the plates for periodic scrubbing like commercial chilling systems.

To best clean a CFC, flush the chiller path with hot water and then recirculate cleaner through the chiller and rinse as per cleaner instructions. Plate chillers should be rotated and backflushed to remove as much debris as possible. Flush the chiller with sanitizer and then drain completely. (Drew blows CO_2 to force as much liquid out as possible) Store dry to avoid weird chemical interactions. Before using, repeat the cleaning and sanitizing cycle and then use. (Now you see why ICs are generally easier for homebrewers?)

Photo by Walter Diaz

Wort chillers can come in many shapes and forms. This homebrewer-built counterflow chiller has removable end caps so that the interior pipes that the wort flows through can be manually cleaned with a brush.

SPEEDING IT UP

Minimizing your chilling time with your selected gear comes down to two things — temperature delta and preventing thermal jackets.

When we say "temperature delta," what we mean practically is colder water. The greater the difference between your wort temperature and your cooling water temperature, the faster heat can be transferred into the cooling water. As the difference gets smaller, it will take you longer to chill (lots of science-y handwaving there!).

Denny's well water pours from the faucet in the 50s °F (~12–13 °C), whereas Drew's tap water is a balmy 76 °F (25 °C) during the summer. Denny can swing a beer to target temperature with little worry, but Drew sees a dramatic slowdown in chilling below 100 °F (38 °C). One way to combat that is to chill your water with ice. For IC users, chill the beer with tap water until the cooling slows down and then pump ice water through the chiller to finish. CFC users would need a ton of ice or they can chill with tap water and flow the mostly chilled wort through a coil sitting in ice water.

The other key is to prevent thermal jackets by agitating the wort. This is more an immersion problem. As the wort cools around the coil, the local delta-T is reduced, and chilling slows. By moving the wort, you break up the cool zone and get back to chilling.

The simplest way? Shake the chiller. Pick it up slightly and put it down gently. Put your hand on the output side of the chiller and notice the immediate rise in output water temperature. Use a sanitized spoon and give it a stir for the same effect. And if you're fancy and tired of manual labor, use a pump to move the wort in a constant flow from the output of the kettle back to the top. Whirlpooling the wort with a pump is effective both in chilling improvements and in collecting the trub for easier/cleaner wort pick up.

ONE LAST CHEAT

Back at the start of this we told you — don't use your fridge! Now, we're going to tell you "No, use your fridge." If, like Drew, you can't chill the wort all the way to pitching temperatures (mid 60s °F/upper teens °C, for example), but you can get down to 80 °F (27 °C) – throw your fermenter into a fridge/chest freezer for a couple of hours and let the fridge do the decidedly easier task of dropping those last few degrees. (Drew uses a Grainfather glycol chiller to cool the fermenter directly, but the idea remains the same.)

Once you've sufficiently chilled out, time to get those yeast cells into the pool to do their job and make you some great beer! BYO

BY DAVE GREEN

QUICK CONNECTS

Finding the right fittings for you

When it comes time to moving your water, hot wort, or beer from one vessel to another, homebrewers have traditionally relied upon gravity to perform this task. Outlets and valves installed with snugly fit barbed fittings can easily handle the pressures seen in gravity-fed systems since there is very low pressure within the hoses/tubes. But when homebrewers want to move towards kegging systems on the serving side or a pump on the hot side, more secure fittings than simple removable hosing over a barb fitting is required.

There are now many different styles of such connects that are available to homebrewers and it's "fitting" we go through them. In this piece we'll start at the easiest (barbed connections) and move towards the more complex . . . although they aren't necessarily complicated.

Several of these connection systems do require rubber gaskets to maintain a proper seal. When you do decide which you may opt for, if it requires a rubber gasket for the seal, get some spares. They're a cheap and highly recommended purchase, providing you with an insurance policy in case of a gasket failure at a crucial moment. Also, be sure to use silicone or other high-temperature rated hosing/tubing when dealing with brew-day connections. This is not a place for vinyl. Leave the vinyl for transferring cold beer or in a draft system.

BARBED CONNECTIONS

As mentioned earlier, barbed connection paired with a snugly fit hose/tubing does the job in basic homebrew setups. They work perfectly fine when gravity is the only pressure being applied to the system. These connections are cheap and allow brewers to easily switch tubes from one outlet/inlet to the next.

If you and your system can maintain barbed connections without any clamps, there are very few reasons to move past them. They are available in both brass and stainless versions. I would recommend keeping the barbs a uniform size so the number of tubes can be minimized.

The biggest downfall of barbed connections is the fact that they don't handle pressure well. On the hot side, over-pressurizing them will lead to failure and spraying hot wort on yourself can easily lead to burns. On the cold side, it could lead to a giant mess.

BARBS WITH CLAMPS

Here, we're going to go with the same concept as the barbed fittings but will now include clamps. There are a couple different clamp types, and each has its pros and cons. Plastic hose clamps are easy and provide a fairly quick level of protection when an added pressure is applied on the hosing/tubing, such as CO_2 or a pump. They are strong when applied properly, but are prone to fail if not secured appropriately. Worm clamps are a step up from plastic clamps, but they require added time and a level of fastidiousness to make sure that they are secure upon each connection. Both work, but both are prone to fail if not used properly and can be a hassle to apply when you want to quickly move a hose from one outlet to the next.

Barbed connections with clamps are featured in many of the more "advanced" quick-connect systems that follow, as they will often be used to interface the hosing/tubing with the quick-connect system. These are often thought of as more permanent connections rather than quick connects since they will only be taken apart for more thorough cleansing operations. Some permanent barbed connections use Oetiker clamps (aka pinch clamps), which

If you and your system can maintain barbed connections without any clamps, there are very few reasons to move past them.

Brewers can be very opinionated when it comes to their quick connects. Finding the right one(s) for your system comes down to preferences.

provide the most airtight seal. The problem with them is that either bolt cutters or someone with a lot of patience is required to remove them.

THREADED CONNECTORS

Just like with the barbs with clamps, many threaded connectors found in hot-side brewing systems would be considered more permanent connections and thread-seal tape is used to complete the connections. But there are several exceptions.

Some quick-connect systems use threaded fittings outfitted with rubber gaskets to provide a proper seal when pressurized. Blichmann Engineering's QuickConnectors™ are a high-quality version of this type of system. With several

Photo courtesy of MoreBeer!

different connection styles available, the QuickConnectors™ are adaptable to many different configurations, including integrating them into a draft system. They were designed with homebrewers and small-scale breweries in mind, mainly for hot-side processes, and behave as such. They may not be the fastest of the connection systems, nor the cheapest, but they are quite user-friendly and well-crafted.

Threaded connectors also find their home in many draft systems, using flared fittings with a rubber gasket seated inside the female nut to provide a seal. These allow a faster connection when swapping out different configurations on both liquid and gas lines and can provide an airtight seal (so long as the gasket is seated properly).

AIR-STYLE QUICK CONNECTS

In general, homebrewers use this style of quick connects not for air, but for brew-day operations. They are a bit more expensive then the QuickConnectors™ but are easy to use and are attached with one hand. Just note that a good pair of silicone or brewer's gloves are required when using these since they get scalding hot as they are stainless steel. (Of note, hardware stores and garden centers will also carry this style of quick connects, but these are not meant for brewing purposes.)

With male and female ends, homebrewers may have all the male ends on the hoses and all female ends on their brew pots (or vice-versa). Quickly pulling back on a ring (the collet) found on the female side of the connection allows several ball bearings to roll over the male end. When the collet is released, the ball bearings clamp down inside the groove found on the male side and a rubber gasket seals the connection.

Photo courtesy of MoreBeer!

Just be sure to give a little tug before opening any valves to assure a proper connection. While not designed for homebrewing, they have found a home here but are not always the best design since they are more prone to drip issues.

CAM-LOCK CONNECTS

With many of the same pros and cons of the air-style connects, cam-lock fittings (or cam and groove fittings) are found on many homebrew systems on the hot side. Found with either a female or male end, these fittings rely on the cams found at the end of two levers on the female side of the connection to align with the grooves on the male side. When the levers are pulled back, the cams will rotate into the grooves, pulling the male socket into a gasket found in the female fitting, providing the necessary seal. These often run a little bit cheaper than either the QuickConnectors™ or

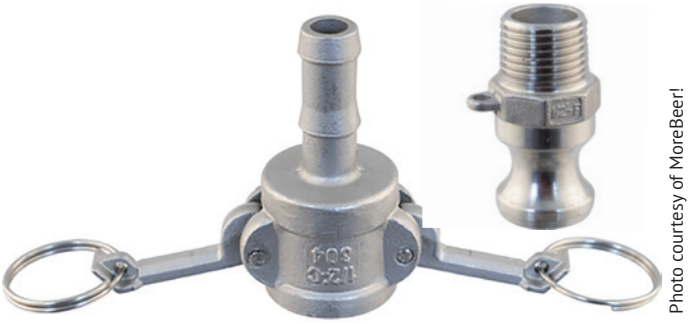


Photo courtesy of MoreBeer!

the air-style connects, giving them the leg up with the more frugal-minded brewer. Just like with the air-style connects though, it's advisable to use gloves when using these connects. They are also less prone to drip issues compared to the air-style connects due to their design.

TRI-CLAMP FITTINGS

The tri-clamp fitting is often seen as the gold-standard for brewing connection systems . . . but they're not without faults. Many homebrewers have utilized them because of their ubiquity in the commercial brewing world, but it takes a skilled brewer/cellarman to use them quickly and deftly. Seeing an experienced brewer with tri-clamp fittings is a thing of beauty; watching them twirl the clamp to open it up then quickly fling the clamp over the connection and with one hand clamping it down while holding the hosing in the other hand. Some of them can do it with their eyes closed.

On the plus side, there are no male-female ends, allowing for more versatility in applying different connections for different uses. Also, they can be used in nearly all facets of your brewery. Unfortunately, I have seen enough homebrewers

fumble around with tri-clamp fittings that I generally steer homebrewers away from this fitting type.

Another term for these connects that homebrewers often hear is "sanitary fittings," but they are not always a true sanitary fitting in many homebrew systems because non-sanitary, threaded ends are welded onto a tri-clamp cap. True sanitary conditions can only exist when connections are flush on the product side of the union. In other words, where no nooks and crevices exist to harbor bacteria and other spoilage organisms. In my opinion, tri-clamp fittings are an overkill when dealing with moving liquid on the hot side in the homebrew world and only really can be advantageous after the wort has been cooled . . . like on the outlet of a counterflow chilling system. But most homebrew systems I see have the tri-clamp fitting threaded onto the outlet of a plate chiller, for instance. This threaded connection is not a sanitary connection (as the threads provide a bacterial nook), making the "sanitary" part of tri-clamps obsolete. So, unless you plan to unthread and then clean and sanitize the tri-clamp connection after each brew, I'd say stick with a simpler style of connection . . . one that is easily removable for cleaning and sanitation purposes.

Photo courtesy of Blichmann Engineering

Some of the nicer homebrew setups now have tri-clamp fittings on their fermenters. This is a luxury ticket and one that I won't tell brewers not to do. But again, in many cases, I find it to be overkill. There are cheaper and more user-friendly connection systems out there. But there are definite advantages to having tri-clamp ports on your fermenter. First, many of the fermenters have multiple ports at different heights of the fermenter allowing for different purposes and configurations with all the ports. Because there is neither a male/female side of tri-clamps, the same piece of equipment can be used different ways. Also, tri-clamps allow fermenters to be pressurized so brewers can carbonate the beer in the same vessel. Just be ready to pay top dollar for the equipment once all the pieces are put together.

PUSH-FIT CONNECTS

On the cellar and draft side of things, we've already been introduced to barbed and threaded flare connections, but in recent years the push-fit connections have been gaining popularity in this arena. With no special equipment required, fittings like the Duotight and John Guest offer an alternative to barbs as the hose-to-quick connect interface. The push-fit connects do require special tubing to work properly and those are typically recommendations from the manufacturer.

These connections are sealed by simply pushing the tubing into the fitting. A straight and clean cut of the tube is required for a good seal. To release the tube, simply push in the collet while pulling on the tube and it will be released.

Photo courtesy of MoreBeer!

Some can be used in certain hot-side operations as well, such as on the outlet of a mash tun.

SOCKET AND PLUG QUICK DISCONNECTS

Often featuring a little tab for disconnecting the plug (which can look like a spark plug), this style of disconnects are also popular for draft systems. They are a great option for those who like to switch out lines for different connections for things like carbon dioxide purging or pressurizing fermentation vessels. When the plug is removed from the socket, an internal spring in the female socket is engaged and closes the valve. This allows the line to be pressurized on the female side, with some rated upwards of 120 PSI (827 kPa). Most found at homebrew supply stores are plastic so are more prone to breaking if mishandled.

A modern draft setup for homebrewers may include push-fit connections for the liquid lines and socket and plug

Photo courtesy of MoreBeer!

quick disconnects located on the gas lines. The fun thing about many of these is that they are not necessary to produce good beer. It has more to do with the tinkering aspect and how you prefer to optimize your system . . . from brew day through service. BYO

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BY LEIF BOGWALD

ANCESTRAL BREW

Connecting with my homebrewing roots

As the word "homebrewer" suggests, we brew in our homes. But what if you had the opportunity to learn about brewing in your ancestral home?

For me, that's Norway, where my father was born and raised. These days, he lives about 25 kilometers (16 miles) away from me and my family on Vancouver Island, Canada, so we chat often and are never shy to share a beer or two.

In the summer of 2019, I first read about the Norsk Kornolfestival in Hornindal — an October festival celebrating farmhouse brewing in Norway, and I flippantly mentioned to my dad that we should go to it someday.

"Let's go this year," he said, surprising me with a rare bout of spontaneity. "You never know what might get in the way."

A few months later, and we're on a plane to Norway.

Coastal Norway certainly has its differences from coastal Canada, but what I really wasn't prepared for was how different this beer festival would look from the festivals I attended back home. Picture attendees dressed in full Viking gear and brewers serving beer out of wooden jugs and recycled pop bottles.

But the biggest appeal for me as a novice homebrewer was to be fully entrenched in the homeland of kveik, strains of yeast that have been used by Norwegian farmhouse brewers for generations. While kveik seemed to be a trendy new thing in the craft beer I was drinking at home, it had been an essential part of brewing here for a long time.

Brewers at the festival were more than happy to share their knowledge about various kveik strains and how they used them in their brewing. We also got to chat with Lars Marius Garshol, a Norwegian researcher and author who is seen by many as the driving force behind the resurgence of kveik and Norwegian farmhouse brewing traditions.

On the first day, we sampled farmhouse ales brewed by commercial breweries, followed by a day of homebrew sampling and more from the commercial brewers. Most exciting of all, we got to witness a brew day at a traditional farmhouse with a local brewer — a guy who it just so happened had gone to school with my dad!

The brew day started early on a clear and crisp morning. While a juniper infusion was boiling in the old farmhouse, the brewers shared tips on achieving the ideal mash thickness, how slowly wort should run off into buckets ("the speed that a little boy pees"), and, most importantly, that one must scream at the top of their lungs while pitching the kveik.

It was an all-day endeavor where our group, made up of Norwegians, Americans, Belgians, Finns, us Canadians, and others shared local meats, cheeses, and breads while nerding out about craft beer. Turning brewing, what is often a solitary pursuit, into an international social event was a major highlight of the festival. At the end of the event, we were offered the opportunity to take home various samples of kveik yeast strains from brewers in the region.

This unforgettable experience inspired me to experiment with kveik more often in my own homebrewing, and I took what I saw and learned to replicate a similar brew day at home with friends in Canada. As snow fell lightly around us, juniper was boiled, wort was heated over an open fire, and yes, we screamed while pitching the yeast.

Most importantly, my dad was there that day too, happy to share another beer and another experience, not letting anything get in the way of a good day.

The 2024 edition of the Norsk Kornolfestival runs October 3–6 in Hornindal, Norway. For more information, visit: www.norskkornolfestival.no

Turning brewing, what is often a solitary pursuit, into an international social event was a major highlight of the festival.

Photo by Leif Bogwald

The author and his father enjoying a beer at the Norsk Kornolfestival in Norway.

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