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THE HOW-TO HOMEBREW BEER MAGAZINE

DECEMBER 2020, VOL.26, NO.8

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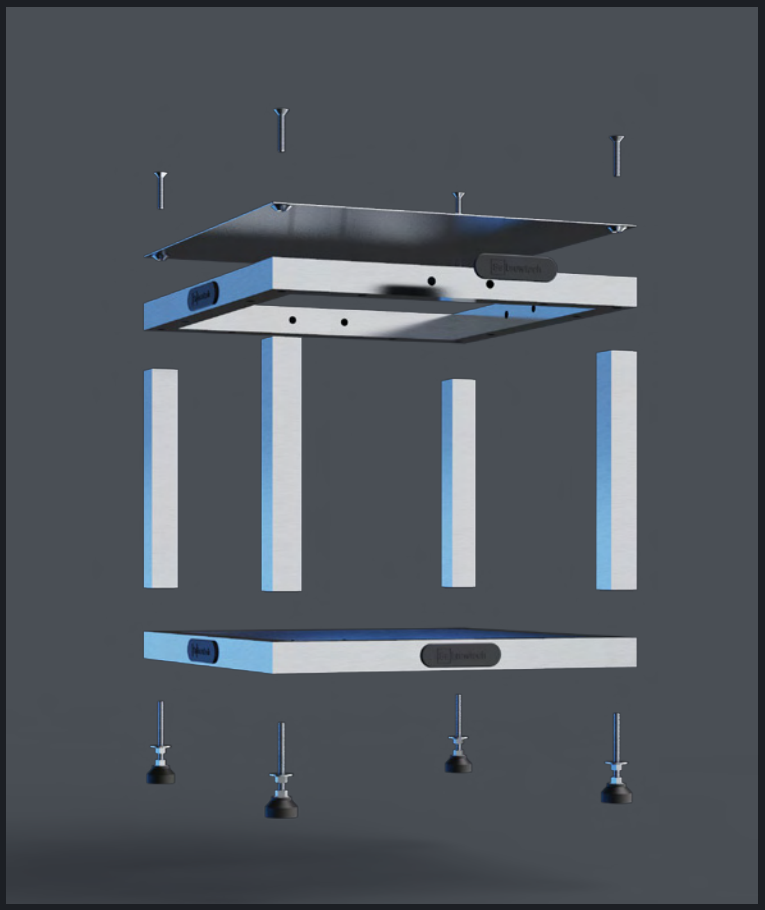

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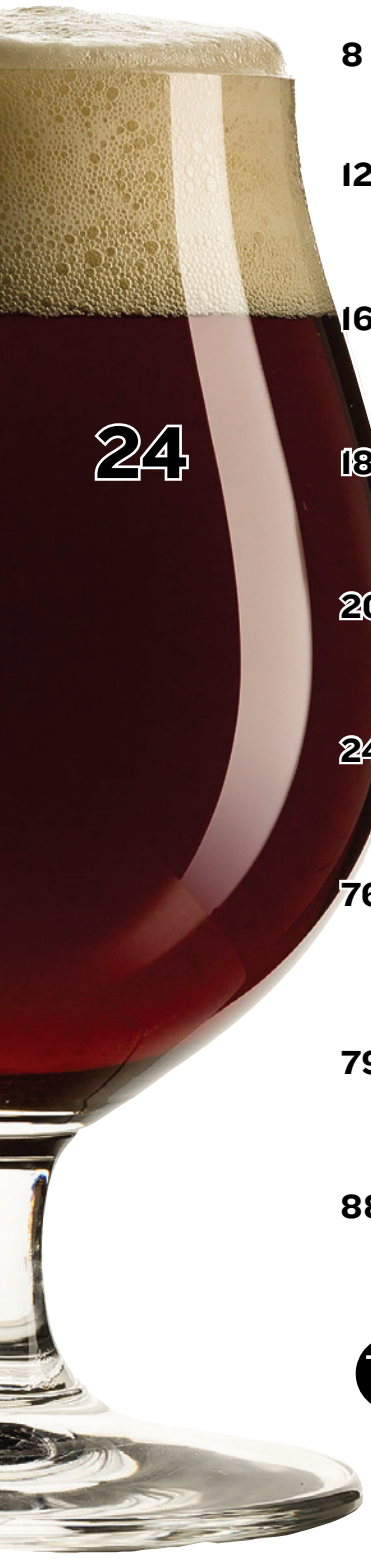

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RECIPE INDEX

RECIPE STANDARDIZATION

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

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

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

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

Gallons:
We use US gallons whenever gallons are mentioned.

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Cover Photo:
Allagash Brewing Co.

Q If you could only choose three base malts, what would they be?

Considering that I brew mostly German, Belgian, and English styles, I have the tendency to gravitate towards base malts of those regions. I couldn't live without Munich, Pilsner, and especially Maris Otter to develop the malt backbone to my beers.

If I could choose only three base malts they would be Maris Otter, Briess Ashburne Mild, and Great Western American Pale. These three malts would serve as the base for almost any style of beer from pale lager to imperial stout and barleywine. More importantly, they could each be used on their own to brew a good beer so they would be very handy if you were stranded on a desert island with no other food.

Simpsons Golden Promise, Weyermann Munich Type 2 (Dark Munich), Best Pilsen. I think about malts I can use for 100% of the grist, and those I can blend to make most styles. Golden Promise is a great pale ale malt, but not too biscuity (I can add biscuit malt if I want that flavor). Pilsner malt can be the base of almost any style, and can cut the flavor intensity of any other base malt. Dark Munich gives me malty richness that is hard to duplicate.

Volume 26, Number 8: December 2020

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suggested pairings at BYO.COM

Winter Seasonal Beers

When the weather turns cold, it's time to seek out the king of all seasonal beers — winter ales. Brewed stronger, richer, and more full-bodied, these beers taste great alongside a roaring fire or when hoisting the holiday cheer with friends. Here are five Best-of-Show recipes. https://byo.com/article/winter-seasonal-beers

MEMBERS ONLY

Ten Tips For Better Extract Brewing

Extract brewing is a great technique for brewing fantastic beers in less time and with less equipment than is generally necessary for brewing all-grain beer . . . even for those who usually brew all-grain. https://byo.com/article/extract-ten-tips

Fermenting Belgian-Style Beers

There is a lot more to producing quality Belgian-style beers than simply ingredient selection. Fermentation is where much of these key characteristics develop. Learn some of the elements to a successful fermentation. https://byo.com/article/fermenting-belgian-style-beers

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with Audra Gaiziunas

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YEAST TECHNIQUES & LAB SKILLS ONLINE BOOT CAMP

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ALL-GRAIN BREWING ESSENTIALS ONLINE BOOT CAMP

with John Palmer and John Blichmann

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HOMEBREW EXPERIMENTS ONLINE BOOT CAMP

with Drew Beechum and Denny Conn

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RECIPE FORMULATION ONLINE BOOT CAMP

with Brad Smith

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MAIL

DEXTROSE ADDITION TIMING

The *BYO* 25 "Celebrating Milestones" article in the September 2020 issue gave us all some great recipes. I am really looking forward to brewing the New Realm Radegast clone recipe. The recipe calls for 1 lb. 12 oz. (0.8 kg) of dextrose corn sugar but there is nothing that I could find that says when to use it. I assume that it would be added in the last 10 minutes of the boil. Does that sound about right?

Jeff Thomas • *Rehoboth Beach, Delaware*

We're glad you enjoyed the article celebrating BYO*'s 25th anniversary, as well as the anniversaries of some of our favorite breweries. We have loved getting feedback from readers saying they are trying (or already enjoying) some of these anniversary clone recipes because this story was a lot of fun putting together, and Dave Clark, who wrote the story, had a blast chatting with some of the industry's top brewers about their special anniversary releases, which in many of their cases were the brewers' passion projects. In all of that excitement it looks like we overlooked that little detail in the New Realm Radegast recipe. Adding the dextrose corn sugar at any time in the boil is fine, but near the end is when we'd recommend the addition. Adding it late would ensure against any browning that adding early might cause (although, it likely wouldn't make any noticeable difference in the final outcome).*

SECONDARY FERMENTATIONS

I am fairly new to homebrewing and I'm planning to brew the Northern Brewer's New Old Ale recipe found on the *Brew Your Own* website (https://byo.com/recipe/northern-brewers-new-old-ale). I am a bit confused by the step by step, as it seems a bit brief to me when it says to "age 6–12 weeks in secondary." Does that mean secondary fermentation? Is there anything I need to do during that phase? Do I need to transfer to another fermentation vessel or check on it during secondary fermentation or anything? I am also unsure about "bottle and enjoy" . . . is there no priming sugar to add before the bottling or a maturing phase after the bottling is done? If you can fill me in on this it would be much appreciated.

Jacob Smith • *Via Email*

contributors

Michael Bury has been brewing award-winning beer and mead for over a decade, crafting his own recipes nearly the entire way. He's active in the Beer Judge Certification Program (BJCP) and holds the rank of Grand Master II with mead certification. Additionally, he's an exam grader and administrator. He is also a past Treasurer and President of the Stoney Creek Homebrewers and sits on the American Homebrewers Association's sub-committee for competitions. Professionally, Mike works as a synthetic medicinal chemist in R&D for a pharmaceutical company.

Mike has been creating clone recipes and telling the stories behind the beers in *BYO*'s "Replicator" column for the past two and a half years. Due to other commitments, this will be his last "Replicator" column, but he ends his run on a high note with a trip to Strike Brewing Co. to clone their Beat the Heat American Pilsner, starting on page 16.

Jon Stika has been making beer, mead, wine, and cider since 1992. He grows both hops and grapes, and makes his own malt from locally grown barley. He is a charter member of the Heart River Homebrewers club where he lives in Dickinson, North Dakota and is a certified beer judge. Jon recently retired from the USDA Natural Resources Conservation Service where he was a soil scientist. He now works part-time as a brewer and consultant for Phat Fish Brewing of Dickinson and at the North Dakota State University Dickinson Research Extension Center as a research technician on a variety of projects, including the production of hops. Jon authored the "Techniques" column for *BYO* from 2007-2009.

As a pro brewer, Jon often gets asked what it takes to start making beer at home. He shares the answer to that question beginning on page 32.

Andrew Martin lives in Salt Lake City, Utah with his wife and 1-year-old son. He is a project engineer at Northrop Grumman, where he works on development and testing large-scale rocket motors. His brewing hobby started in 2017 when enjoying a few Epic Brainless Belgians at a bar with a friend who said, "We should make this!" Andrew's work experience tied with his love for building stuff has resulted in all sorts of homemade equipment to simplify and control the variables found in brewing. He considers himself a seasonal brewer, brewing whatever beer fits the time of year, but always has a stout on tap. He's still fine-tuning that Brainless Belgian clone.

Andrew shares his most recent homebrewing DIY beginning on page 66, as he details the steps taken to build a 10-gallon (38-L) fermenter from an old Sanke keg.

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MAIL

BYO *Recipe Editor Dave Green responds: "For that recipe I would definitely transfer the beer off of the yeast cake for the long-term aging of the beer. You don't want autolysis to start to become a problem in the beer. The most I would leave beer on a yeast cake would be four weeks (six weeks for lagers at colder temperatures) . . . and that is more than many other brewers would.*

"Once the beer is racked into the secondary vessel (preferably a carboy), it should be topped up so the beer is above the curved neck of the carboy so there is minimal exposure to oxygen. Place an airlock (I like to put vodka in my airlock for long-term storage) on it and keep it in a cool, dark corner. You can cut a hole for the airlock in a standard paper grocery bag and put that over the carboy if need be.

"If you're bottling then you'll want some level of carbonation in the bottle, so adding a little priming sugar just before bottling is definitely suggested. As for the level of the priming sugar, that would be a bit of a personal preference. Do you like a fairly still style of old ale (which would be more traditional for the style) or do you prefer a more standard American level of spritz? You could shoot for the middle of the road and do something like ½ of a cup of priming sugar (corn sugar)."

JOHN PALMER LIVE CHAT HIGHLIGHT

BYO digital members have access to a live chat with a featured homebrewing expert each month. In October, John Palmer, author of *How to Brew*, answered questions for an hour. Below is a snippet of the chat. Digital members can join November's Q&A with Hugo Picard, Technical Sales Manager for Fermentis, on November 19 from 1–2 ET (the link is available at www.byo.com).

I like brewing a variety of beer styles. I check pH after 10–15 minutes into the all-grain mash. Should my pH be slightly different for a lighter beer vs. a darker beer or is the 5.2–5.6 range acceptable to use for all styles? If different, what pH values should those be?

Terry McCawley • *Live Chat*

Palmer replied: "For pale beers I recommend a 5.2–5.4 mash pH, as measured on a sample cooled to room temperature. For amber, 5.3–5.5, and dark 5.4–5.6. The point of this is to drive the beer pH a little lower or higher and bring out the best flavors of the malts."

WRITE TO *BYO*

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

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BEGINNER'S BLOCK

BY DAVE GREEN

BREWING WITH OATS

Oats have a long tradition as a specialty ingredient in beer, although few breweries made much ado about oats outside of oatmeal stouts until the last several years. But the surge of popularity of oats in the craft brewing world, starting with stouts and then exploding with hazy IPAs, has made oats a staple in many homebrewers' grain bins. There are certain qualities to oats that make them distinct from the more "traditional" cereal brewing grains, namely wheat and barley.

BASICS OF BREWING OATS

We can break down the oats we use in brewing into two broad classes: Malted and unmalted. Starting with the raw cereal grain, most oats that we use in brewing will be processed in some way, whether they are malted or not. Most unmalted oats have been processed to remove their protective hull or husk layer (flaked torrified oats are the one exception). The de-husked cereal oat is now known as oat groat and we officially call the grain naked. Malted oats come both with and without husk. Most products will indicate they are naked if the husk has been removed. Rice hulls may be desired if naked grains are included in your mash, especially if the naked oats exceed 10% of the mash.

UNMALTED OATS

Unmalted oats can be purchased in the cereal aisle of a grocery store as either steel-cut, old-fashioned (rolled), or quick oats. At the homebrew store, we most commonly see flaked oats as the unmalted option. All of these forms can be used in brewing, but homebrewers have to understand that in order to get sugar from them, they need to be mashed with base malts. The starch that unmalted oats contain will remain unusable to yeast unless enzymes can start breaking them down.

The steel-cut oats are oat groat that has been chopped into smaller nuggets. If you are using steel-cut oats, you probably want to run them through a grain mill to crush them more and expose more starch to the mash's enzymes. The other three common forms of unmalted oats are all smashed by rollers: Flaked, old-fashioned, and quick oats, will all act fairly similarly for brewers. Quick oats will be flattened more so than the flaked or old-fashioned, but there is no harm in running any of these through a grain mill. In fact, increasing the surface area of the oat may positively impact your mash efficiency. Studies have shown that oat starch is a little more difficult to access than more common brewing grains and the increased surface area may help with this issue.

Finally, while unmalted oats can be purchased at your grocery store, there is a reason that you may opt for buying flaked oats at your homebrew supply shop. Oats high in fat content have been shown to be highly susceptible to rancid characteristics and bitter flavors when processed. Flaked oats purchased from maltsters are specifically selected to minimize this issue.

MALTED OATS

Malted oats means that they have gone through the malting process, allowing them to potentially be enzymatically active, meaning they can convert the starch into sugars. But just because they've been malted doesn't mean that they are enzymatically active. Plain oat malts do indeed contain the enzymes required to break down the starch stored in grains during a normal mash period of 60 minutes. Oat malts also do still contain their husks, helping brewers who sparge their beer.

Another popular malt used today is crystal oat malt, like Golden Naked Oats (GNO) malt from Simpsons. Crystal oat malts may or may not contain husks and they do not need to be mashed. The sugars in crystal malts are already formed and ready for yeast to consume. Finally, both forms of malted oats can benefit from a tighter milling gap than standard wheat and barley malts due to the thinner nature of the grain.

OAT'S CONTRIBUTIONS

Depending on which products you use, oats can add a range of different flavors and body building components to a beer. Oats in general are rich in beta-glucans, proteins, and fatty acids when compared to barley. The beta-glucans along with other components are well known to help build body in beer, but when it comes to mashing they can cause headaches in the form of slow run-off from the mash tun. There are several tricks to avoid this headache, but the addition of some rice hulls to your mash is the easiest solution.

While generalities abound about the flavor contributions oats impart on a beer, they can be distilled down to a few key elements. Unmalted oats are going to be the most neutral flavor-wise and are more known as a body-building component as well as potential contributor of some hazy compounds for styles like witbiers and hazy IPAs. Malted oats are more known to add a velvety, creamy texture to beers. This can help by cutting the astringency and sharpness of beers like porters and stouts. Crystal oat malts will provide a slight nutty character to a beer, contribute to a creamier body, and smooth mouthfeel as well.

Another popular technique with flaked oats is to toast them until browned and smelling like oatmeal cookies. This same characteristic can make its way into a beer so it has been common in many recipes for beers like brown ales, winter warmers, and porters.

BYO HOMEBREW DROOL SETUP

PAUL SHÜSSLER • WIESBADEN, GERMANY

My brewing system is a custom heat exchange recirculating mash system (HERMS) planned and designed with the guidance of Craft Hardware. Recently I was finally able to break it in. So thought I'd take everyone on a virtual brew day!

Today, I'm brewing a Maibock and it begins with filling my hot liquor tank (HLT). For this recipe I needed 55 L (14.5 gal.) of water in total, including some buffer and lactic acid. I had already entered the recipe into my controller based on craftbeerpi the day before. I weighed and milled the malt. For the Maibock I used Vienna malt, Pilsner malt, and some Carahell®. After the strike water temperature was reached, 33 L (8.7 gal.) were pumped from the HLT into the mash tun. The mash temperature landed at the planned 52 °C (126 °F) and I started the recirculation.

For this brew I have chosen a classic step-mashing method. After a low mash-in, I ramp the temperature up to 64 °C (147 °F), followed by a short "Narziss rest" at 67 °C (153 °F), and a final rest at 72 °C (162 °F). With a recirculating mash system the malt bed is already compacted and set at the end of the mash, so runoff to the kettle begins by flipping the valves at the pump outlet and rate is set at ~1 L/min (1 qt./min).

The remaining water in the HLT is now used as sparge water. This water is pumped through the HERMS coil inside and onto the top of the grain bed. A nice side effect: The wort is rinsed out of the heat exchanger leaving the coil clean. To keep an eye on the original gravity during lautering, a sample valve was installed between the pump outlet and the kettle's inlet.

As soon as the heating element in the boil kettle is covered, I begin heating the wort in order to achieve a boil promptly at the end of lautering. As soon as the wort boils, the steam condenser is activated to minimize vapor creation. During the boil traditional Perle hops are used.

Next the wort is recirculated through the counterflow cooler back into the kettle's whirlpool inlet. The wort was chilled to 78 °C (172 °F) within 3 minutes. My whirlpool hops, Pacific Crest, are added to the kettle. The wort continues to circulate without chilling water to start a proper whirlpool. I let the wort spin for 20 minutes and then, with chilling water on, pump it through the chiller again and into my Unitank. The wort temperature was now at 20 °C (68 °F). The final cooling is done by my glycol chiller.

To see my Maibock recipe check out: www.byo.com/recipe/omb-oh-my-bock

WHAT'S NEW

THE BIG BOOK OF CIDERMAKING

Authors Christopher Shockey and Kirsten K. Shockey turn their attention to the world of fermented beverages in a guide to home cidermaking. With advice and step-by-step instructions, *The Big Book of Cidermaking* equips readers with the skills they need to make the cider they want: Sweet, dry, fruity, farmhouse-style, hopped, barrel-aged, or fortified. The authors have years of experience cultivating an orchard and have conducted many experiments producing their own ciders. This book is for any cidermaker, whether starting with apples fresh from the tree or working with store-bought juice. Cider recipes range from cornelian cherry to ginger, and styles including New England, Spanish, and late-season ciders. You can purchase a copy at bookstores or at: https://www.storey.com/books/the-big-book-of-cidermaking/

INFUSsION MASH TUN UPDATE

For 2020, Ss Brewtech has updated their InfuSsion Mash Tun with TC (tri-clamp) ports throughout for easy integration with the rest of their lineup. They have also made changes to several key features and components such as the feet of the tun, the thermometer, and their new Pure Flow Valve (patent pending). Many of the original InfuSsion Mash Tun features remain such as the mash tun's 5° floor slope to the center drain to eliminate dead space and 1-in. (2.5-cm) thick insulated walls and lid. To learn more, check out https://www.ssbrewtech.com/pages/mash-tun

HAAS HOPCAST

The HAAS® HopCast is a podcast that covers all the latest and greatest happenings in the craft beer industry, with a special focus on hops. Host Micah Cawley talks to innovative brewers and brewing industry experts from around the world about all the latest and greatest happenings in the industry. Episodes run about 35 minutes and they can be found at: https://soundcloud.com/johnihaas

Photo courtesy of The Kernel Brewery

MONITORING SOUR BEERS' PROGRESSION

For a long time science has known the various chemicals produced during the long-term souring process using microbes. They can also identify the flavor impacts these compounds have on the unique characteristics of beers like lambics, Flanders reds, and American wild ales. But what has remained in the shadows is a comprehensive study that covers the timeline of how these compounds evolve over the course of the long-term aging process.

Work is being done by a group of scientists out of the University of California-Redlands that is mapping the progression of a broad range of organic acids, esters, and even ethanol every 2–4 weeks from several different batches from Sour Cellars based in Rancho Cucamonga, California. By observing the differing initial conditions and the ways that the beer then transforms, brewers will be able to better understand how their choices affect the downstream product. They have been tracking each batch for one year now and are getting some interesting results including how slowly this development really takes. The research is still ongoing, but their initial findings were presented at the Fall 2020 American Chemical Society's virtual meeting. To learn more, check out: https://www.chemistryworld.com/news/sour-beer-compounds-tracked-during-brewing-process/4012360.article

REPLICATOR

BY MICHAEL BURY

DEAR REPLICATOR,

On a recent trip to the Pacific Coast of the U.S. I had the opportunity to sample several brews from Strike Brewing Co. Although, I thoroughly enjoyed their hoppy offerings, one beer stood out to me as being especially alluring: Beat the Heat. Based on the taste and bits of information I gathered, I deduced that it isn't your typical Pilsner. The can said that it was dry hopped, but I didn't see what type of hops they were using or any specifics to the other ingredients used. This is a type of beer I'd love to recreate back home to enjoy during our upcoming hot summer months. I'd be really pleased if you could put all the pieces together for me. Thanks in advance!

Andrew Robertson
Australia

Thanks for the request, Andrew! The more I dug into the background on Beat the Heat from Strike Brewing Company, the more the recipe aligned for brewing in the upcoming warm, summer months in the Southern Hemisphere. You'll also be delighted in its use of more of your "local" Kiwi hops as well.

The brewery's opening pitch was delivered by Jenny Lewis, Strike's CEO and co-founder. After graduating from Rice University in Houston, Texas with an MBA followed by the successful management (retail and wholesale operations for four years) of a specialty bakery chain in the San Francisco, California and Hawaii areas, she desired to open her own company. Her husband, Ben, introduced her to Drew Ehrlich in 2008. Drew was a former Stanford baseball pitcher who went on to play Double-A baseball. Over a couple of homebrews while they watched a San Francisco Giants game in 2008, the concept of Strike Brewing Company was born, a culmination of a baseball-fueled dream.

To ensure Strike's success, Jenny and Drew diversified their skillsets. Jenny ended up quitting her job at the bakery chain in order to focus on the concept and provide the business acumen that the brewery needed; her success has been evident and currently she sits on the Board for the Bay Area Brewers Guild. On the flip side of the coin, Drew immersed himself in the brewing industry by first apprenticing at Firehouse Brewing in Sunnyvale, California under the tutelage of Steve Donohue.

Unlike many other breweries at the time, Strike took a different path than promptly opening a brick and mortar establishment. Beginning in 2011, Strike Brewing began operations by contract brewing at Hermitage Brewing Company in San Jose, California. Their initial focus was on a sessionable lineup, which was trending at the time and complemented watching a game or relaxing with friends without the heft of drinking higher-octane brews. A blonde, brown, porter, and wit were among those primary offerings. However, they quickly determined that their patrons desired other styles and within six months of opening, their first IPA was rolled out. Other brews such as a double IPA, imperial red, and a stout soon followed. In July 2014, after several years of building capital, they began brewing on their own premise in San Jose, California in preparation of opening day, October 12, 2014. In that 6,000 sq. ft. (557 m^2) space, which was part of a larger 90,000 sq. ft. (8,400 m^2) warehouse and uniquely situated near several other sports stadiums and the fairgrounds, they could easily house a 15-BBL brewhouse and accompanying fermenters plus enough room for a taproom for the local San Jose fans.

Success has come in a variety of ways for Strike. In 2019, they opened their second taproom in Campbell, California, a southwestern suburb of San Jose. They've morphed their offerings to include hoppy beer in general but continue their love for lager and fruited sours that are more balanced in nature than many domestic variants. Their barrel program focuses on Bourbon barrel-aged strong ales. They also have a goal of putting out one to two new beers every month although they've put out six new brews in as many weeks leading up to their sixth anniversary. Numerous beers such as their Screaming Hand Imperial Amber, Colossus of Clout Irish-Style Red Ale, Big Wall Imperial Stout, Brown, and Blonde have all won medals at the US Open Beer Championships, California State Fair, and/or World Beer Cup.

They've also remained open to collaborations and have discovered that such initiatives are amazing sources of inspiration. In July 2015, they launched a venture with the renowned NHS, Inc.'s Santa Cruz Skateboard Company, which produced their Classic Dot Blonde Ale. Since then, the pairing has gone onward to produce Nor Cal California Kölsch and the previously mentioned Screaming Hand Imperial Amber. Akin to their branding, their constantly evolving experimental series is named the Bullpen.

A testament to these rotating series, Beat the Heat is an ode to the fastball — or at least an ode to a faster lager fermentation. Primary fermentation is started near ale temperatures and with yeast pitch rates that allow for a faster start, less yeast biomass requirements, and slight fruity esters that are produced in the first 24 hours. Those esters combined with the fruitiness from the Taiheke® dry hop and the dry finish come together to afford a neo-American Pilsner, perfect for summertime in any hemisphere. Cheers!

STRIKE BREWING CO.'S BEAT THE HEAT CLONE

(5 gallons/19 L, all-grain)
OG = 1.049 FG = 1.008
IBU = 24 SRM = 3 ABV = 5.4 %

INGREDIENTS

10 lbs. (4.54 kg) Weyermann Barke Pilsner malt
6.5 AAU Magnum hops (60 min.) (0.5 oz./14 g at 13% alpha acids)
2 oz. (57 g) Taiheke® hops (dry hop)
GigaYeast GY045 (German Lager), White Labs WLP830 (German Lager), Wyeast 2124 (Bohemian Lager), or SafLager W-34/70 yeast
⅞ cup corn sugar (if priming)

STEP BY STEP

Mill the grains, then mix with 3.75 gallons (14.2 L) of 162 °F (72 °C) strike water to reach a single infusion temperature of 150 °F (66 °C). Hold the mash at this temperature for 60 minutes.

You can begin the lauter process by either raising to mashout temperature or simply vorlauf the mash until the runnings are clear. Sparge the grains with 4.5 gallons (17 L) and top up as necessary to obtain 6.5 gallons (25 L) of wort. Add the Magnum hops at the outset of the boil and then continue to boil for 60 minutes.

After the boil, rapidly chill the wort down to 68 °F (20 °C). Pitch the yeast and aerate if using a liquid strain. After 24 hours, drop the temperature of the fermentation to 58 °F (14 °C) and then after a second 24 hours, drop it further to 53 °F (12 °C). Maintain this cold fermentation temperature until the gravity reads approximately 1.012–1.015. Raise the temperature back to 58 °F (14 °C) and then allow it to free-rise to clean up any diacetyl.

Once the final gravity has been reached, dry hop with the Taiheke® hops for three days. Rack off the yeast and hops or dump the yeast, dry hops, and trub, and lager the beer for 2–3 weeks at near-freezing temperature (32–34 °F/1–2 °C). Bottle or keg the beer and carbonate to approximately 2.8 volumes.

STRIKE BREWING CO.'S BEAT THE HEAT CLONE

(5 gallons/19 L, extract only)
OG = 1.050 FG = 1.009
IBU = 24 SRM = 4 ABV = 5.4 %

INGREDIENTS

5.5 lbs. (2.49 kg) Pilsen dried malt extract
6.5 AAU Magnum hops (60 min.) (0.5 oz./14 g at 13% alpha acids)
2 oz. (57 g) Taiheke® hops (dry hop)
GigaYeast GY045 (German Lager), White Labs WLP830 (German Lager), Wyeast 2124 (Bohemian Lager), or SafLager W-34/70 yeast
⅞ cup corn sugar (if priming)

STEP BY STEP

Bring 5 gallons (19 L) of water to a boil. At some point prior to boiling, off heat, add the dried malt extract while stirring, and stir until completely dissolved. Add the Magnum hops at the outset of the boil. Boil for 60 minutes.

After the boil, rapidly chill the wort to 68 °F (20 °C). Pitch yeast. After 24 hours, drop the temperature of the fermentation to 58 °F (14 °C) and then after a second 24 hours, drop it further to 53 °F (12 °C). Maintain this coldest fermentation temperature until the gravity reads 1.012–1.015. Raise the temperature back to 58 °F (14 °C) and then allow it to free-rise to clean up any diacetyl.

Once the final gravity has been reached, dry hop with the Taiheke® hops for three days. Rack off the yeast and hops or dump the yeast, dry hops, and trub, and lager the beer for 2–3 weeks at near-freezing temperature (32–34 °F/1–2 °C). Bottle or keg the beer and carbonate to approximately 2.8 volumes.

TIPS FOR SUCCESS:

According to Ryan Bridge, Head Brewer at Strike, "The unique thing about this lager is that we do a 'warm-start' ferment. It allows us to pitch less yeast and gives the yeast a strong start at warmer temperatures before we slowly ramp down. The resulting beer has some mild, fruity yeast esters that really work well with the dry hop. We also don't fine or filter, so it retains a slight haze." Additionally, "This beer has noticeable hop flavor and aroma (tropical fruit/grapefruit/lime) over a crisp, bready body with mild, fruity yeast esters. It is seriously drinkable and a perfect outdoor summer beer." BYO

BY DAWSON RASPUZZI

BREWING WITH EXTRACT

Many homebrewers start the hobby brewing with malt extract and move into all-grain batches, but that doesn't mean there aren't advantages to brewing with extract or that great beer can't be made from it. Two experts on the subject — one on the supply side and one a pro extract brewer — share their advice for brewing great extract beers.

In addition to saving time by skipping the mash step, extract brewing also saves time by allowing for a shorter boil. Extract does not require a full 60-minute boil (although specific hop schedules may) as the vast majority of dimethyl sulfide (DMS) is removed during the evaporation phase of production of both liquid and dried malt extract. A boil of at least 10 minutes would be recommended to get additional hot break and destroy potential spoilage organisms. Just remember to turn the heat off and dissolve liquid extracts fully before turning heat back on; LME is very dense and can sink to the bottom of a kettle and scald very quickly.

For many beer styles there are two potential approaches for extract brewers — using 100% extract or using extract and steeping grains. I feel deciding between grain and extract should be based on personal preference. A brewer needs to weigh their values regarding convenience, taste, cost, and flexibility. I feel a small amount of steeped grain brings a fresh grain flavor to any extract brew. I like to use a light extract with a portion of steeping grains to make darker styles, however, you can make really good beer with extract alone.

Whether you use liquid malt extract (LME) or dried malt extract (DME), the resulting beers are very similar — liquid may have slightly more aromatics since they are not concentrated as far, but these differences are minor. I think most people find LMEs to be a little easier to work with but there are plenty who prefer DMEs.

Water adjustments when brewing with extract are not necessary unless there is a specific hardness or minerality that is critical to the style. Extract will contain a certain level of minerality. In most instances I would recommend using deionized or reverse osmosis water to avoid excessive minerality.

There is a real savings for bulk extract purchases, but I'd suggest purchasing package sizes that will be emptied soon after opening. Liquid extract does not contain preservatives, in fact it is extremely nutrient-rich, which is why yeast (and spoilage organisms) go crazy for it. A partial package has more headspace, which can make for dramatic in-package condensation as storage temperatures fluctuate — at elevated temperatures moisture from the syrup will be drawn into the air space above the syrup. Upon cooling, the air will no longer be able to hold as much moisture and condensation will form on the surface of the syrup which will promote surface spoilage. It is possible to successfully repackage and store extract refrigerated or frozen, although doing so would likely be outside of the manufacturer's guidelines. In a similar vein, opened DME is also difficult to store; an opened package will quickly turn into a brick above 40% relative humidity.

If you have any concern about the freshness you should taste the extract (about two tablespoon in a cup of warm water) to make sure it meets your expectation before you invest more time and additional ingredients.

In addition to boosting gravity in high-gravity recipes, I think all-grain brewers should consider extract for recipe development. Building on top of an extract can be a great tool for specialty malt, hop, and flavor exploration — a brewer may be able to turn out 2–4 times as many concept brews in the time it takes to brew one all-grain brew by utilizing extract with partial steeps.

Water adjustments when brewing with extract are not necessary unless there is a specific hardness or minerality that is critical to the style.

Dan Bies is a Technical Services Representative at Briess where he works on brewing and R&D projects, including new product development and process improvement. Dan manages the pilot brewing and pilot plant operations and commercialization of new products in the extract plant. Prior to joining the technical service staff, Dan was an analyst in the malting lab.

Chris Townsell is the General Manager and Head Brewer at Buffalo Brewpub, New York's first brewpub that opened more than 30 years ago. The brewery houses a 10-barrel extract system.

My brewing experience is actually limited to our 10-barrel extract system. I started brewing on it in 1999. It's a very simple and efficient way to brew. Cost per ounce is unbeatable and if you stay within its capabilities you can make really great beer. We offer 3–5 of our house beers along with other locally- and nationally-touted craft beers. We're happy to say our beers are still the best sellers. We have been especially successful with our amber ale, Oktoberfest, wheats, and porters.

We only brew with liquid malt extract from Briess. It's readily available, consistent, and most importantly, it's what we know. All of our beers brewed in-house are 100% extract brews. For darker beers I use darker extracts — mainly Briess's traditional dark. It offers a darker finished product and stronger characteristics typically found in dark beers like stouts and porters.

We don't do any brewing water treatment. We actually just recently installed a water filter and there has not been a noticeable change in the beer flavor.

Boil times vary based on how long the bittering hops need to be boiled. Our finishing hop additions are all 15 minutes and our first hop addition is boiled either 30 or 45 minutes.

One downside of extract is how hard it is to brew lighter beers. We offer a year-round lager — Buffalo Lager — but it is not brewed in-house.

I did once attempt to brew a Pilsner using Pilsen light extract. The lightest liquid malt extract available is Golden, which I wish I had used as the Pilsen did end up being too dark. I have yet to be brave enough to give it another go using the Golden. I'm not able to make a smaller batch than 10 barrels, so obvious concerns prevail. I do plan on attempting another batch at some point and flavoring some of it by individually dosing kegs. I do wish we could brew smaller batches so I could experiment more, but we have a relatively large recipe book and it's still growing.

HELP ME, MR. WIZARD

BY ASHTON LEWIS

THE RAW DEAL WITH RAW ALES

Also: Seltzer nutrients and grain milling considerations

Q I READ THE RAW ALE ARTICLE BY LARS GARSHOL IN THE MAY-JUNE 2018 OF *BYO* AND HAVE BEEN EMPLOYING THIS TECHNIQUE EVER SINCE. I DO A STANDARD MASH AND MAKE A SEPARATE HOP TEA THAT I ADD TO THE SPARGE WATER. ONE KEY DURING THE MASHING AND SPARGING PROCESS IS TO ENSURE THAT NEITHER MASH NOR WORT TEMPERATURE EXCEEDS 76 °C (168 °F). THIS IS TO PREVENT THE FORMATION OF DIMETHYL SULFIDE (DMS). I MASH OUT INTO A STERILIZED CONTAINER, CHILL THE WORT, AND PUT INTO A FERMENTER. THERE ARE NO ISSUES WITH FINAL CLARITY WHEN IRISH MOSS IS ADDED TO THE HOP TEA AND GELATIN FININGS ARE ADDED ONE OR TWO DAYS BEFORE KEGGING.

HOWEVER, I HAVE NOTICED SOME UNUSUAL RESULTS WITH THE RAW ALE. YEAST ATTENUATION IS EXTREME (99% APPARENT). USING STANDARD SAFALE US-05 THE FINAL GRAVITY (FG) IS USUALLY WELL BELOW 1.003 AND MOST TIMES IS BETWEEN 1.001 AND 1.000 WITH AN ORIGINAL GRAVITY (OG) OF AROUND 1.040. A GOOD FRIEND OF MINE BREWED A STOUT RAW ALE AND IT FINISHED AT 1.003. HIS STOUT NORMALLY FINISHES AT 1.015. ANY THOUGHTS ABOUT THIS TOPIC WOULD BE APPRECIATED.

RICHARD ALBRECHT
JOHANNESBURG, SOUTH AFRICA

Unboiled wort contains active amylase enzymes that will continue to do their thing beyond mashing.

Photo by Chip Walton

Traditional Scandinavian brewing techniques often left wort unboiled prior to inoculation with yeast. This has come to be called brewing raw ales.

A This question makes me want to try brewing raw ales because the method certainly saves time and really addresses one of those nagging questions to young brewers who don't think outside of the modern box; how did brewers boil wort before metal working was common? And, of course, the answer is that early brews were not boiled! Try telling that to a youngster who has been piped into Google via their handheld device since they were old enough to crawl. OK, right, you are wondering about the crazy high attenuation you are achieving with raw ales.

Before I actually begin answering the question, I do want to touch on yeast. Your strain selection likely has little to do with your observations. Although different strains may make a marginal difference in your final gravity, what is happening in your wort during and after mashing is so dynamic and so good at producing yeast fodder, that this style of brewing presents some special challenges because malt enzymes are not being denatured by boiling.

And this is the topic to really dig into if you want to boost the FG of your raw ales. For all practical purposes, the two enzymes present in malted barley that are relevant to this discussion are alpha and beta amylase. Alpha amylase chops up large starch molecules into smaller chunks, and beta amylase produces maltose and a little bit of glucose from large and small starch molecules. I am going to skip the review and point you to the discussion we had in the November 2020 issue of the "Mr. Wizard" column covering starch conversion.

Your observation with really high attenuation is a great reminder that some of the old brewing chestnuts are

more than tired rules. A quick review of wort boiling reminds brewers that boiling kills pathogenic and spoilage microbes, denatures enzymes, coagulates proteins, isomerizes hop alpha acids, helps strip unwanted volatiles like dimethyl sulfide (DMS) from wort, increases wort density, and has a positive effect on finished beer clarity. There are other reasons to boil wort, but these are among the most important.

As a food safety nut and a fan of history viewed through the eyes of a food geek, the killing pathogenic microbes ranks at the very top of the list because this is why beer was such an important beverage in areas without clean drinking water. The fact that wort boiling also kills spoilage bacteria is a nice secondary story because it explains why boiled wort was the perfect media to be fermented by pure yeast cultures. Although clean drinking water is still a concern in many regions of the world, most homebrewers are using potable water for brewing, and the argument that beer is safer than water is not the best excuse to give your wife for pounding pints like your life depended on it! OK, maybe you haven't done that, but I have unsuccessfully tried that argument and felt pretty dejected by the whole experience.

But the enzyme denaturation story is rock solid, despite all of the changes that have come with modernity. Unboiled wort contains active amylase enzymes that will continue to do their thing beyond mashing. Two interesting things to ponder are the other enzymes that may be present in malted barley and the effect of very long mashing on wort fermentability. I earlier noted that alpha and beta amylase were, for all practical purposes, the only enzymes relevant to this discussion. That's true when wort is boiled, but in lightly kilned malts, like Pilsner malt, there can be some remaining amyloglucosidase (AMG) activity. AMG is an enzyme that de-branches amylopectin and is used to produce highly fermentable wort for styles like light lager and brut IPA. Another method used to increase fermentability is to use a very long mash. The method you are using allows for residual AMG activity to survive into fermentation (if AMG is present in your base malt) and also allows alpha and beta amylase to continue doing their things for a long time.

My usual way of addressing questions is to leave some solutions to specifically address the problem. I am going to take a different tack on this question and fire off some ideas that could be used to boost the FG of a raw ale. One idea is to alter wort pH after mashing to essentially stop further enzyme activity. This idea will result in a sour ale, but that may not be a problem. You can do this by using a homofermentative lactic species, like *Lactobacillus delbrueckii*, or by adding acid to your wort to drop the pH below about 4.5. If this sounds interesting, read up on the effect of mash pH on alpha and beta amylase activity.

You can also use crystal, caramel, and a range of roasted grains, to add unfermented carbohydrates, color and flavor to your beers. You may even want to explore separately cold mashing your special malts. Special malts, like Munich and Vienna, contain starch that is acted on by mash enzymes, but roasted grains and crystal malts have very little, if any, starch that will be converted to fermentables and are well-suited for your raw ales.

And perhaps the simplest suggestion is to design your recipe around the fact that raw ales end up being very dry. Look to styles like light lager, saison, Belgian tripel, brut IPA, and dry stouts for ideas on how to brew dry beer with balance. Thanks for the fun question!

Q I'VE BEEN MAKING HARD SELTZERS USING THE BASE INSTRUCTIONS YOU PROVIDED IN THE MARCH-APRIL 2020 ISSUE OF *BYO*. BUT I'VE BEEN THINKING ABOUT TRYING TO BRANCH OUT AND START TO PLAY AROUND WITH THE BASE RECIPE, LIKE CHANGING THE ABV, YEAST SELECTION, AND SUGAR SOURCE. ONE THING I'M STRUGGLING WITH IS YAN (YEAST ASSIMILABLE NITROGEN) AND FAN (FREE AMINO NITROGEN) LEVELS. I NOW UNDERSTAND THE DIFFERENCE BETWEEN THE TWO, BUT I'M STILL HEARING CONFLICTING NUMBERS FOR RECOMMENDED LEVELS AND THE FACT THAT MANY NUTRIENTS (LIKE THE WYEAST BEER NUTRIENT BLEND AND THE YEASTEX PRODUCT YOU LIST) DON'T LIST THE YAN/FAN CONTRIBUTION. DO THOSE LEVELS CHANGE WITH DIFFERENT ABV LEVELS OR YEAST STRAINS? I KNOW IN MY HEART I SHOULD JUST GO AND TRUST YOUR RECOMMENDED DOSAGES, BUT WHERE'S THE FUN IN THAT?

JOSHUA GREENBERG
KANSAS CITY, MISSOURI

A The answer to this question requires an upfront disclaimer about any bias or product promotions that may accompany my answer. I work for BSG (Brewers Supply Group) and we carry several products used by producers of seltzers, and some of these products will be mentioned in this answer because they are most familiar to me. There are many other products available in the marketplace. I don't do infomercials and want to get the disclosure out of the way up front. Now let me tell you about this great new product!

In all seriousness, there are really two paths that can be followed when it comes to the yeast + nutrient decision making for seltzer production. The easiest path is to select a yeast + nutrient product that has been specifically developed for seltzer production. Since the starting point of most seltzers is a sugar solution somewhere in the 8 °Plato (1.032) to 20 °Plato (1.083) range and the desired outcome from the base fermentation is pretty much the same regardless of what is done after fermentation, for example cleaning up the base, adding acids, and adding flavors, it follows that yeast + nutrient products provide a useful tool to the seltzer maker. Call me lazy, but these products are really attractive to me because someone has already figured out what combination of goodies works the best to optimize the product. The addition rates can be varied by sugar water density (can we just call this "swort"

as in sugar wort?), and you can proportionally adjust based on the recommended use rate at a given "swort" density.

Many seltzer makers are happy with these products and are not bothered that the formulations are proprietary. The companies that produce and market these mixes have done the bench trials, invested into the formulations, and keep the information locked down. You want to know more so you can create your own yeast + nutrient blend. There is no silver bullet to this process and I will give you some basics to help you move in the right direction.

The first thing that needs to be addressed is the elephant in the room . . . as in, what's the big deal with seltzer? After all, *Saccharomyces cerevisiae* (translated from Latin as sugar yeast from beer) seems like the right organism for the task of fermenting "swort." But there is a pretty huge difference among the various sugar-containing solutions to make alcoholic beverages. Brewers have things pretty easy because wort contains much more than sugar and great beer can be made without ever having to worry about nutrients, aside from zinc, which really is one of those good-to-great things. OK peanut gallery, I am not talking really high-gravity beers and/or worts with high adjunct ratios, so pipe down!

Winemakers deal with fruit musts and must (no pun intended) be more mindful of nutrient levels. Then there are meadmakers . . . I have often wondered if the wide array of things added to honey must has not been in the pursuit of the perfect mead nutrient. Hmmm, if only the Pythons were still creating comedy this could make for an interesting sequel to *Monty Python and the Holy Grail*! And now we have swort for seltzer, with nothing at all for the yeast cells that are expected to transform this nutrient-empty liquid into a clean base to build upon. That's why nutrients are needed.

This is a high-level, how-to discussion and the very deep topic of yeast nutrition will be kept brief. Yeast cells need nitrogen to grow because without nitrogen cellular functions simply don't exist. This is because enzymes are proteins, and proteins are built from amino acids, and amino acids contain nitrogen. DNA and RNA also contain nitrogen. Like Bob Marley wailed, "no nitrogen, no wine." Yeast also require phosphorous to multiply because phosphorous is a critical cell wall constituent, as in phospholipid membranes, required to synthesize DNA and RNA, and essential for the cellular fuel known as ATP (adenosine triphosphate). And don't forget the vitamins, especially B-vitamins, enzyme co-factors like zinc and manganese, and minerals like calcium and magnesium that are essential for cellular activity. If this paragraph does not send you to the yeast + nutrient shelf, keep reading!

A great resource to help simplify this messy topic can be found on the BSG website at https://bsgcraft.com/resources/FAQ/4.26.18%20Nutrient%20Addition%20Charts.pdf. This is where that disclaimer comes into play. If you follow this link you will find an extremely useful chart that provides several nutrient addition approaches for fruit musts with varying levels of yeast assimilable nitrogen (YAN). Note that all of the addition rates in this table are pegged to 25 °Brix (essentially the same as 25 °Plato or 1.106 specific gravity) must and that there is a statement that reads "Lower Brix grapes need less nitrogen, higher Brix grapes need more." This point was made earlier, and reinforces the importance of the question you raised about matching nutrients with ABV/swort density.

The very high-risk must category is a good basis for formulating a nutrient blend for seltzers because the risk levels in this table are defined by YAN concentration, and swort has zero YAN. Without calling out product names, the suggested strategy for all of the examples shown in the high-risk must category use a blend of a proprietary yeast food + diammonium phosphate (DAP). Almost all nutrient-rich yeast foods on the market contain a large percentage of lysed yeast cells as the primary source of vitamins and minerals. The DAP component brings simple nitrogen and phosphorous to the party, and a blend of these two general types of yeast foods give yeast a fighting chance to convert swort into something that is fit for consumption.

And that brings up yeast. You need it! The most popular strains being used by the DIY crowd fall into two main categories: 1) Brewing yeast known to be clean and alcohol-tolerant, such as the Chico strain of yeast, and 2) Wine yeasts known to be clean and alcohol-tolerant, especially so-called prise de mousse yeasts that are often used for sparkling wine production. This is where you will need to do bench trials to select the strain that tickles your funny bone.

If all goes well with your nutrient formulation and yeast strain selection, you will produce a relatively clean product from primary fermentation. Two common off-flavors encoun-

Chart I: Examples of Various Yeast Nutrient Protocols

MUST/SWORT COMPOSITION	NUTRIENT TYPE	INOCULATION ADDITION (PER 5 GAL./19 L)	ACTIVE FERMENTATION ADDITION (PER 5 GAL./19 L)	MID-FERMENTATION ADDITION (PER 5 GAL./19 L)
VERY HIGH RISK (Initial YAN 50 ppm or 100 ppm YAN @ 25+ °Brix)	NUTRIENT A	Yeast Nutrient A: 5 g, DAP: 5 g	Yeast Nutrient A: 5 g, DAP: 5 g	Yeast Nutrient A: 2 g, DAP: 5 g
	NUTRIENT B	Yeast Nutrient B: 5 g; DAP: 3 g	Yeast Nutrient B: 5 g; DAP: 5 g	Yeast Nutrient B: 2 g; DAP: 5 g
	NUTRIENT C	Yeast Nutrient C: 5 g; DAP 5 g	Yeast Nutrient C: 2 g; DAP 7 g	Yeast Nutrient C: 2 g; DAP 5 g
HIGH RISK (Initial YAN 100 ppm or 150 ppm YAN @25+ °Brix)	NUTRIENT A	Yeast Nutrient A: 5 g; DAP 2 g	Yeast Nutrient A: 2 g; DAP 3 g	Yeast Nutrient A: 2 g; DAP 5 g
	NUTRIENT B	Yeast Nutrient B: 5 g; DAP 0 g	Yeast Nutrient B: 5 g; DAP 0 g	Yeast Nutrient B: 2 g; DAP 5 g
	NUTRIENT C	Yeast Nutrient C: 5 g; DAP 2 g	Yeast Nutrient C: 0 g; DAP 5 g	Yeast Nutrient C: 2 g; DAP 6 g

tered by seltzer makers are hydrogen sulfide (H_2S) and sulfur dioxide (SO_2). Sulfur dioxide smells like a burnt match and H_2S supposedly smells strongly of rotten egg— but how often do we encounter rotten eggs in our modern lives? In any case, you'll know it when you smell it. These are followed by the perfume-like esters that many describe as sake-like. Although sake-like esters are not unpleasant, they are distracting in a hard seltzer. This is where the big mop called activated carbon comes in handy to clean things up before adding acids, flavor extracts, herbal tinctures, or fruit juices to your fermented base.

This answer really just scratches the surface of the topics raised in your question. If you are serious about this project, the most efficient route will be running dozens of 1-liter (1-qt.) bench trials and collecting as much data as possible. If this is more of a science project than you expected, consider checking out some of the yeast + nutrient blends on the market and finding the product that suits your particular needs.

Q I RECENTLY ORDERED INGREDIENTS FROM A WELL-KNOWN, ONLINE SUPPLIER. DESPITE SPECIFYING ALL GRAINS BE SHIPPED UNMILLED, THE BASE MALTS ARRIVED MILLED, AND THE SPECIALTY MALTS UNMILLED. RATHER THAN DELAY MY BREW DAY, I DECIDED TO PROCEED. I WEIGHED OUT ALL OF MY GRAINS AND ADJUNCTS AND RAN THE WHOLE BATCH THROUGH MY MILL. I HAD NO PROBLEM WITH THE MASH, HIT ALL OF MY TARGET TEMPERATURES, VOLUMES AND GRAVITIES, AND THE BATCH IS BUSY FERMENTING AS I WRITE. WHAT IS THE IMPACT OF RUNNING BASE GRAINS THROUGH A MILL TWICE AND IS IT WISE TO MILL FLAKED BARLEY AND CORN?

TOM VOLK
BLAIRSVILLE, GEORGIA

A To mill once, or to mill twice? That is the question — but why shall a brewer mill at all? Brewers mill malted barley for two purposes, extract yield and husk preservation, and these purposes are opposed in terms of process optimization. Extract yield, measured by comparing wort density and volume to malt weight, increases as grist particle sizes decrease. In a lab setting, malt extract is measured on coarsely milled and finely milled malt samples, and the difference between the two values is one of many indices of malt modification. The lab method uses funnels and filter papers to separate wort from mash solids; time is not so critical because malt labs have lots of these filter set-ups and the time required for the filtration is just part of the method.

When it comes to practical brewing operations, the grist is rarely milled as finely as the finely milled malt used in lab analyses and brewers look to the coarse-ground, as-is (meaning the value is not on a dry weight basis) extract value (CG as-is) as a good indicator of what to expect in the brewhouse. Mill adjustment is one of the first things to look to when troubleshooting low extract yields. Brewhouse efficiency is calculated by comparing the extract yield in the brewery to the CG as-is value.

But extract yield is not the only value to focus on when it comes to efficiently producing a kettle full of wort. Time is money, and the gains in extract efficiency that come with adjusting the crush can easily be erased if wort collection times become too long. This is especially true in a commercial brewing operation where the most expensive piece of brewhouse equipment is the wort separation device (usually a mash tun, lauter tun, or a mash filter). The bottom line is that coarse grist makes for easier wort recovery.

So, you ordered unmilled malt, received some pre-milled and some unmilled, and decided to just mill it all to make things easiest. The good news is that everything turned out OK. If you had ended up with a stuck mash, I would be jumping into a discussion about how milling twice can bash up the malt husk and potentially cause you headaches. To neatly answer your first question about milling twice, try to avoid this in the future unless you are doing something to emulate multi-roll milling or are employing brew-in-a bag mashing.

Your question about milling flaked adjuncts is a really good subject with a bit of controversy surrounding it. For whatever reason, there are some brewers who are dead-set against milling flaked grains. One of the most common justifications given for this view is that milling flakes can end up with a gummy mash that does not make for easy wort separation. The primary point to this argument is that the stuff contained in flaked grains causes issues with run-off, so it's best to keep most of this stuff in the flaked grains by minimizing extract efficiency. OK, that's an interesting way to do things, but the other way is to mill the flakes and use less since the efficiency will increase with milling. Another totally radical approach is to mill the flakes *and* enzymatically address the gummy materials, primarily beta glucans and arabinoxylans, by adding a low-temperature mash rest and/or adding exogenous, cellulase enzymes to the mash.

I am in the mill the flakes camp. Flaked grains do not have any husk to be preserved and the majority of the solids contained in flakes are solubilized during mashing. There is no argument that cell wall constituents from certain flaked and unflaked grains, especially barley, oats, and rye, are quite effective at gumming up the works. The solution to this conundrum is found by varying the grist bill and/or mashing process, versus faking things by reducing yield.

As an aside, starchy adjuncts like rice and corn grits are typically milled finely because these ingredients are almost entirely comprised of starch and fine milling optimizes yield. Similarly, wheat malts and other huskless grains are often milled more finely than barley malts because there is no husk to preserve. Finally, when you do buy pre-milled grains, be mindful about storage conditions because they pick up moisture from the environment more readily than whole grains.

BY GORDON STRONG

WINTER SEASONAL BEER

Winter warmers, Christmas beers, and holiday treats

Certainly not all Christmas or holiday ales are spiced, but from a competition standpoint, there are other places where these beers can be entered.

WINTER SEASONAL BEER BY THE NUMBERS

OG: . . . . . varies by base style
FG:. . . . . varies by base style
SRM: . . . . .varies by base style, usually dark
IBU:. . . . . varies by base style
ABV: . . . . .varies by base style, usually over 6%

Photo by Charles A. Parker/Images Plus

I've written previously about winter seasonal beers, but only as a survey of competition winning beers. Here I'll focus on the Beer Judge Certification Program (BJCP) Style 30C, winter seasonal beer, but also speak a bit about how it is related to other spiced beers and seasonal beers. The BJCP style is part of the spiced beer category, so winter seasonal beers are specifically the spiced versions most common in the U.S.

Certainly not all Christmas or holiday ales are spiced, but from a competition standpoint, there are other places where these beers can be entered. Many British beers are produced for cold weather, and they often are called winter warmers, Christmas ales, or other similar names. They are rich, malty, and stronger than normal beers but are generally unspiced. However, they often have rich flavors from darker brewing sugars and malts. These beers can be entered as British strong ales under the BJCP guidelines.

Belgium is another country that often produces winter beers, many of which are just a stronger and richer version of their flagship beers. Some of these beers are spiced, but many of the base beers in Belgium are spiced or use brewing sugars anyway. So some Belgian versions can fall into this category, but only if they are spiced. I've seen beers from Germany, Mexico, and elsewhere that are designed for the winter season, but they are usually just maltier, darker, and stronger versions of existing beers.

Why does this matter for the style? Well, remember we are talking about beers for competition. One goal of the style guidelines is to make competitions easier to judge by grouping similar beers by style. Winter seasonal beers are a type of specialty beer, so some brewer creativity is expected. But it doesn't work well for judges to have long flights of radically different beers, so we have tried to subdivide these types of beers to assist with the process. That's all — it doesn't imply that some beers are more "Christmas" than others. That would be an incorrect interpretation of the guidelines.

Winter seasonal beers are an artificial construct for judging purposes that takes some subset of Christmas beers (the spiced ones) and allows for additional fermentable sugars. To do well in this style, the brewer should describe the beer, and identify the spices included. A base style should be declared, but it doesn't have to be one of the identified classic styles (like pale ale or porter). Specialty beers are about the balance of ingredients and drinkability, so brewers should avoid describing them in a way that confuses judges or disadvantages them.

HISTORY

It's hard to describe the history of a style that is a specialty category since it is more of an entry category than a true beer style. However, brewers have long produced special beers for cold weather or the holiday season. Sometimes these beers have been sold commercially, and sometimes brewers just used them as special gifts for friends, partners, or special customers.

As I said in the introduction, winter beers have a tradition in the UK, Belgium, Germany, and the U.S., and elsewhere. Americans and Belgians tend to use more spices, but that is reflective of their

brewing traditions in general rather than being specific to these beers.

Anchor Brewing Co.'s Our Special Ale, first produced in 1975 at the dawn of the craft era in the U.S., inspired many American craft Christmas beers. It has the features we are describing, with a dark beer of around 7% that is spiced. The recipe (and the label) changes every year, making this beer a nice Christmas gift worth anticipating. As with most beers of this type, it is a seasonal offering only available in winter months.

Seasonal beers are a popular craft offering, from the seasonal pumpkin and harvest beers of the fall, to the heavier-spiced sipping beers of the winter, to the spring bocks and stouts, to summer wheat and fruit beers. Many smaller craft producers have made a name producing one-off beers and special offerings, while seasonal beers last a few months. I enjoy waiting for Sierra Nevada Brewing's Celebration and Bigfoot, which are winter seasonal offerings but not spiced beers.

SENSORY PROFILE

Since this is a specialty category, writing a sensory description is tricky because every sentence would begin with "it depends . . ." So it's best to start with the general theme and then try to get more specific. Winter seasonal beers are specialty spiced beers for the winter season and should have a suggestion of an accompaniment for a cold winter night or a good fireside beer. There is any number of beer styles that fit this mold, so we need to get a bit more specific.

The general characteristics for this style are that the beer is somewhat strong; with a rich body, and a full, warming finish; that it is dark; and that it contains spices. But we can't stop here because you could construct a beer that fits that description that wouldn't fit the style. So let's take a look at each part of that statement.

"Somewhat strong" and "warming finish" means the alcohol should add a warming element to the beer; it shouldn't be hot or burning. These beers aren't usually huge, about the strength of an IPA to a double IPA, I'd guess. We aren't usually talking barleywines or imperial stouts, although if

WINTER SEASONAL BEER

(5 gallons/19 L, all-grain)
OG = 1.068 FG = 1.016
IBU = 24 SRM = 24 ABV = 6.8%

INGREDIENTS

6 lbs. (2.7 kg) UK pale ale malt
1.75 lbs. (794 g) dark Munich malt
1.75 lbs. (794 g) aromatic malt
12 oz. (340 g) flaked barley
12 oz. (340 g) Caramunich® II malt (45 °L)
12 oz. (340 g) UK dark crystal malt (100 °L)
4 oz. (113 g) chocolate malt
1.5 lbs. (680 g) honey
2 oz. (57 g) treacle or molasses
2 oranges, zested
2 vanilla beans, split, scraped
6 cinnamon sticks, broken up
12 coriander seeds, crushed
1 whole nutmeg, chopped
8 whole allspice, crushed
6.2 AAU UK Challenger hops (60 min.) (0.75 oz./21 g at 8.3% alpha acids)
1 oz. (28 g) Styrian Goldings hops (5 min.)
Wyeast 1968 (London ESB), White Labs WLP002 (English Ale), or LalBrew London ESB 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.

This recipe uses a single infusion mash. Use enough water to have a moderately thick mash (1.5 qts./lb. or 3.1 L/kg). Mash the pale, Munich, and aromatic malts with the flaked barley at 154 °F (68 °C) for 60 minutes. Add the remaining specialty malts, raise the temperature to 168 °F (76 °C) and recirculate for 15 minutes. Sparge slowly and collect 7 gallons (25.6 L) of wort.

Boil the wort for 90 minutes, adding hops at the times indicated in the recipe. Put all the spices in a mesh bag and add during the last 10 minutes of the boil, removing at the end of the boil. Add the honey and treacle at the end of the boil, and stir.

Chill the wort to 68 °F (20 °C), pitch the yeast, and ferment. After two weeks, prime and bottle condition, or keg and force carbonate.

WINTER SEASONAL BEER

(5 gallons/19 L, extract with grains)
OG = 1.068 FG = 1.016
IBU = 24 SRM = 24 ABV = 6.8%

INGREDIENTS

4.4 lbs. (2 kg) pale liquid malt extract
2.3 lbs. (1 kg) pale liquid Munich malt extract
12 oz. (340 g) Caramunich® II malt (45 °L)
12 oz. (340 g) UK dark crystal malt (100 °L)
4 oz. (113 g) chocolate malt
1.5 lbs. (680 g) honey
2 oz. (57 g) treacle or molasses
2 oranges, zested
2 vanilla beans, split, scraped
6 cinnamon sticks, broken up
12 coriander seeds, crushed
1 whole nutmeg, chopped
8 whole allspice, crushed
6.2 AAU UK Challenger hops (60 min.) (0.75 oz./21 g at 8.3% alpha acids)
1 oz. (28 g) Styrian Goldings hops (5 min.)
Wyeast 1968 (London ESB), White Labs WLP002 (English Ale), or LalBrew London ESB Ale yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Use 6.5 gallons (24.5 L) of water in the brew kettle; heat to 158 °F (70 °C). Steep the grains for 30 minutes in a mesh bag, then remove from the kettle. Turn off the heat. Add the malt extracts and stir thoroughly to dissolve completely. Turn the heat back on and bring to a boil then follow the all-grain recipe for spicing and fermentation instructions.

you age them enough, spiced versions of these beers could fit the bill.

"Rich body" and "full finish" means that it should be medium to full, chewy even. Rich, malty flavors are pretty much required but the beer doesn't have to be sweet. They can be malty-sweet, but that is often due to restrained hopping rather than overt sugary sweetness. The balance is not often hoppy since that can interfere with spices, but brewer creativity shouldn't be discounted. There are probably hoppy versions with spices that could be quite interesting.

"Dark" doesn't mean black; it just means more than pale. Although the base style could make it lighter, beers that are coppery to brown are most common. Color is the least important aspect to this style, so judges shouldn't claim a beer is out of style solely on color unless it is radically at odds with a declared base style.

"Contains spices" is the requirement for this style, but should be interpreted liberally. Spices that evoke the Christmas or winter season are most appropriate, but many combinations can fit this bill. Dried fruits or fruit peels, various dark sugars or syrups, and spices can all be used in combination, but there should be something more than just sugars. Brewer creativity can create interesting combinations between the base beer's malts, the yeast, any noticeable hops, and the spices. Judges shouldn't focus on a favorite commercial interpretation, and brewers should always try to explain their concept to the judges to get the best score.

Malt can bring some flavors like chocolate, caramel, toffee, and toasted nuts, depending on the style. Spices should be in balance, but noticeable. If you mention a specific spice in your description of the beer, judges will expect to be able to detect it. If you use a combination of several spices, sometimes it is best to give a name to the mix or to identify the associated food (mulling spices, gingerbread spices, etc.). Believe me, if you list ten spices, there are judges who will argue that they could taste only eight of the ten and therefore ding your score for the lapse.

Some of my favorite interpretations include those beers that evoke Christmas desserts, such as English-type Christmas pudding, rum cakes, eggnog, gingerbread cookies, and the like, as well as Christmas decorations, such as mulling spices, potpourri, and evergreen trees. Basically, if it makes you feel warm and happy and brings back good, childhood memories, you've nailed it.

BREWING INGREDIENTS AND METHODS

Since the base style for this beer can vary, it's hard to directly address how to brew it and what ingredients to use. I can make some generic statements like most of these are ales and since they don't require high attenuation; a single infusion mash is appropriate. But isn't that how you would have made it anyway if I didn't say anything at all? I can see some cases where a decoction mash could make for an interesting beer, particularly if the base style is a malty lager. But in general, use the ingredients and methods as appropriate for the base style of beer.

Select malts that play up the flavors that are commonly found in this style. You are missing an opportunity if you use a simple base malt rather than one that brings bready, malty, or toasty flavors. I often use a blend of base malts for more flavor complexity, such as using pale ale-type malts and Munich-type malts. The same is true of specialty malts. Caramel and toasted malts can bring in toffee, caramelized sugar, and dark fruit flavors, and a light use of chocolate-type malts can bring in cocoa flavors if desired.

Sugars and other fermentables can add flavor complexity. Many English ales use brewing sugars like invert sugars of varying color to add flavors similar (but more intense) than flavors found in crystal malts. Honey, treacle, molasses, brown sugar, maple syrup, and other similar products can be used to add gravity points as well as flavor. Body in the beer can be gained through the use of a higher mash temperature, the use of starchy adjuncts such as flaked oats, barley, or wheat, or the use of dextrinous malts such as Carapils®.

Spicing can be just about anything, but it's helpful to pick a theme. I like to think of food memories or certain cuisines to inspire spice choices. Some combinations are known to work together, and will help inspire flavor memories for drinkers. Spices like cinnamon, nutmeg, allspice, ginger, clove, and mace can be found in holiday foods, but more exotic spices like star anise or cardamom can add a unique character. Vanilla should not be overlooked, since it can round out other spices. Be careful with clove, however, since many judges will mistake it for a fermentation flaw. Dried fruit such as raisins, prunes, figs, and dates can be used, as can the peels from various citrus fruit. Herbs are less common, but I've used thyme on occasion, as I know it has been used in some Belgian beers.

When using spices, I like to add them towards the end of the boil (10 minutes or less), or just put them in after heat is turned off and let them steep. I think spices need some heat to bring out their full flavor and aroma but too much will potentially drive off the more volatile of the aromatics. Too much exposure to heat can extract tannins from many spices (think about tea steeping too long), so I try to avoid this by putting spices in a mesh bag and removing them after they have steeped.

Spices are a perishable product, and the strength and potency of them can be quite variable. So take the listed amounts in recipes as a guideline. You have to adjust spicing to taste. I often intend to go light on the spices in the boil, knowing that I can increase them later if necessary. But if you overspice a beer, there is not much you can do (let it age, or blend it). I often steep spices in boiling water, like making tea; then I use the strained, cooled product to adjust the final spicing of the finished beer. I don't like to add raw spices to finished beer since that can often give an unpleasant "dusty" flavor to the beer.

HOMEBREW EXAMPLE

I've been making Christmas beers since my fifth batch, which won my first best-of-show award (so it kind of has a sentimental place in my heart). It has several of my favorite ingredients and combinations, and is richly malty, complex, and spicy for the season.

To name names, I like to use Golden Promise as the primary base malt but any pale ale malt should work. I'm not

Photo courtesy of Anchor Brewing Co.

Anchor Brewing Co's iconic Our Special Ale has been released yearly since 1975 featuring a new recipe and artwork each year since.

looking for something overly bready, so this is why something like Maris Otter is a second choice. Several of the specialty malts are British, since they tend to add the deep caramelized flavors I like; the chocolate malt is really just for color and a little extra richness. I think too much roast flavor in this beer would get in the way.

To boost richness, I have dark Munich and aromatic malts; I often use these malts in recipes where I want significant malt flavors, like bocks and other strong German beers. I'm adding flavor and gravity points with honey (I tend to use orange blossom honey since the flavors are very compatible) and a little treacle adds dark molasses sugary flavors often found in Christmas desserts.

The flaked barley is to boost the body. Using oats, Carapils®, or other similar malts, could work as well for this purpose. I like some chewiness in these cold-weather beers. The spices seem Christmas-like to me, but I don't like to have them add astringency so I tend to bag them, add them near the end of the boil, and then remove them. If the spicing is off to your taste, you can always make a tea from boiling water steeping the same spices (or a different mix to your taste) and dosing the finished beer with the tea. Note that I'm calling this infusion a tea, but that it doesn't actually contain tea.

I like English ale yeast for this type of beer, especially ones that aren't overly attenuative or that emphasize malty or fruity flavors. I'm not looking for yeast to bring any spicy flavors, so I try to avoid strains that produce phenols or minerally flavors. Calcium chloride as the water treatment emphasizes the malty, rounded flavors.

I try to keep the alcohol around 7% by volume because I normally make this beer in the early fall for holiday serving. If you make this too big, you might find the alcohol too sharp and then have to cellar the beer for another year. Talk about a lump of coal in your stocking . . . BYO

Holiday GIFT GUIDE

This holiday season give the gift of beer! Check out all of the great beer gear on the next few pages for some gift ideas for friends and family or make your own homebrew holiday wishlist...

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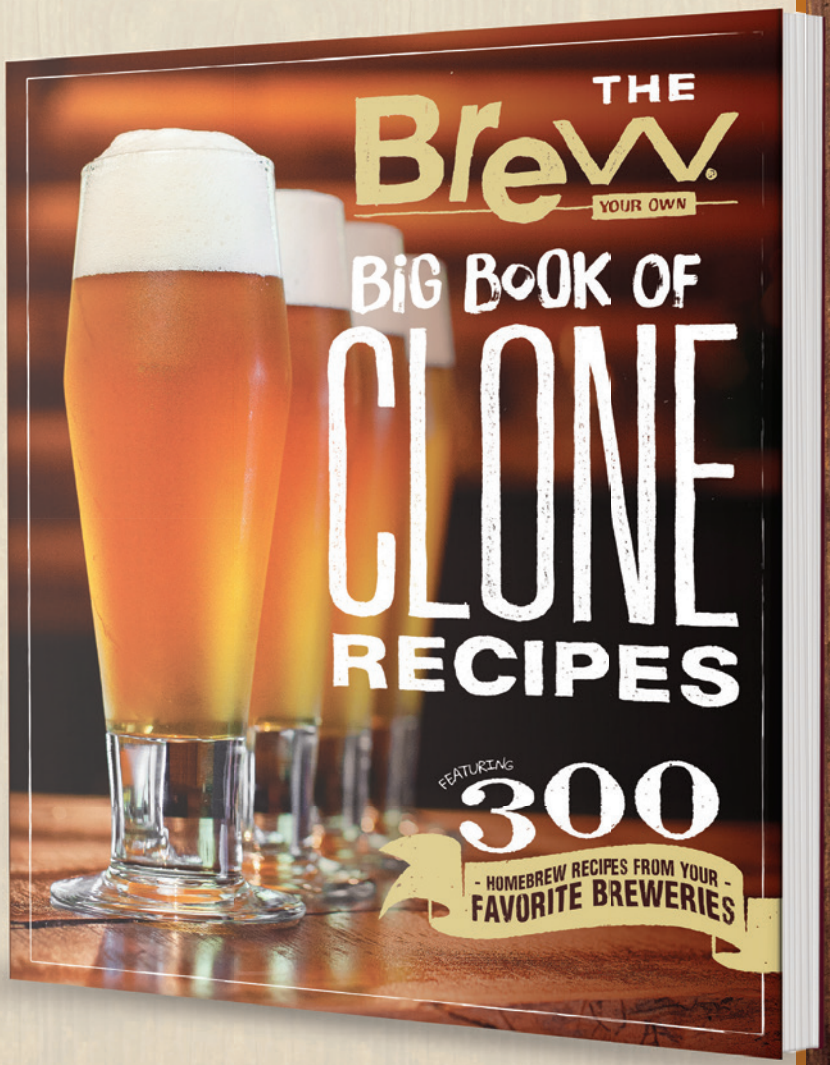

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Brew YOUR OWN — THE HOW-TO HOMEBREW BEER MAGAZINE

Extract Brewing Essentials

by Jon Stika

The necessities of homebrewing

As both a homebrewer and professional brewer at Phat Fish Brewing in Dickinson, North Dakota, I frequently get asked about the process of brewing beer, including how difficult it might be to get started brewing at home. I always do my best to give a complete yet concise answer that includes encouragement for them to take the leap to begin brewing beer themselves.

Any discussion of brewing beer is inextricably linked to the equipment necessary to carry out the process, particularly what pieces of equipment would be essential to get started. Before grasping the concepts of the brewing process itself, most people want to know what it will cost them in time and money to get into the hobby of homebrewing. I tell those interested in getting started that it is important for them to understand the essential steps of the brewing process and the equipment needs will then become apparent to them. I say this to challenge would-be brewers to take stock of what equipment they may already have on hand in their kitchen, attic, basement, or workshop in order to not only keep costs down, but to help them realize that they may be closer to getting started brewing than they previously thought.

Photo by Michael Tonsmeire

If you're a longtime reader of *Brew Your Own*, you may not learn a lot of new information from this article (although, refreshers are always nice!). However, I believe this article will be useful to read so you can consider it when others take interest in your hobby and you find yourself trying to describe the necessary steps and equipment for a newcomer to get into homebrewing. If you have been homebrewing for a while, the chances are that you, too, have been asked by a friend, family member, or even a stranger about what it takes to start making beer at home.

My elevator pitch to beginning brewers about getting started is that it is easier and cheaper than they might think. Most homebrew suppliers have beginning brewer kits that include most of the items listed in the essential equipment sidebar on page 35, plus an extract ingredient kit and instructions, enough to brew a 5-gallon (19-L) batch of beer for less than $100. Once you have purchased the essential equipment, you can buy recipe kits that typically cost between $20 and $60 to brew again and again. I strongly encourage new brewers to begin with extract brewing, rather than brewing all-grain batches by mashing malt to produce wort. By getting comfortable with an abbreviated brewing process, you will have a greater chance of immediate success before attempting the somewhat more complicated process of brewing from scratch.

Starting with a liquid malt extract recipe kit not only simplifies the brewing process, it cuts the time required to brew a batch of beer from about five hours to three, and reduces the amount of equipment and expense of getting started brewing. Malt extract comes in the form of a syrupy liquid of approximately 20% water content, or a dry powder, with nearly no water content. Recipe kits may include one or both forms of extract. Once you are a successful extract brewer, you can add the mashing step to your process later. I brewed with extract kits for several years before I made the leap to mashing to produce wort and am glad I did. It allowed me to be successful making good beer first, then I added more detail and dimensions to my brewing later. So, let's walk through the extract brewing process and the corresponding pieces of equipment needed to get the job done.

Steeping specialty grains in a mesh bag will add flavor and color to beers brewed with malt extract.

STEEPING SPECIALTY GRAINS

Oftentimes, an extract kit includes the option of some crushed specialty malt (and possibly un-malted grains) along with a mesh bag for steeping them in the brewing water. The crushed grains are placed in the mesh bag supplied with the kit and suspended in the brewing water as the water is heated, but not boiled, prior to adding the malt extract. Do this by steeping the specialty malt in 2.5 gallons (9.5 liters) of potable water in a pot that can hold at least 5 gallons (19 liters) until the water reaches a temperature of 170 °F (76 °C), then lift the bag out of the water, let it drain into the pot for a minute, and discard the malt.

Regardless of whether your recipe kit includes specialty grains or not, it is helpful to warm the container of liquid malt extract by removing the lid from the container and placing it in some hot water while you are waiting for your brewing water to heat. This will make the extract easier to pour. If you have not already prepared some brewing water by conducting the steeping process of any specialty malt (leaving you with a bit less than 2.5 gallons/9.5 L of water that has not yet begun to boil) then place 2.5 gallons (9.5 L) of potable water in at least a 5-gallon (19-L) pot that you will use for the actual wort boil, or continue to heat the water that you steeped the specialty malt in, until the water comes to a boil. At this point it is important to remove the pot from the heat source before adding the warmed liquid malt extract. The reason for removing the pot from the heat source it to avoid scorching the malt extract on the bottom of the pot. Scorched malt is very difficult to clean off of the bottom of the pot and more importantly, will leave a nasty burnt flavor in your beer that is impossible to remove or mask.

Stir the liquid malt extract into the water with a large spoon. Rinse the malt container with a little hot water to get most of it into the pot.

BOILING

Boiling is necessary to sanitize the wort, extract bitterness from the hops, and coagulate proteins so the finished beer will become clear. Wort is a complex solution of sugars, color and flavor compounds, yeast nu-

Photo by Charles A. Parker/Images Plus

Boiling is an important step to extract bitterness from hops, as well as sanitize the wort and coagulate proteins to help clarify the beer.

trients, and water, which in the case of beer come from malted grains, primarily barley and wheat. Later in the brewing process, wort will also contain bittering acids and aroma compounds from hops. As mentioned previously, we are skipping the step of mashing to allow you to focus on the basics of the brewing process, including what lies beyond the boil.

Once you are certain that the extract is completely dissolved in the water so that no extract remains on the bottom of the pot, you may return the pot to the heat source and continue heating it up to a boil. Do not leave the pot unattended during the time it is heating up to a boil! As the wort reaches a boil it will often foam excessively (this is why we suggest using a 5-gallon (19-L) pot to boil approximately 14 quarts (13.3 L) of wort. When the wort begins to foam, you can reduce the heat, stir the wort with your big spoon, and/or spray water onto the foam to keep it from overflowing the pot. If the pot should foam over its sides (aka the dreaded boilover) it will not ruin your batch of beer, but you will have a burned and sticky mess to clean off of your stove that you will live to regret!

For most beer recipes, you will need to boil the wort for about an hour, adding particular hops at specified times during the boil according to the recipe. The boil should be a gentle rolling boil that can be sustained without resulting in a boilover. Also, each time hops are added to the pot there is a chance the wort will foam excessively and need to be controlled as mentioned previously. During the boil, sanitize your fermenter by spraying it with a solution of 2 mL/liter or ½ teaspoon/quart of Star San or the sanitizer supplied with your kit per the instructions and allow the excess sanitizer to drain from it.

CHILLING

After the boil the wort must be cooled down to a temperature at which yeast can survive and thrive. From this point on, everything the wort or beer touches needs to be sanitized! Failure to sanitize equipment is perhaps the greatest reason for failure in homebrewing beer. By killing any other bacteria or fungi before adding our fungi of choice (beer yeast) we can be reasonably assured that the beer will be fermented by the yeast we add rather than some other organism(s). Star San and other sanitizers are cheap, bad beer is expensive!

As a general rule, brewing yeast perform best between 50–78 °F (10–26 °C). Since we now have something less than 3 gallons (11.4 L) of hot wort and wish to have just over 5 gallons (19 L) of final volume at a temperature suitable for our yeast to thrive, the simplest approach is to add about two gallons (8 L) of ice to the wort and allow it to melt. If you plan to make homebrewing a continuing hobby, the first equipment upgrade to con-

Photo by Charles A. Parker/Images Plus

Wort chillers aren't often included in beginning homebrewing kits, although they should be the first piece of equipment to purchase afterwards so wort can be cooled quickly.

Essential Equipment

- 5-gallon (19-L) or larger pot for boiling wort.
- Long-handled spoon for stirring wort.
- 6.5-gallon (24.5-L) fermenter, plus a lid with a hole in it to accept an airlock — fermenter may be made of food-grade plastic (bucket with lid or carboy), stainless steel with a lid, or glass (carboy) where the airlock fits into a drilled rubber stopper that fits into the opening of the carboy.
- Plastic airlock
- A thermometer capable of measuring between the freezing and boiling points of water.
- A 6.5-gallon (24.5 liter) bottling bucket similar to a plastic fermenter bucket with a lid and plastic spigot that fits in a hole in the side near the bottom of the bucket to be used to fill bottles.
- Plastic tubing for transferring beer from the fermenter to the bottling bucket.
- Bottling wand
- Scale or measuring cups to measure priming sugar and water.
- 2-quart (1.9-L) or larger saucepan to dissolve and boil priming sugar solution.
- (48) 12-ounce (355-mL) bottles or an equivalent number and size of bottles to contain 5 gallons (19 L) of beer. Either brown glass bottles that will accept a crimp-on steel cap, bottles with swing-top stoppers, or brown plastic bottles with reusable screw-on caps. Brown glass or plastic is important to restrict light, which can adversely affect the flavor of beer.
- Bottle caps, if not using swing-top bottles or screw-on bottles.
- Bottle capper

sider is a wort chiller. Wort chillers are available from homebrewing suppliers or can be made yourself from materials found at a hardware store. Transfer the semi-cooled wort into your sanitized fermenter. Some splashing of the cooled wort while pouring the wort into the fermenter is a good thing, as yeast require some oxygen during the first part of their life cycle. Do your best to leave most of the sediment (trub) behind in the pot. Check the wort temperature with a sanitized thermometer and add ice and/or cold water until the wort in your fermenter is at a volume just over 5 gallons (19 L) and a temperature between 50–78 °F (10–26 °C). If you have just over 5 gallons (19 L) in your fermenter and it is still over 78 °F (26 °C), then cover the fermenter with the sanitized lid and set it in a sink of cold water (with ice if necessary) until it does cool below 78 °F (26 °C).

Photo by Charles A. Parker/Images Plus

After sanitizing the bottles, caps, bottling wand, and tubing, fill the bottles with minimal splashing.

PITCH THE YEAST

Once you have the volume of wort adjusted to just over 5 gallons (19 L) and in the correct temperature range, cut the yeast package open with sanitized scissors and sprinkle (dry) or pour (liquid) yeast into the wort. Sanitize the lid or stopper and the airlock and attach them securely to the fermenter. Add a bit of water to the airlock so it is less than half full and place the fermenter in a place with consistent temperatures between 50–78 °F (10–26 °C) and where it will not be exposed to light or wide temperature variations.

FERMENTATION

Active fermentation should begin within 48 hours of pitching the yeast into the wort. You should see a layer of foam develop on the surface of the wort and carbon dioxide bubbling through the airlock. The layer of foam and the bubbling of the airlock should continue for a week or two. When the layer of foam is nearly absent and little or no carbon dioxide is coming through the airlock, fermentation is essentially complete. One of the next pieces of equipment you'll likely want to buy is a hydrometer to measure gravity, which is a more accurate way to determine fermentation completeness, but we can get by without one to start.

RACKING, PRIMING, AND BOTTLING

When fermentation appears to be complete (usually 10–14 days), sanitize the bottles, caps, bottling bucket (including the attached spigot), and plastic tubing that will be used to transfer the beer from the fermenter to the bottling bucket by spraying them with sanitizer or soaking them in a bath of sanitizer solution and allowing the excess sanitizer to drain away.

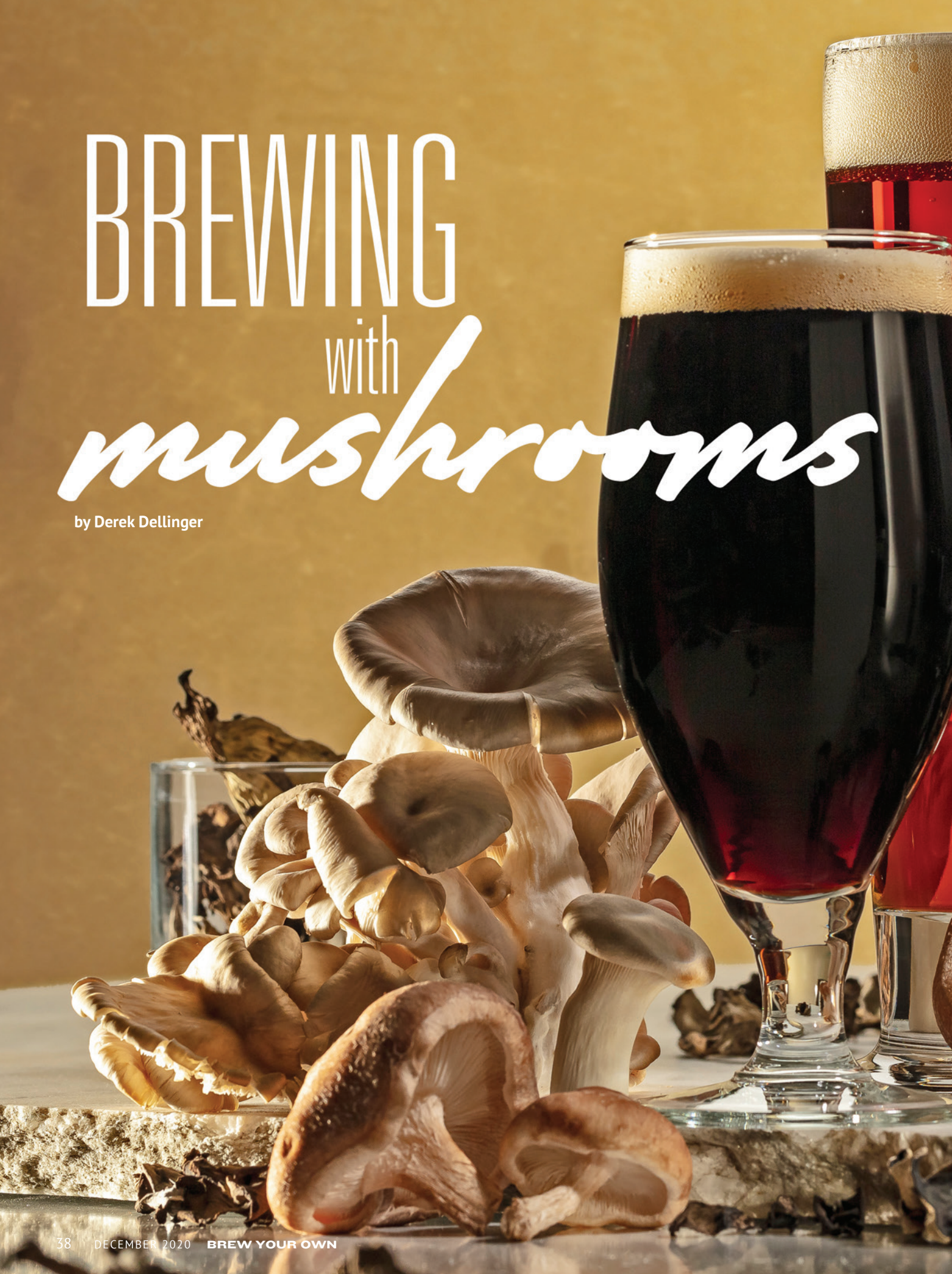
Make a priming sugar solution by dissolving 5 ounces (142 g) of dextrose (corn sugar that is typically provided with a recipe kit) or white granulated sugar in a pint (473 mL) of water and bring it to a boil to sanitize. Allow the solution to cool slightly and pour it into the bottling bucket. Siphon the beer from the fermenter into the bottling bucket using sanitized plastic tubing, leaving the sediment behind in the fermenter. Carefully fill each bottle using a bottling wand or directly from the spigot on the bottling bucket, allowing the beer to flow down the inside of the bottle instead of splashing straight down, to within ¾ inch (2 cm) of the top, position a sanitized cap on the mouth of the bottle and crimp it down to seal it with the bottle capper. If you used swing top bottles or plastic screw-top bottles then secure the sanitized stopper or cap onto the mouth of the bottle.

CONDITIONING AND SERVING

Allow the bottled beer to sit upright at room temperature away from light for two weeks to allow the yeast to ferment the priming sugar to produce carbonation. Chill the bottles down to serving temperature. Pry off a cap from a bottle (or open the swing or screw top) and carefully pour the beer into a clean glass being careful to stop before the yeast sediment comes out of the bottom of the bottle. If all went well, you should be drinking carbonated beer (hopefully good beer!). If the level of carbonation seems a bit low, allow the bottles to sit at room temperature for another week before chilling them again to serving temperature. BYO

BREWING with *mushrooms*

by Derek Dellinger



ADDING ANOTHER FUNGI TO YOUR BREW

If you want to give someone a lesson in the primary modalities of taste — sweet, bitter, sour, salty, and savory — there's perhaps no easier place to start than with craft beer. Indeed, over the past few decades, what else has served to revive the merits of bitterness like West Coast IPA? Sweetness? That's easy to find too, of course. Sour? Another huge trend in the beer world, opening up yet another category of flavor. Salty, admittedly, might not be a major role player in our educational beer lineup, outside of perhaps a Gose — which is probably fine, considering how prevalent salt already is in so much of our food. Yet finally, there's the mercurial world of umami, the dimension of savoriness. How would one even go about making a beer savory? And considering that savory is associated with rich, hearty flavors, could that even be good?

Photo by Charles A. Parker/Images Plus

Photo by Shutterstock.com

Depending on the variety, mushrooms can impart a wide array of flavors and aromas suitable for various beer styles. Porcini mushrooms, pictured here, impart a bright, rich sort of earthiness that may be desirable in farmhouse ales or even a stout.

To find one of the world's best sources of umami, one has only to turn to the siblings of our precious fermenting agents. Brewer's yeast is of course a member of the kingdom of fungi, and so, sliding just a few spots over on the tree of life, we find mushrooms. The mushrooms most prized by foodies are, unsurprisingly, probably the best place to start when considering uniting our fungal cousins in the form of a beer. Chanterelle mushrooms can lend a slight buttery, umami-infusing texture, with a light, fruit, apricot-like aroma that pairs well with saisons and wild ales. Oyster mushrooms can evoke subtly earthy flavors. Porcini impart a brighter, richer sort of earthiness, ideal for a more straightforward "mushroom" character. Shiitake mushrooms — one of the best-known varieties in America that's managed to retain a bit of an exotic air — can work well to punch up a beer's funky qualities.

PLANNING THE RECIPE & BREWING WITH MUSHROOMS

As some varieties of mushroom can be quite pungent, the first step in brewing a mushroom beer should probably be one of calibration. Do you want to use mushrooms to accent certain qualities of the base beer, or do you want to brew an overtly mushroom-flavored beer?

Making a tincture or tea and adding it in measured doses to an existing beer is a great way to test out the flavor of the mushrooms in advance, honing in on the right base style for the pairing. Mushrooms will sometimes lose certain aspects of their character once added to alcohol, often becoming less earthy and somewhat more savory or rich, so this advance taste testing can pay dividends later. When measured carefully, a tincture will also allow you to hit the right dosage for the final product, saving you from a potential umami-bomb if a slight funk was all that you really desired.

Yet mushrooms are certainly not limited exclusively to funk. One of the most exciting aspects of brewing with exotic and unusual ingredients is discovering unique, yet specific flavors where one least expects them, and mushrooms hold great potential in this regard. While formalizing an idea for a mushroom stout at Kent Falls Brewing Company in Kent, Connecticut, I originally balked at the price when discussing the concept with Co-Owner Barry Labendz. Spending hundreds of dollars on a relatively small amount of mushrooms felt hard to justify, until we considered that their pungent, maple-like character offered a perfect substitute for another, even more expensive ingredient. Candy cap mushrooms have the unexpected distinction of smelling and tasting exactly like maple syrup. Maple syrup itself is a frustratingly delicate ingredient to brew with. As with many sugar-dense ingredients, the fermentation tends to carry off much of the precious flavor that you'd prefer to stick around. Compared to the cost of an adequate amount of syrup, candy cap mushrooms were practically a bargain. Not only that, but they wouldn't noticeably budge the beer's terminal gravity, eliminating many of the concerns with stability and residual sugar that adding massive amounts of syrup posed.

Dried mushrooms from a quality source are easy to work with, and in most cases, can be added directly to the fermenter to impart their flavor. Extra care with calibrating your dosage with a tincture in advance can ultimately make life easier later on, as the measured dose of mushrooms can then be steeped in your fermenter or secondary vessel with little worry. Brewing with candy caps at Kent Falls, we knew we wanted to saturate as much character as possible into the rich imperial stout base. When the mushrooms arrived, I found they were one of the most pungently aromatic ingredients I had ever worked with — I could smell the distinctly maple character through the packaging from ten steps away. We settled on using just 1 lb. (450 g), for a 30-barrel (35 hectoliter) batch of stout, or the equivalent of just 2 grams in a 5-gallon (19-L) batch. The result was a pleasant, lingering maple note, subtle but very persistent. For an even more pungent maple character, at a smaller and more economical scale, a brewer could safely double the dosage.

At this stage, one can simply add a mushroom tincture to the fermented beer, or add a measured amount of mushrooms directly to the fermenter. With such a pungent ingredient,

CANDY CAP MUSHROOM IMPERIAL STOUT

(5 gallons/19 L, all-grain)
OG = 1.084 FG = 1.021
IBU = 60 SRM = 41 ABV = 8.2%

Candy cap mushrooms impart a distinct flavor and aroma of maple syrup, but unlike syrup those qualities are not lost in fermentation. A little goes a long way with these mushrooms.

INGREDIENTS

13 lbs. (5.9 kg) 2-row malt
1 lb. (0.45 kg) brown malt
1 lb. (0.45 kg) flaked oats
1 lb. (0.45 kg) Carafa® III malt
1 lb. (0.45 kg) dextrose sugar (10 min.)
12.75 AAU Brewers Gold hops (60 min.) (1.5 oz./42 g at 8.5% alpha acids)
12.75 AAU Brewers Gold hops (10 min.) (1.5 oz./42 g at 8.5% alpha acids)
0.07–0.14 oz. (2–4 g) dried candy cap mushrooms (secondary)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale), or SafAle US-05 yeast
⅔ cup corn sugar (if priming)

STEP BY STEP

This is a single step infusion mash. Heat 4 gallons (15 L) of strike water to 168 °F (76 °C). Stir in the grains, ensuring no dough balls are left. Mash should stabilize at 154 °F (68 °C). Hold at this temperature for 60 minutes then begin your lautering process. Sparge with enough water to collect 7 gallons (26.5 L) of wort in your kettle. Boil for 90 minutes adding hops and corn sugar at the times indicated.

After the boil is complete, chill the wort down to fermentation temperature and pitch the yeast. Be sure to aerate the wort properly and pitch enough yeast if using a liquid strain. Use two sachets if using a dry yeast strain; aeration is not needed. Ferment at 69–72 °F (20–22 °C) for two weeks.

The dried candy cap mushrooms are added during secondary a week before packaging. Two grams will impart a more subtle hint of maple, while 4 grams should impart a pronounced, lingering maple character. It's recommended to start at the low end of the addition rate the first time brewing this recipe (you can always make a steeped mushroom tea to add after fermentation if you desire more character from the mushrooms).

After a week, rack off the mushrooms and bottle or keg as usual.

CANDY CAP MUSHROOM IMPERIAL STOUT

(5 gallons/19 L, extract with grains)
OG = 1.084 FG = 1.021
IBU = 60 SRM = 41 ABV = 8.2%

INGREDIENTS

7.5 lbs. (3.4 kg) golden dried malt extract
1 lb. (0.45 kg) Carafa® III malt
0.5 lb. (0.23 kg) Carafoam®
0.5 lb. (0.23 kg) crystal malt (60 °L)
1 lb. (0.45 kg) dextrose sugar (10 min.)
2.25 AAU Brewers Gold hops (60 min.) (0.25 oz./7 g at 9% alpha acids)
6.75 AAU Brewers Gold hops (10 min.) (0.75 oz./21 g at 9% alpha acids)
0.07–0.14 oz. (2–4 g) dried candy cap mushrooms (secondary)
Wyeast 1056 (American Ale), White Labs WLP001 (California Ale), or SafAle US-05 yeast
⅔ cup corn sugar (if priming)

STEP BY STEP

Begin by heating 5 gallons (19 L) of water in your kettle. Place crushed grain in a muslin bag and submerge in the water. Allow the grains to steep as the water heats up to 168 °C (76 °C). Remove grains allowing liquid to drip back in the kettle. Remove kettle from heat and stir in the dried malt extract. Once the extract is fully dissolved, turn heat back on and bring wort to a boil. Boil for a total of 60 minutes adding hops and sugar at the times indicated.

After the boil is complete, chill the wort to fermentation temperature. Transfer to a fermenter and top off to 5 gallons (19 L). Pitch the yeast. Be sure to aerate the wort properly and pitch enough yeast if using a liquid strain. Use two sachets if using a dry yeast strain; aeration is not needed. Ferment at 69–72 °F (20–22 °C) for two weeks.

The dried candy cap mushrooms are added during secondary a week before packaging. Two grams will impart a more subtle hint of maple, while 4 grams should impart a pronounced, lingering maple character (you can always make a mushroom tea to add after fermentation if you desire more character from the mushrooms). After a week, rack off the mushrooms and bottle or keg as usual.

Photo by Shutterstock.com

a post-ferment steeping for just a few days is all that's required to capture the flavor thoroughly.

If mushrooms can cement the flavor profile of a beer as bold and rich as an imperial stout, what else can they do? Diving into the world of mushrooms feels a lot like first immersing oneself in the vast potential of homebrewing — you realize swiftly that there are far more out there than you had even imagined.

SOURCING MUSHROOMS

Mushrooms do pose one particularly notable caveat compared to most other ingredients found in a brewery. Mushroom foraging is an ancient and popular hobby, but it requires a great deal of expertise, as the results can be potentially dangerous when a mushroom is misidentified.

Perhaps the greatest factor keeping mushroom beers from crossing a mainstream threshold is how difficult, or expensive, it can be to source many of the most flavorful and exotic mushrooms. While mankind may have landed on the moon and figured out how to edit our very DNA, there are still a surprising number of highly sought-after mushroom species that we don't know how to reliably grow in a domesticated environment. These varieties, which must be foraged in the wild, command a hefty price tag, sometimes hundreds of dollars per pound (0.45 kg). Some breweries oriented around local ingredients work with professional mushroom foragers to source their elusive flavorful fungi, but this can grow quite expensive. Here is another advantage homebrewers have over large professional operations: Homebrewing requires far less of an ingredient, making its application more forgiving on the wallet and more apt for experimentation. For instance, a quick internet search for dried candy cap mushrooms turns up various retailers selling quantities of an ounce (28 g) or less for under $50. For the recipe on page 41, that's just a few dollars a batch on mushrooms.

It must be said: Never consume a mushroom found in the wild unless you are an expert or are working with an expert mushroom forager. There are enough varieties of poisonous mushrooms (and mushrooms that simply aren't edible and will cause an unpleasant response if consumed) that it's truly not something an amateur should attempt. Avoid a trip to the hospital, or worse, and simply buy mushrooms foraged or grown by experts. Fortunately, most culinary varieties can be found dried and packaged from reliable sources.

To date, scientists have classified about 14,000 different species of mushrooms. That's obviously quite a lot — but it's estimated that there exist somewhere between 2 and 5 million species of fungi, most of them unknown and unstudied. It's exciting to explore a new horizon, especially when it might taste like maple syrup, or something even more curious. But sometimes, too, it's just as exciting to realize that horizon may be too vast to ever be fully explored. BYO

ALLAGASH®

Blazing its own trail for 25 Years

How a brewery in Maine changed the country's beer landscape

by Dave Clark

Ask any aficionado or craft beer historian to name America's most influential craft breweries and Allagash Brewing Company will be high on the list. This Portland, Maine craft brewing icon is celebrating its 25th anniversary in 2020, driven by the success of its wildly popular flagship offering, Allagash White, a classic Belgian-style witbier.

Despite the success and respect of its flagship, by no means is Allagash a one trick pony. This Belgian-inspired brewery that was founded in 1995 by visionary Rob Tod focuses on creating artistically balanced beers, regardless of the style. Besides the flagship White, Allagash is known for barrel aging and their cutting edge coolship brewing program that produces some of America's best Belgian-influenced lambic-style brews. But it all started with one man and an idea.

Photos courtesy of Allagash Brewing Co.

Rob Tod started Allagash Brewing Company in 1995 with the goal of giving consumers a unique experience with their very first offering, Allagash White. It's fair to say that most people weren't ready for it.

A BREWERY IS BORN

It was the early 1990s when Rob Tod began missing his East Coast roots after spending a few years living in Colorado. Relocating back east, Tod landed in Vermont and got a job working in a brewery. He had never brewed a batch of beer, nor did he have any aspirations to do so. He was simply looking for gainful employment. Otter Creek Brewing Co. in Middlebury became both his employer and his inspiration.

Naturally curious, the former geology major fell in love with everything he saw in the brewery. "I love to work with my hands, I love science, and I love the creative component of brewing," said Tod.

July 1 is an important date in Tod's life. Hired on July 1, 1993, he spent a year working at Otter Creek observing, asking questions, and learning. Exactly one year later, he began writing his own business plan. Wasting no time, Tod moved forward with his vision, including relocating to the Portland area. During that time, he came up with what he believed to be the perfect name for his brewery-in-planning: Allagash.

"Allagash is a wilderness region in the north of Maine," explained Tod. "Since I didn't think we'd ever sell beer outside of Maine, I wanted a name that resonated with Mainers. I thought Allagash had a nice ring to it, being a very important part of Maine's history and culture. I really felt it would resonate with the locals."

On July 1, 1995, exactly one year to the day after he began writing his business plan, Tod enjoyed his first commercial pour of Allagash White at the Great Lost Bear, a popular Portland bar.

AHEAD OF ITS TIME

Today, Allagash White sets the standard for the Belgian wit style in America. That success certainly did not happen overnight.

"I couldn't give away Allagash White for the first ten years," quipped Tod. When Allagash White hit the nascent craft beer market back in 1995, people just weren't sure what to make of this cloudy, spiced wheat beer that wasn't a hefeweizen.

Tod explained that he wasn't looking to follow a trend and be like everyone else. "Why should I make something people can already get? I wanted to give people a unique experience with beer. That's when I decided to make a white beer," he said. "I didn't look at it as being a visionary or as a niche, I looked at it purely from the perspective of people having an experience they have never had before," said Tod. (Read more about the ascent of Allagash White in the sidebar on page 49.)

ALLAGASH GAINS A BREWMASTER

Jason Perkins joined the Allagash team in January 1999. Originally from Vermont, Perkins went to college in Maine before relocating to Montana for a year. There, Perkins discovered homebrewing when he got a job at the small Missoula brewery KettleHouse, where Perkins also bought homebrewing supplies.

"I fell in love with brewing," said Perkins. "I moved back to Maine in 1998, working in a seasonal job near Portland at a place called Gritty McDuff's Brew Pub. I wanted to stay in brewing and started looking around."

Having taken courses from Siebel's

Jason Perkins joined Allagash as a part-time brewer in 1999. He's been a critical part in the brewery's growth ever since, and now oversees all brewing operations as the Brewmaster.

What started as a 15-barrel brewery Rob Tod welded together himself has grown to a state-of-the-art facility that produced 100,000 barrels of beer in 2019.

World Brewing Academy and the Master Brewers Association, Perkins was ready for his next big move. Knocking on doors brought him to Allagash. At the time, there were three employees: Tod and one full-time and one part-time brewer. Perkins was hired first as a part-timer, quickly earning full-time status before eventually ascending to Head Brewer.

More than 20 years later, Brewmaster Perkins oversees all aspects of the brewery, including heading up the coolship and barrel-aging programs. Additionally, he leads efforts with local farmers and growers to plan for crops years in advance and also leads efforts for company conservation and innovation initiatives.

BALANCED BEERS

By nature, Allagash brews beers that emphasize balance. "In everything we brew, our goal is to give consumers new flavor experiences through beer," said Perkins. While Allagash White leads the way, many of the brewery's other beers have caught the attention of fans, aficionados, and beer judges alike.

River Trip is a low-alcohol fan favorite and often what Tod can be found drinking when not consuming his beloved witbier. A hop-forward, Belgian-style session beer, River Trip employs Azacca® and Comet hops to produce notes of tropical fruit and grapefruit.

One of the brewery's newest offerings debuting in August 2020, North Sky is a silky Belgian-inspired stout. North Sky balances light notes of fruit and sweetness, reminiscent of date and raisin, with a subdued roast malt character that lets the yeast esters shine through. According to Allagash Brewer Patrick Chavanelle, "American and English stouts use a more neutral yeast for fermentation. The Belgian strain we use is far more expressive and the esters it produces integrate nicely with the other components of the beer."

Saison is Allagash's take on a traditional farmhouse-style ale. Northern Brewer, Bravo™, and Cascade hops sit atop a malt base consisting of 2-row barley, malted oats, rye, and an addition of Belgian candi sugar. Peppery spice notes emanate from the signature yeast strain to create a refreshing, dry, palate-cleansing sensation.

Nowaday Blonde, an ale fermented like a lager, is a brand new addition to the lineup. Combining Pilsner malt with Nugget, Hallertau, and Saaz hops, the Allagash house ale yeast is fermented at lower temperatures, including an additional lagering step, resulting in a crisp 5.5% ABV refresher of a beer with very low ester character.

Allagash Tripel, the beer with the complex taste made from simple ingredients, is also a fan favorite. Checking in at 9% ABV, this traditional tripel features 2-row base malt, Hallertau and Nugget hops fermented with house yeast to produce its award-winning combination of flavors. Tripel has twice won silver World Beer Cup medals and is a four-time medal winner at the Great American Beer Festival, including two golds.

Then there is the highly regarded Curieux, a barrel-aged version of Tripel. The beer is first barrel-aged for seven weeks, then blended with fresh Tripel producing smooth notes of vanilla, coconut, and a touch of Bourbon. This 10.4% monster of a beer took a bronze medal at the 2008 World Beer Cup.

THE COOLSHIP PROGRAM

After a trip of a lifetime with fellow brewing legends coined "The Brett Pack" (see sidebar on page 51), Tod was ready to try something new; something extremely cutting edge. Enter the coolship. Inspired by his trip to Belgium, specifically his visit to revered Brasserie Cantillon, Tod wanted to bring a little bit of Belgium to the United States. However,

Inspired by the lambic brewers of Belgium, Allagash was the first American brewery to install a coolship in 2007 to create spontaneously fermented beers. Built in a separate space, a fan draws cool evening air as well as native yeast and bacteria through the open windows to cool and inoculate the wort.

nobody really knew if what he had in mind would work.

"Jean Van Roy of Cantillon is our peer," said Tod. "We were talking about spontaneously fermented beers, specifically talking about the 'fact' that you can only brew these beers in the Senne Valley. Jean believed these beers could be brewed anywhere. That gave me the confidence to imagine I could do something similar in the States."

Tod and Perkins went to work on designing a cooling vessel that would incorporate the naturally-occurring microbiota of the brewery and its grounds. The pair hoped and believed these microbiota would be the basis for crafting their own take on Belgian-style lambic beers.

"We didn't know if it would work or not," said Perkins. "We referred to it as an experiment for at least two years."

Even prior to Tod's trip to Belgium, there was hope for spontaneous brewing at Allagash, even if that chance was discovered by accident. "We have our own house strain of *Brettanomyces*," said Perkins. "In 2004, we accidentally discovered a strain of *Brett* in one of our beers. Once we watched the behavior of what it did and the flavor and aroma of what it produced, we were excited. It produced very fruity flavors and aromas — especially pineapple, mango, and other tropical fruits." Knowing this wild yeast was naturally present gave Perkins and Tod reason to believe great potential existed in the realm of spontaneous beer brewing.

"Lots of components go into lambic beer production," said Perkins. "*Brett* is the key part. Lactic acid produces the acidity. Knowing we had this naturally-occurring strain, along with the encouragement from our Belgian brewing friends, gave us the confidence to move forward with this project."

The respect between the Belgian brewing community and the Belgian-influenced upstarts in Maine culminated with Allagash being the first American brewery ever invited to participate in the esteemed Night of the Great Thirst event, a biennial celebration of lambic beers held in Belgium. Allagash's participation in the 2010 event marked the introduction of its coolship-produced beers to the world.

Building the coolship took a lot of careful planning and strategic thinking. "We didn't want to put it in the main brewery. We tried to separate the process as much as possible from the regular *Saccharomyces* beers. There's a fan in the room that draws air from four windows across the coolship," said Tod. The ceiling of the coolship space is made from pine trees that had to be cleared from the property in which the brewery was built.

"When it comes to producing wort, a whole different approach is taken compared with traditional beer brewing," said Perkins. "We want to produce a wort composition — a feed source for the microbes — that's very different from a traditional beer. Fermentation speed is very slow. It's a 2–3 year fermentation process. For lambic beers, we're looking for longer-chain sugars and starches to provide long-term food for the *Brettanomyces*. There are multiple types of microorganisms that take part in spontaneous fermentation. *Brettanomyces* is the one that finishes off the complex fermentation, so it's important for there to be food leftover for it to consume."

"It starts out similar to normal beer fermentation, except that it happens with naturally occurring wild yeast — no actual yeast is added. Simple sugars in the wort are consumed first over the first 2–4 weeks. After that, lactic acid begins to create acid-

Allagash White: The Beer That Started It All

When you think about iconic, classic examples of specific styles from American breweries, some obvious choices come to mind. Sierra Nevada Pale Ale. Anchor Steam for California Commons. Heady Topper for New England IPAs. And Allagash White for Belgian-style witbiers. Five Great American Beer Festival medals (the fourth gold just announced in 2020) and five World Beer Cup awards will attest to the fact that Allagash White is the quintessential witbier brewed in America.

THE VISION

It was Rob Tod's encounter with Celis White that turned him on to the style around which he'd later build a brewery. Celis Brewery in Austin, Texas was the company created by former Hoegaarden Brewmaster Pierre Celis, often credited as the savior of the Belgian witbier style.

"I tried Celis White," said Tod. "After my first sip I thought, 'this is weird, I don't know if I like this.' I tried more, and by the third bottle I was fascinated by this beer. I loved it."

Typically when a new brewery opens, many different styles are available, giving patrons options. Breweries in the mid-1990s were making standard, predictable beers such as pale ales, ambers, and brown ales. Tod wasn't looking to be revolutionary, but he wanted to create something different. When he started Allagash in 1995, it was with a single beer — Allagash White. While that may seem brilliant in hindsight, in 1995 the average beer consumer was not familiar with the witbier style. That, and hazy beers were widely looked upon as being flawed. Tod strongly believed in his witbier and went "all-in," believing if he was meant to make it in the beer business, it would be with Allagash White.

"When planning what I would brew, I wanted to give people a unique experience with beer," said Tod. "That's when I decided to make a white beer. It was somewhat against the grain at the time. I knew I accomplished my goal when people reacted the way they did to it, saying things like 'what's wrong with this?' or 'I've never had anything like this before.' The downside was that it was so different that it did not sell for at least a decade. In fact, I couldn't give it away for the first ten years."

While saying he "couldn't give it away" might be somewhat of an overstatement, the fact was the beer was not selling at the pace needed to sustain a brewery, long term.

"It wasn't that nobody liked the beer," said Tod. "Often, once people gave it a try, they really liked it. The struggle was more about the awareness of the witbier as a style. It was hazy and had spices where the average beer of the time was a clear lager or pale ale. So we had to do a lot of scrambling to increase our volume in any way we could. I was traveling all of the time, visiting as many bars as possible in all of the states where we were distributed. We were distributing to a bunch of places, many more states than we're distributed to right now, actually. We were stretched really thin and just barely hanging on, but luckily we stuck it out until the craft beer environment started to change."

CRAFTING A MASTERPIECE

Allagash White is not an easy beer to brew, due to the delicate balance needed to achieve the beer's complexity. Two-row malted barley, pale malt, red wheat, oats, and unmalted white wheat make up the grain bill, much of which is grown and processed within the state of Maine. Nugget, Crystal, and Czech Saaz round out the hop bill. Coriander and Curaçao orange peel deliver the authentic flavor profile expected for a true, traditional Belgian-style witbier. Using any other type of orange peel will alter the character of the beer beyond traditional style guidelines. Allagash's Belgian house yeast complements the lineup of ingredients that deliver a symphony of flavor without any single component standing out and taking center stage.

According to Brewmaster Jason Perkins, crafting a moderately hazy beer is actually quite challenging. "It's relatively easy to make a clear beer, and it's relatively easy to make a really hazy beer," said Perkins. "But crafting a predictable, consistent beer with stable haze is a challenge since multiple components go into creating that haze, such as yeast, polyphenols, and proteins. You have to achieve the perfect balance for it to work."

Tod stresses that balance is the key to success when crafting his popular White beer. "When you drink the beer, you shouldn't be able to quickly and easily identify the ingredients in the beer," said Tod. "There should be a spicy character, but not so much that any one specific ingredient stands out. You want subtlety. So much of the character comes from the Belgian yeast strain. To achieve the end result, you need the right amount of oxygen and a perfect temperature curve during the fermentation process."

After all this time, you'd think Tod would want to change it up a bit, but that's simply not the case. Allagash White is, and always has been, his "go-to" choice when he's looking for a refreshing beer. "Not being able to pick out any individual ingredient is key," said Tod. "I'll discover a new flavor even 25 years after having my first one! The complexity is so important because it keeps you guessing."

ity. Finally, *Brettanomyces* finishes it off, fermenting sugars that normal *Saccharomyces* yeast can't consume. We use a turbid mash made up of barley and 40% malted wheat, trying to extract as much as we can from that grain," explained Perkins.

The wort is produced in the evening and it cools overnight for about 18 hours until it reaches its ideal temperature of around 65 °F (18 °C). This is best accomplished when the outside temperature falls in the range of 28 to 37 °F (-2° to +3 °C). Throughout the night, airflow cools and inoculates the wort. Once the ideal temperature is achieved, the wort is mixed in a vessel known as a "horny tank" to ensure the inoculation reaches all parts of the wort. It's mixed for just a few minutes before being sent into previously used wine barrels. The intent is not to barrel age or pick up heavy barrel character, the barrels are used simply as long-term fermentation vessels.

"After mixing, the rest of the life of the beer is in barrels, 1–3 years, most being over two years," said Perkins. "We're relying on those barrels to be a home for the microbes to be happy. The barrels allow for some micro oxygenation."

Another key differentiator of spontaneous brewing is the cleaning process. "We don't use chemicals," said Tod. "We manually clean everything with water. You get a natural population of bacteria and wild yeast wanted for the fermentation. We don't want to change the balance."

Conservation/Green efforts

When it comes to finding ways to reuse, repurpose, and recycle, Allagash walks the walk. The initiatives are endless and are baked into the DNA of every employee of the company. Finding ways to be environmentally friendly is never considered burdensome, instead it's seen as an opportunity. Some of the countless efforts employed to help the environment include:

- Finding new homes for used materials, which results in keeping 99% of waste out of landfills.
- Repurposing spent grain with local farmers to be used as cattle feed.
- Installing a solar array on top of the brewery to reduce energy needs.
- Creating a designated "green team" constantly looking for ways to be more environmentally friendly.
- Using motion sensing LED lights throughout the brewery.
- Collecting used corks, which are sent to ReCORK to turn into sandals and yoga blocks.
- Collecting wire cages from Allagash bottles to be specially recycled.
- Reusing all packaging materials from bubble wrap to packaging peanuts and air pillows.
- Being a founding member of the Glass Recycling Coalition — a group of companies dedicated to improving the recycling and sustainability of all kinds of glass.
- Finding ways to use less water per barrel for brewing and cleaning in the brewery.
- Donating money to Sebago Clean Water Organization with the purpose of keeping the brewery's water source clean and pure for years to come.

THE FOUR STAPLES

Malt

Like any brewery, the key to Allagash's success lies within the four main ingredients of beer: Malt, hops, water, and yeast. When it comes to malt, the story of Allagash lies in its commitment to sourcing as much locally grown and produced grain as possible. In fact, the company's mission is to be able to use one million pounds (450,000 kg) of locally grown and processed Maine grain in the coming years.

"It's a 5-year goal that we hatched in 2016," said Tod. "We've been working closely with local farmers and grain processors. We were on track to reach our goal until COVID hit, yet even with the pandemic, we expect to reach our goal no later than 2022. Jason is very technically savvy when it comes to grain and malt specs. He works with the farmers on the specs we need to make quality and consistent beer."

"Occasionally we run into issues, which helps inform us. We look at the specs and figure out what went wrong. Over 25 years of doing this, we have a pretty expansive set of specs that we need from our suppliers. The right farmer can fit those specs. No one really thought of Maine as a place for producing brewing quality wheat or barley — including me — but working together, it has become a reality."

Hops

Despite the fact that Allagash doesn't make many "hop-forward" beers, hops are still a very important part of the overall picture. Careful attention is taken to choose hops that aren't assertive, but instead meld with the other flavors in the beer, especially the yeast esters. To that end, Perkins and his team tend to favor more subtle, balanced hops like Saaz and Hallertau.

"When we do make hoppier beers, like River Trip, we make sure to not be too heavy handed, so that the hops are not overpowering," said Perkins.

In the case of the lambic-style beers, the goal is to use aged hops that retain very little of their bittering capabilities but do retain their antioxidant properties needed to produce great lambic-style ales.

Yeast

While many breweries rely on just one or two house strains of yeast, that's not the case at Allagash. Besides the house strain that produces the popular Allagash White, the proprietary *Brettanomyces* strain, and a strain used specifically for bottle conditioning, several different yeasts are employed depending on the style of beer being produced.

The Brett Pack

Inspiration can come from just about anywhere. In the case of Allagash Founder Rob Tod, his inspired moment came during a visit with a group of friends who also happen to be craft beer brewing legends.

Nicknamed "The Brett Pack" due to their love and admiration of all things *Brettanomyces*, this group of five brewery owners assembled to visit the holy land of wild yeast brewing — the Senne Valley of Belgium. Already leading the charge of American craft brewing, Rob Tod (Allagash), Tomme Arthur (Lost Abbey), Adam Avery (Avery Brewing), Vinny Cilurzo (Russian River) and pack leader and trip organizer Sam Calagione (Dogfish Head) set out for Belgium in November 2006 to see what they could learn and bring back to America.

While today these five are considered brewing royalty to many, at the time they weren't exactly flush with big travel budgets.

"Adam and I were roommates on the trip," said Tod. "We were sleeping on these cheap foam mattresses with beds about four inches apart. We stayed in small, smelly rooms that went for about $25–$30 per night. Despite that, we had a blast! It was cool of Sam to organize this trip. Because of it, we all formed a long-term bond we probably wouldn't have formed otherwise."

Visiting several Belgian breweries, the group set its sights on Brasserie Cantillon, renowned for its expertise in crafting some of the world's finest spontaneously fermented lambic ales. Here the group connected with Brewmaster Jean Van Roy who would support Tod's vision of bringing true Belgian-style lambic brewing to the United States.

At the time, it was widely believed that brewing lambic-style beers could only occur in Belgium's Senne Valley near Brussels. Centuries of tradition supported that theory, however Van Roy challenged that concept and convinced the American brewing contingent that this type of brewing could occur elsewhere. Realizing that Portland, Maine and Brussels, Belgium had some overlapping climatic similarities, a light went off in Tod's mind, inspiring the idea that brewing lambic-style beers in America may actually be possible.

According to DownEast.com, Dogfish Head's Sam Calagione said this about the group's visit to Cantillon. "Rob and I climbed the stairs to the attic at Brasserie Cantillon — where they keep their coolship, the vat where the beer gets spontaneously colonized by yeasts and bacteria in the environment. We were sitting there with the roof slits open, the night air coming in, the steam coming off the (wort). We were just quiet for a second, and then Rob turned to me and said, 'You know what, Sam? I'm going to build a coolship in Maine.' That was a great moment that I'll never forget."

It took over a year before the idea of building a coolship went from concept to reality. "I went from 'we can do this' to 'no way we can' due to worry about potential cross-contamination," said Tod. The adventurous side won out, and brewing commenced in December 2007.

Not only was the Belgium trip inspirational and informational, it created a connection with many of Belgium's best brewing minds, helping Tod launch his Belgian-inspired brewing system in Maine.

"Our Belgian friends encouraged us to experiment," said Perkins. "They monitored our progress. They wanted to sample our work as we were developing the beers."

An important distinction at Allagash is that they never use the specific Belgian terms such as lambic, gueuze, framboise or kriek; they use "Belgian-style" instead.

"We know Belgian brewers are proud," said Perkins. "Sure, there may have been some apprehension from our Belgian counterparts when we started down this path, but I think the way we approached it with respect to their craft made it easier for them to be supportive of our efforts."

The coolship has produced some of Allagash's most revered brews. Resurgam is a 1-, 2- and 3-year lambic blend made in the gueuze-style. Coolship Balaton is a spontaneously fermented beer aged on cherries. A similarly crafted beer with raspberries is called Coolship Red.

That trip to Belgium with The Brett Pack resulted in other spontaneous beers from other parts of the country too. "Ultimately the most awesome part of the trip was agreeing to collaborate on a spontaneously fermented beer when we got home," said Tomme Arthur of San Diego's Lost Abbey. "Isabelle Proximus came out of that and it was an incredible experience that we were able to steward here at our brewery. My favorite part of that collaboration was reading on *Beer Advocate* that the five of us would never be able to all agree on something to brew. Then we collaborated and created this stunning batch of beer. That is a legacy that I am always going to be proud of."

Photo courtesy of Tomme Arthur

Rob Tod (Allagash), Adam Avery (Avery Brewing), Tomme Arthur (Lost Abbey), Vinny Cilurzo (Russian River), and Sam Calagione (Dogfish Head) became dubbed The Brett Pack after a trip to Belgium, which was the inspiration to numerous beers each brewery has released as well as the creation of a coolship program at Allagash.

Allagash Recipes

ALLAGASH BREWING CO.'S ALLAGASH WHITE CLONE

(5 gallons/19 L, all-grain)
OG = 1.049 FG = 1.010
IBU = 20 SRM = 3 ABV = 5.2%

One of America's most awarded Belgian-style witbiers, Allagash White features coriander and Curaçao orange peel that delivers a refreshing balance of citrus and spice.

INGREDIENTS

5.5 lbs. (2.5 kg) 2-row pale malt
2 lbs. (0.91 kg) malted red wheat
2 lbs. (0.91 kg) raw white wheat
0.3 lb. (0.14 kg) dextrin malt
0.5 lb. (0.23 kg) flaked oats
3.9 AAU Nugget hops (60 min.) (0.3 oz./8.5 g at 13% alpha acids)
4.1 AAU Crystal hops (10 min.) (1.25 oz./35 g at 3.3% alpha acids)
0.75 oz. (21 g) Czech Saaz hops (0 min.)
0.25 oz. (7 g) Curaçao orange peel (0 min.)
0.5 oz. (14 g) coriander, crushed (0 min.)
Wyeast 3463 (Forbidden Fruit), White Labs WLP400 (Belgian Wit Ale), Imperial Yeast B44 (Whiteout), or SafAle K-97 yeast
⅞ cup corn sugar (if priming)

STEP BY STEP

Heat 15.5 qts. (14.6 L) of strike water to 165 °F (74 °C). Mix with grains. The mash should stabilize at about 152 °F (67 °C). Hold at this temperature for 60 minutes, then raise temperature to mash out at about 168 °F (76 °C), either by infusion of boiling water, decoction, or other means. Vorlauf until wort runs clear then begin the sparge process. Collect 7 gallons (26.5 L) and bring to a boil. Total boil time is 75 minutes, adding hops as indicated. After boil is complete, turn off the heat, add the final hop addition along with the coriander and orange peel bagged (it helps to bag the coriander and orange peel) and give a long stir to create a whirlpool. After 15 minutes remove the spice bag.

Chill the wort to 65 °F (18 °C). There should be about 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a temperature-stable place in the 68–72 °F (20–22 °C) range. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.7 v/v.

ALLAGASH BREWING CO.'S ALLAGASH WHITE CLONE

(5 gallons/19 L, partial mash)
OG = 1.049 FG = 1.010
IBU = 20 SRM = 2.5 ABV = 5.2%

INGREDIENTS

3.3 lbs. (1.5 kg) extra light dried malt extract
2 lbs. (0.91 kg) malted red wheat
2 lbs. (0.91 kg) raw white wheat
0.3 lb. (0.14 kg) dextrin malt
0.5 lb. (0.23 kg) flaked oats
3.9 AAU Nugget hops (60 min.) (0.3 oz./8.5 g at 13% alpha acids)
4.1 AAU Crystal hops (10 min.) (1.25 oz./35 g at 3.3% alpha acids)
0.75 oz. (21 g) Czech Saaz hops (0 min.)
0.25 oz. (7 g) Curaçao orange peel (0 min.)
0.5 oz. (14 g) coriander, crushed (0 min.)
Wyeast 3463 (Forbidden Fruit), White Labs WLP400 (Belgian Wit Ale), Imperial Yeast B44 (Whiteout), or SafAle K-97 yeast
⅞ cup corn sugar (if priming)

STEP BY STEP

Put all the grains in a steeping bag, then heat 2 gallons (7.6 L) of water to 159 °F (71 °C). Add the grain bag. The target mash temperature is 152 °F (67 °C). Hold at this temperature for 60 minutes. Rinse the grain bag with 170 °F (77 °C) water to top up to 7 gallons (26.5 L), remove bag, then boil. (If your brew kettle doesn't allow for that large of a volume, rinse the grain bag with another gallon/4 L of water, remove bag, then raise to a boil.) When boil is achieved, take the kettle off the flame and slowly add the extract while stirring. Return to heat source and boil for 60 minutes, adding hops as indicated. After boil is complete, turn off the heat, add the final hop addition along with the coriander and orange peel bagged (it helps to bag the coriander and orange peel) and give a long stir to create a whirlpool. After 15 minutes remove the spice bag.

Chill the wort to 65 °F (18 °C). If you brewed a smaller volume, top off fermenter with pre-chilled water. In either case, the goal is to collect 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a temperature-stable place in the 68–72 °F (20–22 °C) range. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.7 v/v.

ALLAGASH BREWING CO.'S RIVER TRIP CLONE

(5 gallons/19 L, all-grain)
OG = 1.040 FG = 1.004
IBU = 40 SRM = 2.5 ABV = 4.8%

Good for any adventure, River Trip is a low-ABV, Belgian-style table beer with hop-forward grapefruit and stone fruit notes.

INGREDIENTS

6.5 lbs. (3 kg) 2-row pale malt
1 lb. (0.45 kg) Munich malt (10 °L)
1 lb. (0.45 kg) flaked oats
6.5 AAU Nugget hops (60 min.) (0.5 oz./14 g at 13% alpha acids)
8.3 AAU Cascade hops (15 min.) (1.5 oz./43 g at 5.5% alpha acids)
1.5 oz. (43 g) Comet hops (0 min.)
1.5 oz. (43 g) Azacca® hops (0 min.)
1.5 oz. (43 g) Comet hops (dry hop)
1.5 oz. (43 g) Azacca® hops (dry hop)
0.25 oz. (7 g) coriander (0 min.)
Wyeast 3463 (Forbidden Fruit), White Labs WLP400 (Belgian Wit Ale), Imperial Yeast B44 (Whiteout), or SafAle K-97 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Heat 12.7 qts. (12 L) of strike water to 162 °F (72 °C). Mix with grains. The mash should stabilize at about 149 °F (65 °C). Hold at this temperature for 60 minutes, then raise temperature to mash out at about 168 °F (76 °C), either by infusion of boiling water, decoction, or other means. Vorlauf until wort runs clear then begin the sparge process. Collect 6.5 gallons (24.6 L) and bring to a boil. Total boil time is 60 minutes, adding hops as indicated. After boil is complete, turn off the heat, add the whirlpool additions (with the coriander bagged) and give a long stir to create a whirlpool. Steep for 10 minutes and remove coriander. Rest for an additional 10 minutes.

Chill the wort to 68 °F (20 °C). If you end up with a smaller volume, top off fermenter with pre-chilled water. The goal is to collect 5.5 gallons (21 L) of wort in the fermenter. Add yeast and aerate wort if using a liquid yeast strain. Place your fermenter in a temperature-stable place in the 70–74 °F (21–23 °C) range. Add the dry hops on day four of fermentation directly into the fermenter. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.55 v/v.

ALLAGASH BREWING CO.'S RIVER TRIP CLONE

(5 gallons/19 L, partial mash)
OG = 1.040 FG = 1.004
IBU = 40 SRM = 5 ABV = 4.8%

INGREDIENTS

4 lbs. (1.8 kg) extra light dried malt extract
1 lb. (0.45 kg) Munich malt (10 °L)
1 lb. (0.45 kg) flaked oats
6.5 AAU Nugget hops (60 min.) (0.5 oz./14 g at 13% alpha acids)
8.3 AAU Cascade hops (15 min.) (1.5 oz./43 g at 5.5% alpha acids)
1.5 oz. (43 g) Comet hops (0 min.)
1.5 oz. (43 g) Azacca® hops (0 min.)
1.5 oz. (43 g) Comet hops (dry hop)
1.5 oz. (43 g) Azacca® hops (dry hop)
0.25 oz. (7 g) coriander (0 min.)
Wyeast 3463 (Forbidden Fruit), White Labs WLP400 (Belgian Wit Ale), Imperial Yeast B44 (Whiteout), or SafAle K-97 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Heat 2 gallons (7.6 L) of water to 157 °F (69 °C). Using a steeping bag, insert the Munich malt and flaked oats. The goal is to achieve a mash temperature of 149 °F (65 °C). Mash for at least 60 minutes or until converted. Rinse the grain bag with 170 °F (77 °C) water to top up to 6.5 gallons (24.6 L), remove bag, then boil. (If your brew kettle doesn't allow for that large of a volume, rinse the grain bag with another gallon/4 L of water, remove bag, then raise to a boil.) When boil is achieved, take the kettle off the flame and slowly add the extract while stirring. Return to heat source and boil for 60 minutes, adding hops as indicated. After boil is complete, turn off the heat, add the whirlpool additions (with the coriander bagged) and give a long stir to create a whirlpool. Steep for 10 minutes and remove coriander. Rest for an additional 10 minutes.

Chill the wort to 68 °F (20 °C). If you brewed a smaller volume, top off fermenter with pre-chilled water. In either case, the goal is to collect 5.5 gallons (21 L) of wort. Add yeast and aerate wort aerate wort if using liquid yeast. Place your fermenter in a temperature-stable place in the 70–74 °F (21–23 °C) range. Add the dry hops on day four of fermentation directly into the fermenter. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.55 v/v.

Allagash Recipes

ALLAGASH BREWING CO.'S NORTH SKY STOUT CLONE

(5 gallons/19 L, all-grain)
OG = 1.073 FG = 1.016
IBU = 45 SRM = 32 ABV = 7.5%

A silky Belgian-inspired stout, North Sky balances light notes of fruit and sweetness with a subdued roast malt character that lets the yeast esters shine.

INGREDIENTS

11.5 lbs. (5.2 kg) 2-row pale malt
1 lb. (0.45 kg) flaked oats
0.3 lb. (136 g) caramel malt (120 °L)
0.5 lb. (227 g) Caramunich® malt (57 °L)
0.5 lb. (227 g) torrified wheat
0.75 lb. (0.34 kg) chocolate malt (350 °L)
0.1 lb. (45 g) Briess Midnight Wheat malt (550 °L)
0.1 lb. (45 g) roasted barley (300 °L)
0.3 lb. (136 g) dextrose sugar (30 min.)
8 AAU Northern Brewer hops (60 min.) (1 oz./28 g at 8% alpha acids)
5.5 AAU Cascade hops (10 min.) (1 oz./28 g at 5.5% alpha acids)
1.25 oz. (35 g) Cascade hops (0 min.)
Wyeast 3787 (Trappist High Gravity), White Labs WLP500 (Monastery Ale), Imperial Yeast B48 (Triple Double), or Fermentis BE-256 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Keep the light and dark grains separate. Heat 20.7 qts. (19.6 L) of strike water to 166 °F (74 °C). Mix with pale malt, oats, and wheat. The mash should stabilize at about 153 °F (67 °C). Hold at this temperature for 60 minutes, then add the crystal and roasted malts. Mix until homogenized. Begin lautering by raising temperature to mash out at about 168 °F (76 °C), either by infusion of boiling water, decoction, or other means. Vorlauf until wort runs clear then begin the sparge process. Collect 7 gallons (26.5 L) and bring to a boil. Total boil time is 75 minutes, adding hop additions as indicated.

After boil is complete, turn off the heat, add whirlpool addition and give a long stir to create a whirlpool. Rest for 15 minutes.

Chill the wort to 68 °F (20 °C). There should be about 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a temperature-stable place in the 70–74 °F (21–23 °C) range. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.65 v/v.

ALLAGASH BREWING CO.'S NORTH SKY STOUT CLONE

(5 gallons/19 L, partial mash)
OG = 1.073 FG = 1.016
IBU = 45 SRM = 32 ABV = 7.5%

INGREDIENTS

6.25 lbs. (2.8 kg) extra light dried malt extract
1.5 lbs. (0.68 kg) 2-row pale malt
1 lb. (0.45 kg) flaked oats
0.3 lb. (136 g) caramel malt (120 °L)
0.5 lb. (227 g) Caramunich® malt (57 °L)
0.5 lb. (227 g) torrified wheat
0.75 lb. (0.34 kg) chocolate malt (350 °L)
0.1 lb. (45 g) Briess Midnight Wheat malt (550 °L)
0.1 lb. (45 g) roasted barley (300 °L)
0.3 lb. (136 g) dextrose sugar (30 min.)
8 AAU Northern Brewer hops (60 min.) (1 oz./28 g at 8% alpha acids)
5.5 AAU Cascade hops (10 min.) (1 oz./28 g at 5.5% alpha acids)
1.25 oz. (35 g) Cascade hops (0 min.)
Wyeast 3787 (Trappist High Gravity), White Labs WLP500 (Monastery Ale), Imperial Yeast B48 (Triple Double), or Fermentis BE-256 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Keeping the pale malt, oats and wheat in one steeping bag and the crystal and roasted grains in another, heat 2 gallons (7.6 L) of water to about 160 °F (71 °C) to achieve a mash temperature of 153 °F (67 °C) once you add the steeping bag with the pale malt, oats, and wheat. Mash for 45–60 minutes, until converted. Once mash is complete, add the dark and crystal steeping bag and steep for 10 minutes. Rinse the grain bags with 170 °F (77 °C) water to top up to 7 gallons (26.5 L), remove the bags, then boil. (If your brew kettle doesn't allow for that large of a volume, rinse the grain bags with another gallon/4 L of water, remove bags, then raise to a boil.) When boil is achieved, take the kettle off the flame and slowly add the extract while stirring. Return to the heat source and boil for 75 minutes, adding hops and corn sugar as indicated.

After boil is complete, turn off the heat, add whirlpool addition and give a long stir to create a whirlpool. Rest for 15 minutes.

Chill the wort to 68 °F (20 °C). If you brewed a smaller volume, top off fermenter with pre-chilled water. In either case, the goal is to collect 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a temperature-stable place in the 70–74 °F (21–23 °C) range. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.65 v/v.

ALLAGASH BREWING CO.'S SAISON CLONE

(5 gallons/19 L, all-grain)
OG = 1.046 FG = 1.000
IBU = 30 SRM = 8 ABV = 6.1%

Allagash's interpretation of a classic Belgian farmhouse-style ale. Saison is spicy, light, and super drinkable, featuring yeast-derived light peppery notes.

INGREDIENTS

7 lbs. (3.2 kg) 2-row pale malt
1.5 lbs. (0.68 kg) rye malt
0.75 lb. (0.34 kg) flaked oats
0.5 lb. (0.23 kg) dark rock candi sugar (30 min.)
2 AAU Northern Brewer hops (60 min.) (0.25 oz./7 g at 8% alpha acids)
11 AAU Bravo™ hops (15 min.) (0.75 oz./21 g at 14.6% alpha acids)
0.5 oz. (14 g) Bravo™ hops (0 min.)
0.5 oz. (14 g) Cascade hops (0 min.)
Wyeast 3711 (French Saison), White Labs WLP590 (French Saison), Imperial Yeast B62 (Napoleon), or LalBrew Belle Saison yeast
⅞ cup corn sugar (if priming)

STEP BY STEP

Heat 13.9 qts. (13.1 L) of strike water to 162 °F (72 °C) and mix with grains. The mash should stabilize at about 149 °F (65 °C). Hold at this temperature for 60 minutes, then raise temperature to mash out at about 168 °F (76 °C), either by infusion of boiling water, decoction, or other means. Vorlauf until wort runs clear then begin the sparge process. Collect 7 gallons (26.5 L) and bring to a boil. Total boil time is 75 minutes, adding additions as indicated. After boil is complete, turn off the heat, add final hop addition, and give a long stir to create a whirlpool. Rest for 15 minutes.

Chill the wort to 75 °F (23 °C). There should be about 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a warm place in the 80–90 °F (26–32 °C) range. Allow to ferment for four weeks, or until a stable gravity is reached. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.8 v/v.

ALLAGASH BREWING CO.'S SAISON CLONE

(5 gallons/19 L, partial mash)
OG = 1.046 FG = 1.000
IBU = 30 SRM = 8 ABV = 6.1%

INGREDIENTS

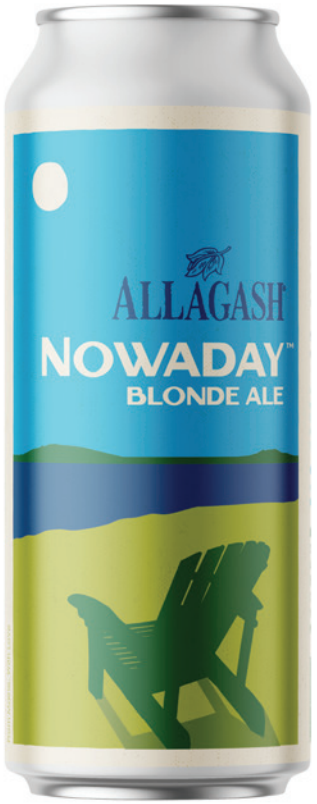
4.25 lbs. (1.9 kg) extra light dried malt extract
1.5 lbs. (0.68 kg) rye malt
0.75 lb. (0.34 kg) flaked oats
0.5 lb. (0.23 kg) dark rock candi sugar (30 min.)
2 AAU Northern Brewer hops (60 min.) (0.25 oz./7 g at 8% alpha acids)
11 AAU Bravo™ hops (15 min.) (0.75 oz./21 g at 14.6% alpha acids)
0.5 oz. (14 g) Bravo™ hops (0 min.)
0.5 oz. (14 g) Cascade hops (0 min.)
Wyeast 3711 (French Saison), White Labs WLP590 (French Saison), Imperial Yeast B62 (Napoleon), or LalBrew Belle Saison yeast
⅞ cup corn sugar (if priming)

STEP BY STEP

Heat 2 gallons (7.6 L) of water to 157 °F (69° C) and add the rye malt and flaked oats in a steeping bag. The goal is to achieve a mash temperature of 149 °F (65 °C). Mash for 60 minutes. Rinse the grain bag with 170 °F (77 °C) water to top up to 6.5 gallons (24.6 L), remove bag, then boil. (If your brew kettle doesn't allow for that large of a volume, rinse the grain bag with another gallon/4 L of water, remove bag, then raise to a boil.) When boil is achieved, take the kettle off the flame and slowly add the extract while stirring. Return to the heat source and boil for 60 minutes, adding hops as indicated. After boil is complete, turn off the heat, add final hop addition, and give a long stir to create a whirlpool. Rest for 15 minutes.

Chill the wort to 75 °F (23 °C). If you brewed a smaller volume, top off fermenter with pre-chilled water. In either case, the goal is to collect 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a warm place in the 80–90 °F (26–32 °C) range. Allow to ferment for four weeks, or until a stable gravity is reached. Bottle or keg after fermentation is complete, targeting a carbonation level of 2.8 v/v.

Allagash Recipes



ALLAGASH BREWING CO.'S NOWADAY BLONDE ALE CLONE

(5 gallons/19 L, all-grain)
OG = 1.051 FG = 1.010
IBU = 25 SRM = 4 ABV = 5.5%

A blonde ale fermented like a lager. Nowaday is fermented at lower temperatures, including an additional lagering step, resulting in a crisp 5.5% ABV refresher of a beer with very low ester character.

INGREDIENTS

9.5 lbs. (4.3 kg) Pilsner malt
1 lb. (0.45 kg) caramel malt (10 °L)
4.3 AAU Nugget hops (60 min.) (0.33 oz./9 g at 13% alpha acids)
5.4 AAU Hallertau Mittelfrüh hops (10 min.) (1.25 oz./35 g at 4.3% alpha acids)
2 oz. (57 g) Hallertau Mittelfrüh hops (0 min.)
1 oz. (28 g) Czech Saaz hops (0 min.)
Wyeast 3463 (Forbidden Fruit), White Labs WLP400 (Belgian Wit Ale), Imperial Yeast B44 (Whiteout), or SafAle K-97 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Heat 15.8 qts. (14.9 L) of strike water to 162 °F (72 °C) and mix with grains. The mash should stabilize at about 149 °F (65 °C). Hold at this temperature for 60 minutes, then raise temperature to mash out at about 168 °F (76 °C), either by infusion of boiling water, decoction, or other means. Vorlauf until wort runs clear then begin the sparge process. Collect 7 gallons (26.5 L) and bring to a boil. Total boil time is 75 minutes, adding additions as indicated. After boil is complete turn off the heat, add whirlpool hops, and give a long stir to create a whirlpool. Rest for 15 minutes.

Chill the wort to 50 °F (10 °C). There should be about 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a cool place in the 50–55 °F (10–12 °C) range. On day five, conduct a diacetyl rest by raising the temperature to around 70 °F (21 °C) for a couple of days.

Once terminal gravity has been reached place the beer in a refrigerator or cold fermentation chamber to get the beer as cold as possible without freezing. Allow at least one week for the lagering period. Bottle or keg after lagering is complete, targeting a carbonation level of 2.55 v/v.

ALLAGASH BREWING CO.'S NOWADAY BLONDE ALE CLONE

(5 gallons/19 L, extract with grains)
OG = 1.051 FG = 1.010
IBU = 25 SRM = 4.5 ABV = 5.5%

INGREDIENTS

5.75 lbs. (3 kg) Pilsen dried malt extract
1 lb. (0.45 kg) caramel malt (10 °L)
4.3 AAU Nugget hops (60 min.) (0.33 oz./9 g at 13% alpha acids)
5.4 AAU Hallertau Mittelfrüh hops (10 min.) (1.25 oz./35 g at 4.3% alpha acids)
2 oz. (57 g) Hallertau Mittelfrüh hops (0 min.)
1 oz. (28 g) Czech Saaz hops (0 min.)
Wyeast 3463 (Forbidden Fruit), White Labs WLP400 (Belgian Wit Ale), Imperial Yeast B44 (Whiteout), or SafAle K-97 yeast
¾ cup corn sugar (if priming)

STEP BY STEP

Place caramel malt into a steeping bag and submerge in 2.5 gallons (9.5 L) of water at or near 155 °F (68 °C). (Reaching an exact, specific temperature is not required as there is no enzymatic conversion happening in this recipe. Just make sure it doesn't exceed 170 °F/77 °C while steeping to avoid tannin extraction.) After 10 minutes of steeping, rinse the grain bag with 170 °F (77°C) water to top up to 6.5 gallons (24.6 L), remove bag, then boil. (If your brew kettle doesn't allow for that large of a volume, rinse the grain bag with another gallon/4 L of water, remove bag, then raise to a boil.) When boil is achieved, take the kettle off the flame and slowly add the extract while stirring. Return to the heat source and boil for 60 minutes, adding the hops as indicated. After boil is complete turn off the heat, add whirlpool hops, and give a long stir to create a whirlpool. Rest for 15 minutes.

Chill the wort to 50 °F (10 °C). If you brewed a smaller volume, top off fermenter with pre-chilled water. In either case, the goal is to collect 5.5 gallons (21 L) of wort in your fermenter. Add yeast and aerate wort if using liquid yeast. Place your fermenter in a cool place in the 50–55 °F (10–12 °C) range. On day five, conduct a diacetyl rest by raising the temperature to around 70 °F (21 °C) for a couple of days.

Once terminal gravity has been reached place the beer in a refrigerator or cold fermentation chamber to get the beer as cold as possible without freezing. Allow at least one week for the lagering period. Bottle or keg after lagering is complete, targeting a carbonation level of 2.55 v/v.

"Yeast is an incredibly important component of what we do here," said Perkins. "We have multiple strains in use at the same time. Yeast is a very important flavor driver. We pick yeasts that have assertive qualities. We often select a yeast strain that will shine and be the star of the show. At any given time, we'll have 4–5 different strains working at a time. In a year, we'll employ between 15 and 20 unique strains."

Water

It can be argued that water is the most important part of any beer, considering it makes up over 90% of a beer's composition. That's certainly the case at Allagash. Water comes from nearby Lake Sebago, one of the purest public water sources in America. It's a protected lake, as are its tributaries, keeping the lake clean and pure, ensuring a fantastic brewing experience.

"It does not require secondary treatment for public consumption, which is rare," said Perkins. "It's just so pure. Also key is how well protected the watershed is around Lake Sebago. The forest area and the tributaries are also very pure. The water that comes into the lake is naturally filtered from the watershed. Portland Water District does a great job of monitoring the water. It's a great water source for brewing, requiring only minor adjustments for brewing purposes. For example, we add some calcium to River Trip to accentuate hoppiness. But that's about it."

B Corp Certification

At Allagash, work-life balance has always been a cornerstone on which the company was built. The brewery has been voted one of the Best Places to Work in Maine for seven years running, thanks to a generous benefit plan that involves volunteer time off, a trip to Belgium after five years of employment, post-shift beers, and more. Being a B Corp gives Allagash specific structure to continue to improve the lives of its employees long into the future.

The company even provides a pilot brewing system available to anyone that works for the company, regardless of position. Beers brewed on the system are judged and the best of the best get put into production. Initiatives such as these expand the innovation footprint exponentially, giving the brewery so many more opportunities to create and develop its next great beer, all to the delight of the brewery's devoted followers.

When 70% of its business sales fell off due to shutdowns caused by the coronavirus Allagash quickly ramped up the use of its canning line that was installed in 2018.

AND THEN, 2020 HAPPENED

Rob Tod continued to build his business with his trusty Allagash White leading the way, most of which was sold on draft. In 2019, the brewery produced a total of 100,000 barrels of beer, 70,000 of which was sold on premise to bars and restaurants (65,000 of which were sold in kegs). Having a devoted draft following is a great way to build a business, at least until a pandemic hits.

"Seventy percent of our sales was draft and that all came to a crashing halt on March 16, 2020 due to the pandemic," said Tod.

Thankfully, the brewery was one year into a four-year plan to grow its off-premise market, having just expanded substantially including installing a state-of-the-art canning line. After assessing the damage caused by distributors canceling their draft orders en masse, the team pivoted and put its efforts behind getting cans into its markets.

It wasn't just the brewery that had to pivot after the pandemic. So did Tod who, personally, was an early victim of COVID-19.

"I had just flown back from Colorado," said Tod. "Just as a precaution, I planned to quarantine after that trip, just in case. I got sick during my first night of standard quarantining. I took it really seriously so I didn't see anyone for two weeks."

Yet, as a brewery owner facing a 70% overnight reduction in orders, Tod couldn't just relax, he had to keep working, albeit from home in isolation. He worked 12-hour days while sick with COVID-19.

"When a business you've had for 25 years loses 70% of its volume almost overnight, you just go," said Tod of how he managed everything.

After a tough April and May, the ship settled. Allagash is running on all cylinders, thanks in part to the new canning line and, not to be understated, from having its founder back to full health leading the charge.

Photo by Shutterstock.com

CASK ALE

by Ben Martin

Serving British ales the way they were intended

Today, we are used to having ice cold, crystal clear, fizzy beer dispensed from a pressurized keg on demand, whether in a bar or at home. But not that long ago, most of the beer brewed around the world was dispensed from a cask, served lightly carbonated with live yeast and at cellar temperatures — cool, but not cold. Whilst that time has largely passed, cask beer culture remains alive and well in Britain, and others around the world are starting to catch on to the joys of cask ale too. In North America, a small but growing number of breweries are serving cask ale at their tap rooms, and a number of beer festivals dedicated to it are held every year. With this growing interest in cask beer — something I have spent my entire adult life drinking and my professional brewing career making — I wanted to share with you how to make it at home, how to look after it, and how to serve it.

Photo by Ben Martin

Casks generally come in three sizes (pins, firkins, and kilderkins) and two materials (plastic and steel). Pictured: Plastic firkin, steel firkin, and a steel kilderkin.

WHY CASK ALE?

I am not here to wax lyrical about how amazing cask beer is; there are many writers who have already done that far more eloquently than I ever could, and at great length. But I will say this; if you have never had a British ale dispensed from a cask, you have missed a key element of the experience. Most of the beer styles that are British in origin — bitter, mild, porter, stout, brown ale, pale ale, IPA, etc. — were originally created by brewers who dispensed them from casks. Because of this, they were designed and crafted to be enjoyed at their best when served lightly carbonated, on live yeast at 52–55 °F (11–13 °C). Don't get me wrong, I have had some very good ales dispensed from kegs, but there is something about them that just doesn't live up to the cask ales I know and love. To me, traditional British beer styles are at their most authentic and enjoyable when served from a cask. If you've never tried one, you really should.

DIFFERENT TYPES OF CASK

In the UK, almost every brewery produces at least some cask beer, with a number producing nothing else. The casks they use are usually made from either stainless steel or food-grade plastic, with each having its advantages and disadvantages. Steel casks are very robust and durable; they are more scratch-resistant, which prevents spoilage microbes getting a foothold; and it is much easier to keep them cool. Plastic casks, on the other hand, are much lighter and cheaper, but are more prone to damage.

As well as different materials, casks come in different sizes with most commercial cask breweries using the following three kinds:

- Pins: 4.5 imperial gallons (5.4 U.S. gallons/20.4 L)
- Firkins (also known as "nines": 9 imperial gallons (10.8 U.S. gallons/40.9 L)
- Kilderkins (also known as "eighteens": 18 imperial gallons (21.6 U.S. gallons/81.8 L)

For the purposes of homebrewing, pins will be the best option for most people as they are the closest in size to the typical homebrewery setup of around 5 gallons (19 L), although you may have to make a slightly larger batch to fill one. However, there's no reason you couldn't also use a firkin if you brew larger batches or want to make two batches in short succession. I would not recommend kilderkins for homebrewers, not just because of the practicalities of filling one, but also because they weigh in at around 200 pounds (90 kg) when full, making them very difficult to move without special equipment.

ANATOMY OF A CASK

Even modern steel and plastic casks are shaped like traditional wooden barrels, with two flat ends and rounded sides. The flat top end is known as the "head" and there you should find a small hole called a "keyhole." This is closed with a plastic or wooden stopper called a "keystone" and is also the hole through which the tap is inserted when dispensing. Around the head you will see a low ring called the "chime," which helps to protect the head and keyhole when the barrel is being moved around, and you will often find the name of the brewery the cask belongs to etched onto the outside of the chime. The curved belly of the cask is called the "bilge," in the middle of which you'll find the "bunghole." This is larger than the keyhole and is used to both clean and fill the cask. The bunghole is plugged with a plastic or wooden stopper called a "shive."

HOW TO CLEAN AND FILL A CASK

In order to clean a cask you must first remove the keystone, carefully levering it out with a metal tool such as a large, flathead screwdriver, or better yet, a special tool called a shive extractor. With plastic casks, extra care must be taken whilst doing this to ensure you don't damage the lip underneath the keystone.

Remove the shive by inserting a heavy-duty screwdriver or shive extractor through the hole in the middle of it and levering it out. Doing this with the cask stood upright and with you sitting on it makes this much eas-

ier, as it prevents the cask from rolling around. Position the cask with the bunghole over a drain or bucket and allow any remaining beer dregs to drain out. Tip it upright and spray sanitizer around the keyhole, take a sanitized keystone and tap it about halfway into the keyhole with a mallet.

Position the cask with the bunghole pointing upwards. You need to clean off any residue from the inside and the best way to do this at home is with a pressure washer, if you have one. Insert the pressure washer nozzle through the bunghole and spray all the internal surfaces. Drain out the water and use a flashlight to check that all visible dirt has been removed.

Pour about 1–2 quarts (1–2 L) of sanitizer solution in through the bunghole, and seal up the bunghole with a shive. With steel casks, you should only need to tap it in with your hand to seal it, allowing you to easily remove it again, but with plastic casks, you will need to knock the shive all the way in, meaning you will have to sacrifice it to remove it. Roll the cask in all directions to ensure the sanitizer comes into contact with every surface. Repeat a few times, then remove the shive and drain out the sanitizer. Rinse if necessary. Use a mallet to knock the keystone all the way in, until it is flush with the keyhole. Now you are ready to fill your cask.

The first step in filling a cask is priming it with sugar. For a pin cask, dissolve 1 oz. (28 g, or 2.25 tablespoons) white sugar in ⅓ cup (80 mL) of boiled water and pour it in the bunghole. For a firkin cask, double these quantities. Do not be tempted to increase the amount of sugar to provide additional carbonation; I've seen several casks blow their shives and it makes an almighty mess!

If you wish to dry hop your beer, add them at this stage just before racking starts. If using pellets, I strongly recommend using a hop filter in your tap later on; if you are using whole leaf hops, this shouldn't be necessary. Next, attach a sanitized hose to the tap on your fermenter that reaches all the way to the bottom of the cask when inserted through the bunghole. Open the tap on your fermenter and allow the beer to gently flow into your cask under gravity. While the cask is filling, you may wish to add isinglass to help ensure your ale is crystal clear on dispense — use around 1 cup for a pin cask and 2 cups for a firkin cask. Do not add isinglass with the priming sugar, as the heat from the boiled water will stop it from working. Alternatively, embrace the haze and don't use finings at all! Fill the cask to the very brim with your beer. Fobbing (foaming) may make it difficult to see where the level of the beer is, in which case keep filling until the liquid (rather than foam) is just starting to overflow. Finally, seal up your cask with a shive, knocking it in with a mallet until it is flush. Rinse off any beer on the outside of the cask and leave it at around 68 °F (20 °C) for at least two weeks to condition before serving.

HOW TO TAP A CASK

So you've brewed your beer, cleaned your cask, filled it and it's been conditioning nicely for a couple weeks, so I'm sure you're eager to break into that beauty and get a taste of that authentic British cask ale, right? Well, hold your horses there buddy, good things come to those who wait.

First, you need to let your cask settle. So, 24 hours before you want to serve your beer, you need to put your cask in position where you want to serve it. Ideally it should be in a cradle called a "stillage" that holds it in place and tips it slightly forward. But if that's not an option, place it on a sturdy table with heavy objects on either side to stop it from rolling, and a suitable block of wood propping it up at the back so that the head is pointing slightly downwards. It should be oriented with the shive pointing upwards and the keystone pointing towards you. During the next 24 hours, any yeast and precipitated protein floating in your beer should settle to the bottom of the bilge, especially if you have used finings. It should also be kept at a constant 52–55 °F (11-13 °C) if possible, so an unheated basement is ideal.

After 24 hours in that position, you're ready to tap. People have slightly different ways of doing this, but here's the way I do it. First, spray the shive and keystone with sanitizer. You will then need a small wooden or plastic peg called a "hard spile." Holding this with a pair of pliers at the blunt end, sanitize it, then hold it just

Traditional tools used for serving cask beer: Pliers, hard spile, soft spile, down spout, tap, mallet.


Removing keystone with shive extractor.

Photos by Ben Martin

Cask Ale Recipes

SHIP'S CAT DARK MILD

(5 gallons/19 L*, all-grain)
OG = 1.035 FG = 1.010
IBU = 24 SRM = 24 ABV = 3.2%

It is rare for me to brew the exact same recipe twice; I tend to make tweaks and adjustments even to ones I like. But I brew this recipe every late spring in time for session drinking over the summer because I love it so much.

**Please note that this recipe is for 5 gallons (19 L), as is standard for* BYO. *If you want to fill a pin-sized cask, I suggest increasing the quantities by 10%. If you want to fill a pressure barrel, increase the quantities by 20%.*

INGREDIENTS

5.7 lbs. (2.6 kg) Maris Otter pale ale malt
1 lb. (454 g) medium crystal malt (60 °L)
7.6 oz. (215 g) chocolate malt (425 °L)
4.7 AAU First Gold hops (60 min.) (0.5 oz./14 g at 9.5% alpha acids)
3.6 AAU Tettnang hops (15 min.) (1.1 oz./31 g at 3.4% alpha acids)
½ tsp. (0.6 g) Irish moss
Silica sol
7.2 fl. oz. (213 mL) isinglass (optional)
SafAle S-04 or your favorite English ale yeast
0.9 oz. (25 g) sugar

STEP BY STEP

Mash all of the malt at around 152 °F (67 °C) for one hour. Collect 6 gallons (23 L) of wort in the kettle and boil for one hour, adding the First Gold hops after 15 minutes, and then the Tettnang hops and Irish moss after 45 minutes. At the end of the boil, chill to 68 °F (20 °C) and then transfer to your fermenter and pitch the yeast. After five days, add the silica sol fining according to the manufacturer's instructions and then chill to 41 °F (5 °C) or below for two days. If filling a single container (e.g. a pin cask or pressure barrel), dissolve the sugar in the smallest amount of boiled water as you can, add this to the container and then rack the beer onto it. Add the isinglass (if using for the purpose of clarification) directly to the container while the beer is being racked. Seal the container and condition at 68 °F (20 °C) for at least two weeks before serving.

SHIP'S CAT DARK MILD

(5 gallons/19 L*, extract with grains)
OG = 1.035 FG = 1.010
IBU = 24 SRM = 24 ABV = 3.2%

**Please note that this recipe is for 5 gallons (19 L), as is standard for* BYO. *If you want to fill a pin-sized cask, I suggest increasing the quantities by 10%. If you want to fill a pressure barrel, increase the quantities by 20%.*

INGREDIENTS

4 lbs. (1.8 kg) Maris Otter liquid malt extract
1 lb. (454 g) medium crystal malt (60 °L)
8 oz. (230 g) chocolate malt (425 °L)
4.7 AAU First Gold hops (60 min.) (0.5 oz./14 g at 9.5% alpha acids)
3.6 AAU Tettnang hops (15 min.) (1.1 oz./31 g at 3.4% alpha acids)
½ tsp. (0.6 g) Irish moss
Silica sol
7.2 fl. oz. (213 mL) isinglass (optional)
SafAle S-04 or your favorite English ale yeast
0.9 oz. (25 g) sugar

STEP BY STEP

Place caramel and chocolate malt into a steeping bag and submerge in 6 gallons (23 L) of water at or near 155 °F (68 °C). After 20 minutes of steeping, remove the grain bag, then bring the wort up to a boil. When boil is achieved, take the kettle off the flame and add the extract while stirring. Once extract is fully dissolved return to the heat source and boil for 60 minutes, adding the hops as indicated.

At the end of the boil, chill to 68 °F (20 °C) and then transfer to your fermenter and pitch the yeast. After five days, add the silica sol fining according to the manufacturer's instructions and then chill to 41 °F (5 °C) or below for two days. If filling a single container (e.g. a pin cask or pressure barrel), dissolve the sugar in the smallest amount of boiled water as you can, add this to the container and then rack the beer onto it. Add the isinglass (if using for the purpose of clarification) directly to the container while the beer is being racked. Seal the container and condition at 68 °F (20 °C) for at least two weeks before serving.

TIPS FOR SUCCESS:

Anyone who is vegan will want to know that isinglass is obtained from bladders of fish. Sadly, isinglass is pretty essential if people want their beer to be crystal clear in 24 hours. As much as I wish silica sol could do this on its own, experience tells me that it simply doesn't (I'm actually vegan and have spent the last three years trying to find a good way of replacing isinglass in casks and so far I have failed). The addition of isinglass is optional but not using it may result in hazy beer.

COPPER CLAD BEST BITTER

(5 gallons/19 L*, all-grain)
OG = 1.040 FG = 1.008
IBU = 29 SRM = 11 ABV = 4.1%

Every self-respecting cask ale pub in the UK will have a best bitter on the bar. This recipe uses Endeavour, a modern British hop variety, to provide a refreshing, light, and fruity character to this most traditional of ale styles.

**Please note that this recipe is for 5 gallons (19 L), as is standard for* BYO. *If you want to fill a pin-sized cask, I suggest increasing the quantities by 10%. If you want to fill a pressure barrel, increase the quantities by 20%*

INGREDIENTS

7.5 lbs. (3.4 kg) British pale ale malt
8 oz. (230 g) medium crystal malt (60 °L)
4 oz. (110 g) amber malt (27 °L)
1.4 oz. (40 g) chocolate malt (425 °L)
3.7 AAU Challenger hops (60 min.) (0.4 oz./12 g at 9% alpha acids)
1.5 AAU Endeavour hops (30 min.) (0.15 oz./4.3 at 9.8% alpha acids)
11.4 AAU Endeavour hops (5 min.) (1.2 oz./33 at 9.8% alpha acids)
½ tsp. (0.6 g) Irish moss
Silica sol
7.2 fl. oz. (213 mL) isinglass (optional)
SafAle S-04 or your favorite English ale yeast
0.9 oz. (25 g) sugar

STEP BY STEP

Mash all of the malts at 150 °F (65.5 °C) for one hour. Collect ~6 gallons (23 L) of wort in the kettle and boil for one hour, adding the Challenger hops as soon as it starts boiling. After 30 minutes, add the first (and smaller) lot of Endeavour hops, then the Irish moss after a further 15 minutes. Add the final lot of Endeavour hops 5 minutes before the end of the boil.

At the end of the boil chill to 68 °F (20 °C) and then transfer to your fermenter. Aerate well and pitch the yeast. After five days, add the silica sol fining according to the manufacturer's instructions and then chill to 41 °F (5 °C) or below for two days. If filling a single container (e.g. a pin cask or pressure barrel), dissolve the sugar in the smallest amount of boiled water as you can, add this to the container and then rack the beer onto it. Add the isinglass (if using for the purpose of clarification) directly to the container while the beer is being racked. Seal the container and condition at 68 °F (20 °C) for at least two weeks before serving.

COPPER CLAD BEST BITTER

(5 gallons/19 L*, extract with grains)
OG = 1.040 FG = 1.008
IBU = 29 SRM = 10 ABV = 4.1%

**Please note that this recipe is for 5 gallons (19 L), as is standard for* BYO. *If you want to fill a pin-sized cask, I suggest increasing the quantities by 10%. If you want to fill a pressure barrel, increase the quantities by 20%.*

INGREDIENTS

5 lbs. (2.3 kg) Maris Otter liquid malt extract
8 oz. (230 g) medium crystal malt (60 °L)
1.4 oz. (40 g) chocolate malt (425 °L)
3.7 AAU Challenger hops (60 min.) (0.4 oz./12 g at 9% alpha acids)
1.5 AAU Endeavour hops (30 min.) (0.15 oz./4.3 at 9.8% alpha acids)
11.4 AAU Endeavour hops (5 min.) (1.2 oz./33 at 9.8% alpha acids)
½ tsp. (0.6 g) Irish moss
Silica sol
7.2 fl. oz. (213 mL) isinglass (optional)
SafAle S-04 or your favorite English ale yeast
0.9 oz. (25 g) sugar

STEP BY STEP

Place caramel and chocolate malt into a steeping bag and submerge in 6 gallons (23 L) of water at or near 155 °F (68 °C). After 20 minutes of steeping, remove the grain bag, then bring the wort up to a boil. When boil is achieved, take the kettle off the flame and add the extract while stirring. Once extract is fully dissolved return to the heat source and boil for 60 minutes, adding the hops as indicated in the recipe.

At the end of the boil, chill to 68 °F (20 °C) and then transfer to your fermenter and pitch the yeast. After five days, add the silica sol fining according to the manufacturer's instructions and then chill to 41 °F (5 °C) or below for two days. If filling a single container (e.g. a pin cask or pressure barrel), dissolve the sugar in the smallest amount of boiled water as you can, add this to the container and then rack the beer onto it. Add the isinglass (if using for the purpose of clarification) directly to the container while the beer is being racked. Seal the container and condition at 68 °F (20 °C) for at least two weeks before serving.

TIPS FOR SUCCESS:

Anyone who is vegan will want to know that isinglass is obtained from bladders of fish. Sadly, isinglass is pretty essential if people want their beer to be crystal clear in 24 hours. As much as I wish silica sol could do this on its own, experience tells me that it simply doesn't (I'm actually vegan and have spent the last three years trying to find a good way of replacing isinglass in casks and so far I have failed). The addition of isinglass is optional but not using it may result in hazy beer.

above the center of the shive. With a hard blow with a mallet, knock it into the shive. Thanks to the pliers, you should have about half an inch (1.25 cm) poking out, and you won't have broken your fingers. Leaving the hard spile in place, take your sanitized tap and, holding it by the rotating faucet section, line it up with the center of the keystone. This next step is important — make sure the tap is closed and do not hold it by the long shaft or you will break your hand. Being careful of your fingers, knock the tap into the keystone with a mallet. It may take a number of strikes and beer may spurt out around the tap as you are doing this — don't panic, just keep hitting it until the spurting stops. Depending on the type of tap you have, you may now need to screw a down-spout on to the end. Now, place a glass under the tap, open it and once the beer is flowing, use your pliers to pull out the hard spile. If you like, you can replace the hard spile by gently placing a soft spile in the hole left in the shive, which will allow air in, but will prevent insects and other things getting in.

If you wish to dispense your cask ale from a beer engine, all you will need to do next is clean out the dispensing hose and dispensing pump with a suitable cleaning agent, as recommended by your equipment supplier. Then attach the hose to the tap of the cask with a ¾-inch cask nut (or whatever size is appropriate for your tap) and a hose tail suitable for your hose (ideally secured with a hosepipe clip), then open the tap and draw the beer through with the pump.

Congratulations! You just tapped your first cask of real ale! Now that you are enjoying that delicious beer, here comes the bad news — you have about 4–5 days to drink it all before it starts turning into vinegar. This is the unfortunate downside of cask ale; once you start letting air into your cask, the beer inside it has a limited lifespan. It's the main reason they have largely been replaced by kegs, which work by keeping air out. You can help to prolong it a little by tapping the hard spile back into the shive between drinking sessions, effectively sealing it again, but you're still on a ticking clock. Now, if you're running a bar, having a party, or just have a lot of drinking buddies, that shouldn't be a problem; but if you're trying to get through that thing on your own, it may be an issue. Thankfully, there are some alternative ways of producing cask ale at home that reduce this issue.

ALTERNATIVES TO CASKS

There are a couple of alternatives to actual casks that will achieve a similar outcome to cask ale. The first is a pressure barrel, which is a popular option amongst British homebrewers. This is essentially a plastic barrel with a built-in tap and large screw-top lid that can hold a certain degree of pressure from carbonation and comes in 2.6-gallon (10-L) or 6-gallon (23-L) sizes. These can essentially be primed, fined, and filled in exactly the same way as casks, adjusting for size, and then sealed up by screwing the top on. With a built-in tap, you also don't need to go through the potentially messy business of tapping it. Many also come with a valve at the top that allows you to attach a small carbon dioxide canister. This is not to push the beer out, as with a keg, but simply to fill the space created at the top of the barrel as the beer is dispensed, preventing oxygen from getting in and spoiling your beer. Hardcore real ale enthusiasts consider this to be cheating, but it's a personal choice.

Another option is to split your batch into several smaller steel "mini casks." These usually hold 1.3 gallons (5 L) and are sometimes erroneously called "mini kegs," even though they have more in common with casks than kegs. Prime each one with 0.25 oz. (7 g) of sugar dissolved in as small an amount of boiled water as you can get away with, fill as you would with a cask, and add about 2.4 oz. (71 mL) of isinglass, if you wish. The rubber bung supplied with it should be sanitized in boiling water, which also helps to soften the rubber, making it easier to push in and seal the mini cask. This bung also acts as the vent, much like the shive on a real cask, allowing air in so that beer can flow out from the built-in tap. This means they have a similar lifespan to real casks once opened. But with a much smaller volume, you can finish them off much more quickly. It is possible to reuse these mini casks, and you can find videos on YouTube instructing you how to do this.

MAKING CASK ALE

Given that this is a magazine about making your own beer at home, it would be pretty remiss of me not to talk about how to actually make ale for casks. This is pretty challenging, given that it covers so many beer styles, but I will provide what advice I can in general terms. British cask ale brewers tend to use a single temperature infusion mash in the region of 149–154 °F (65–68 °C) and use high-quality British base malts, such as Maris Otter and Golden Promise. Obviously the specialty malts and adjuncts you use will depend on the exact beer style you're making, but should also be British

Photo by Ben Martin

Pressure barrels are popular amongst British homebrewers as CO_2 canisters can help prevent oxidation.

Photo by Ben Martin

Mini casks are a great option for homebrewers.

in origin if you want to be authentic. Goldings, Fuggle, and Challenger might be the obvious hops to use in a British style beer, but the UK now produces at least 31 other hop varieties on a commercial scale, many of which are also suitable in traditional ales. Don't be afraid to try something new. I have even used German varieties occasionally, as they share a similarly herbal, earthy aromatic profile. A 60–90 minute boil is typical and the use of copper finings, such as protofloc or Irish moss, is very common.

When it comes to yeast, selecting the right kind can make a huge difference. A true British ale strain is necessary to get the right flavor, but for cask ale you also need a yeast that is going to flocculate well to make sure it settles out nicely in the barrel. In terms of dried yeast, Nottingham and S-04 produce great tasting beer and both flocculate really well. OYL-006 and OYL-016 are good options from Omega Yeast, and from White Labs I would suggest WLP-002, WLP-006 or WLP-030, or from Wyeast 1318, 1335, or 1968.

Your primary fermentation should take place at the recommended temperature for your yeast strain, which for most British yeasts is around 68 °F (20 °C). I suggest fermenting your ale until it reaches a stable gravity, which should take 5–10 days. Once that has happened, add a silica sol fining agent and reduce the temperature to around 41 °F (5 °C) or below if you can, as this will help to settle the yeast and precipitate out any proteins that can cause a haze in your beer. Hold it there for two days, then you are ready to rack into your cask.

Cask ale can be a tricky beast; it requires special equipment and is not to everyone's taste, but there are plenty of people like me who love it and see it as a true art form within the brewing world. And I'm not alone — there are several major organizations in the UK dedicated to preserving it, including the Campaign for Real Ale (CAMRA), and Cask Marque, which ensures pubs serve cask ale to the highest possible standard. So I hope that with my advice, you'll be able to enjoy the sort of beers I have known and loved all my adult life and come to share my passion for them.

SANKE FERMENTER DIY

Build this adaptable double-batch fermenter

Story and Photos by Andrew Martin

I jumped into this hobby brewing 10-gallon (38-L) batches. This was mostly out of necessity as a friend and I went in on it together and we didn't see the point of splitting a 5-gallon (19-L) batch. We started our fermentations off using glass carboys. With both of us enjoying higher-ABV beers, we dealt with blow-offs and the inconveniences of dry hopping in the carboys as a right of passage not thinking much of it. That all came to a screeching halt the day a 5-gallon (19-L) carboy of a Dogfish Head 90-Minute IPA clone slipped from my grasp and came crashing down on the basement floor. The need to simplify the post-boil process through kegging and get away from glass became the priority. Given my process, budget, and love for building stuff, I pursued the Sanke keg fermenter conversion that I'm going to share in this article.


22.4
TRIGLENE 980 REINFORCED
WARNING
DO NOT REMOVE VALVE

Before we start, let's talk about the benefits of using a Sanke keg. Outside of the ability to add custom features for my specific brewing needs, they: (1) Can be found relatively inexpensively on local classifieds or, you may be able to buy an old one from your neighborhood brewery. (The key word here is *buy*. Putting a deposit down on a full keg and then not returning it is theft. Buy them legally!) (2) Are about the correct size for fermenting 10-gallon (38-L) batches, and (3) Probably the most important from my personal perspective, they're built like tanks! Un-modified, these kegs were made to move pressurized liquids up to a max operating pressure of 60 psi from point A to point B with some level of damage tolerance.

PLANNING OUT YOUR SANKE FERMENTER

While I would guess it's everyone's desire to simplify the brewing process, each homebrewer's individual needs are different given their setup, the styles of beer they brew, etc. In my day job, we call this the Concept of Operations or CONOPS. For my specific CONOPS, I needed to move 10 gallons (38 L) of wort from my garage to my basement, ferment, and transfer to kegs. That sounds straightforward until you start looking at each step individually and what features would make each step easier. Here are some of the things I made priorities:

Collecting and moving

I chill my wort using a homebuilt counterflow chiller. Any hot break, hop particles that escaped the hop spider, etc. would find its way into the fermenter. I wanted a means to remove all of these particles before they could enter the fermenter. An inline wort strainer looked pretty effective for my purposes.

Once collected in the fermenter, I needed a means to completely seal the fermenter so I could manhandle 10 gallons (38 L) of wort from the garage to the basement. This step alone was what ruled out a store-bought conical for me in this size. Imagine you've spent the day with friends and/or family brewing a 10-gallon (38-L) batch of beer, likely sampling some of your own product throughout the day, only to finish the day by moving 100+ lbs. (45+ kg) of beer and stainless steel down a set of stairs. I would guess, regardless of the batch size, most homebrewers experience a similar situation of having to haul wort from one location to another. I wanted to make it as easy as possible. The thought of spending ~$1,000 on a conical/unitank, then awkwardly carrying it downstairs with the possibility of dropping and damaging it, not to mention losing all the freshly brewed wort, didn't sit well with me. I could transfer to buckets, carry downstairs, then transfer again to a fermenter but that was an added step that could result in contamination, not to mention it's a pain.

Sanke kegs were designed for this awkward task of moving larger quantities of liquid from point A to point B. They're generally much thicker than what you'll find in a conical or unitank. Using a Sanke keg in combination with tri-clamp fittings for accessories and sealing during transport to the basement, my biggest concerns now became my back and the drywall at the bottom of the stairs if I did happen to lose grip. That said, it is still safest to have two people to move a full keg of beer. Much less chance of dropping it, and your back will thank you later. Fortunately, kegs are relatively easy for two people to move.

Fermentation

There is a plethora of things going on in this step between oxygenating the wort, ability to add yeast, hops, or anything else depending on the recipe, measuring and controlling temperature, ability to bleed off CO_2, and pressure relief.

I welded a 1.5-in. (3.75-cm) ferrule in the center on both the inside and outside of the 6-in. (15-cm) ferrule. I attach a strainer on the outside (shown here) when transferring cooled wort into the fermenter to strain out the hot break. When dry hopping I switch the strainer to the inside so I can clean and sanitize the wort strainer and use it to filter out the hops when transferring to kegs.

Transfer to kegs

For this step, I wanted a means to add CO_2 for pressure transfer as well as a

I traced my 6-inch (15-cm) ferrule and used a metal blade in a jigsaw and cutting oil to cut the opening.

way to filter anything I added during fermentation to prevent clogging up my keg fittings.

Future growth

Who knows what the future of brewing looks like. With this consideration, I threw in an extra tri-clamp ferrule for good measure.

THE BUILD

With my list of CONOPS jotted down, I started the build by depressurizing the keg and a good cleaning/polishing before exposing the inside. While the exterior look isn't too critical, it is a fermenter. Keeping it shiny and clean on the outside will promote keeping it clean and sanitized on the inside. Plus, it just looks cool! I used 4-inch (10-cm) fine nylon buffing wheels in an angle grinder.

Once I pulled the dip tube, I placed my 6-inch (15.25-cm) ferrule on top and used a marker to mark the inside for cutting. A metal blade in a jigsaw and some cutting oil works well here. Another option is to keep a spray bottle with cool water and keep wetting the cutting area. Stainless is easily work hardened so if it gets too hot, it gets much harder to cut. Take your time!

Note here: I wanted my fermenter right-side up for the handles, but if your CONOPS allow yours to remain stationary, you could do this to the bottom of the keg and keep the ferrule already on the keg. It fits a 2-inch tri-clamp with a custom O-ring.

NOTES ON TIG WELDING

There are two important notes I'll make on TIG (tungsten inert gas) welding here: (1) TIG welding stainless is very much like brewing beer . . . the best recipe won't matter if your weld area isn't clean. Think sanitized-level clean. Once I've mechanically cleaned everything, I wipe it down with acetone. (2) The backside of the weld will oxidize, resulting in what's commonly referred to as "sugaring." This isn't sanitary or pretty and results in a poor weld. Purge the backside of the welds with argon. If, like me, you don't have a dual regulator setup to do this, there's a product called Solar Flux that works really well at preventing back-side oxidation of the weld but it's a pain to remove. Because of this, I make sure all my welding is done on the side that is exposed to wort with the backside of the weld being exterior to the fermenter. This keeps the build as sanitary as possible given less than ideal resources available. Thus, the reason for the 6-inch (15.25-cm) ferrule allowing me to get my TIG torch on the inside.

If you don't have the ability to do the welding yourself, my suggestion would be to talk to your local homebrew shop. Those folks probably know a fellow homebrewer in the area that can help you out.

Next, weld the ferrule to the keg. The heat tint on the weld surfaces need to be removed. This can be done while the weld is still hot using a dedicated stainless wire brush, or the same buffing wheel used to

Welding the side exposed to the wort will result in a more sanitary build. Heat tint can be removed with a wire brush while the weld is still hot.

polish the outside the keg. Once the weld has cooled, I wipe down with acetone again and apply Bar Keepers Friend to passivate the area. This eliminates any free iron the weld area may have been exposed to and passivates the stainless, providing a durable coating.

Once the ferrule is installed, drill all your holes for the goodies you've selected into the tri-clamp cap. Most of the goodies I've welded in place can be purchased at Brewershardware.com. I went with a 16-inch (41-cm) thermowell to ensure my thermometer will be submerged in my 10-gallon (38-L) batches. Standard metal twist drills work well here. Drilling in steps works best at the lowest speed your drill will allow with cutting oil (example: If drilling a 1-inch hole, I would start at ¼-inch and work my way up in ¼-inch increments). Don't just jump to the final diameter on the first plunge. Tight tolerances on the holes do make for an easier and nicer weld. When laying out your holes, make sure there's sufficient room for installing and tightening the tri-clamps or whatever fittings you've selected. Once everything is drilled and cleaned, weld them in place accordingly.

PRESSURE TEST

You've just taken a pressure vessel and modified it. If you plan to do pressurized fermentations, or carbonating in the fermenter, or just in case your CO_2 blow-off port gets clogged, you want to test the fermenter to ensure it can handle the pressures it will be subjected to before the pressure relief valve (PRV) releases. Ask yourself, would you rather find out now in a controlled test, or later by accident? Sanke keg PRVs, from what I've found, are set around 55 psi. The kegs themselves have a max pressure of 60 psi marked on them. You can purchase lower PRVs if you choose, but please use one. I chose to pressure test to the 60 psi.

For the fellow nerds out there, I first did some quick math to give me a feel good. The hoop stress of a thin-walled pressure vessel is:

$\sigma = pressure \times radius / wall\ thickness.$

304 stainless generally has 35,000 psi yield strength. Plug that in, the keg radius (~7.75 inches/19.7 cm), and the wall thickness (0.045 inch/0.11 cm) and solve for pressure and you get about 200 psi is what the keg could handle before detrimental yielding (not necessarily rupture). Now the keg isn't a perfect pressure vessel in its geometry as well as the fact it has welds, which all would likely decrease that ~200 psi, but I now felt more comfortable taking the Sanke fermenter to original rating of 60 psi.

To pressure test, I took a 1.5-inch (3.8-cm) tri-clamp cap and drilled and tapped it to a ¼-18 NPT thread for a quick release air compressor fitting. Note this a common thread size for PRVs that can be purchased on McMaster.com. I then installed caps and a pressure release on the 1.5-inch (3.8-cm) tri-clover fittings on my 6-inch (15.25-cm) cap to prep it for install into the fermenter. This next step is crucial: Fill the fermenter with water. I left maybe 0.5 in. (1.25 cm) of headspace for air in the fermenter. The rest was filled completely. With water being incompressible, if the pressure test doesn't go as planned, a rupture will result in a fraction of the energy being released. The high ductility of 304 stainless also means failure would likely not be as exciting as you may think.

After adding water, I installed my modified 6-inch (15.25 cm) tri-clamp cap, tightened down all the clamps, set my compressor regulator to 0 psi, set up a camera, and connected the air hose. I pressure tested the unit outside while I was inside the shop to establish a safety barrier. If you are doing this with friends and/or family around, make sure everybody is safely located. This is a prime opportunity to ask someone to hold your beer. I ramped the pressure from 0–60 psi slowly over four minutes then held for an additional 5 minutes. I then shut off the air supply, inspected for leaks and signs of anything bad, and slowly bled off the pressure. Ensure you always have a means to depressurize in a controlled manner. A 6-inch

Make sure nobody is in the vicinity when conducting a pressure test on your new fermenter.

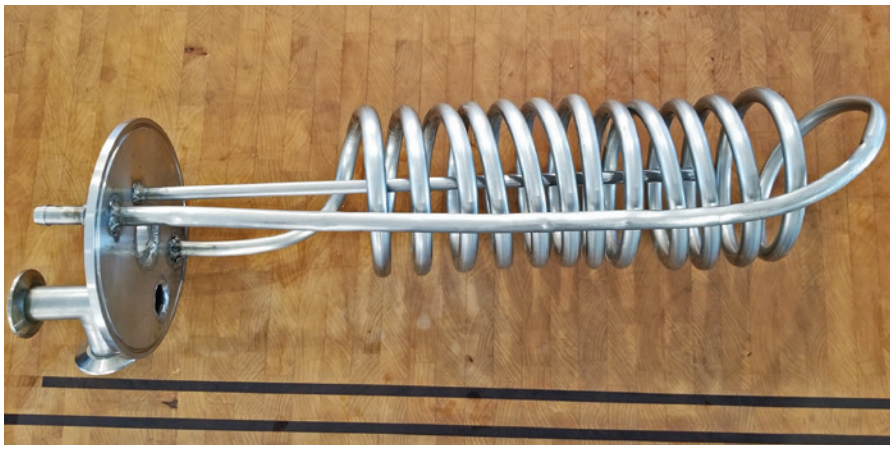
(15.25-cm) tri-clover cap pressurized to 60 psi will have close to 1,700 lbs. pushing on it. You don't want to be on the other side of that when removing the clamp.

Sanke fermenter build complete!

CUSTOM-BUILT ACCESSORIES

Cooling coil

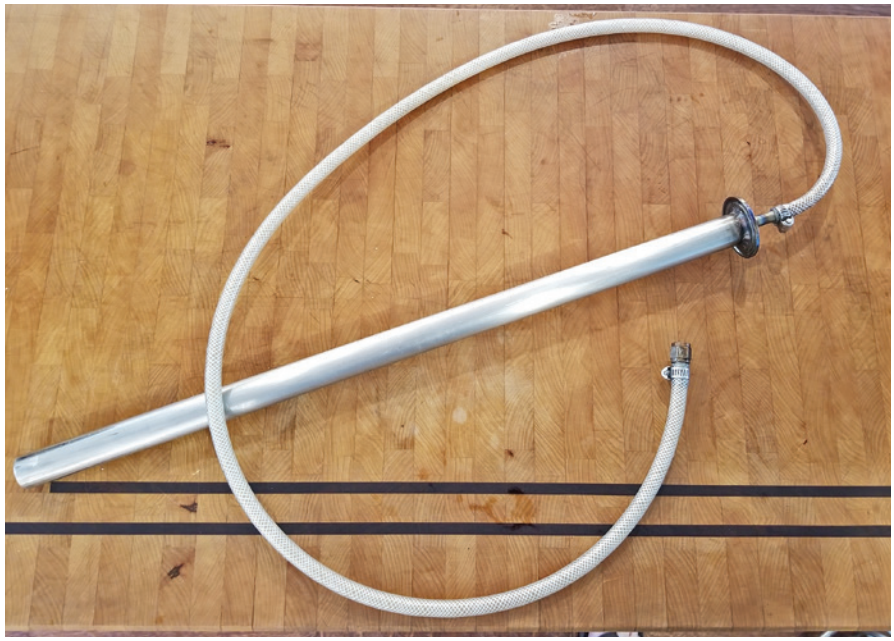
I used about 25 feet (7.2 m) of ½-inch stainless tubing for a cooling coil build. Bending the coil was quite the experience. If this is a feature you want, you'll need a mandrel to bend the tubing around that will result in a finished coil small enough to fit into the tri-clamp ferrule you've chosen for the keg. Next, fill the tubing with glass bead grit blast media. You can get it cheap at Harbor Freight. You could also use play sand but removing the sand will be much harder than the glass bead media, which practically falls out. Pack it in good by shaking and adding until the tube is full. This prevents the tube from kinking while bending it around the mandrel. Make sure you ate your Wheaties that day because bending the tubing was quite the workout. If I were to do it again, I would go with ⅜-inch tubing for an easier time bending.



I used a mandrel to bend 25 feet (7.6 m) of ½-inch stainless tubing to make a cooling coil.

Dip tube

It sounds like a no-brainer, but some design into the dip tube can really reduce your yeast pickup. I found that a 1-inch (2.5-cm) diameter dip tube 1.5 inches (3.75-cm) from the bottom of the fermenter gives me best results for my beers. The clearance to the bottom is such that the yeast cake is below it while minimizing how much beer I leave in the fermenter. Additionally, the 1-inch (2.5-cm) diameter dip tube allows for slower liquid velocity and therefore less yeast pickup.



A 1-inch (2.5-cm) diameter dip tube 1.5 inches (3.75-cm) from the bottom of the fermenter leaves the yeast cake undisturbed while minimizing beer loss.

Oxygenation/carbonation stone

A 1.5-inch (3.75-cm) ferrule welded to a 1.5-inch (3.75-cm) cap that's been drilled and hose barb welded to it allows for an inexpensive oxygenation/carbonation stone. I've used a tri-clover compatible Corny post adapter from Brewershardware.com to hook up to my CO_2.

An inexpensive oxygenation/carbonation stone using a ferrule welded to a cap and hose barb.

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WEDNESDAY, NOVEMBER 3, 2021

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

THURSDAY, NOVEMBER 4, 2021 DENVER BOOT CAMPS

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

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

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

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

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

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

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

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

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

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

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

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

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

NOON TO 1 P.M.
Lunch

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

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

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

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

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

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

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

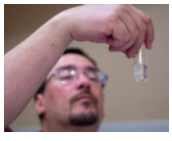
SATURDAY, NOVEMBER 6, 2021 DENVER BOOT CAMPS

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

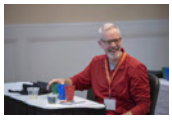
ADVANCED RECIPE FORMULATION – ***with Brad Smith*** – Take your recipe creations to the next level by dialing in the specific grain bill, hop schedule, ingredient proportions, and water treatments to meet your brewing goals. Brad Smith, owner of Beersmith software and a *Brew Your Own* Contributing Writer,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

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

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



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



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

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

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

SUNDAY, NOVEMBER 7, 2021

INSIDER TOUR OF DENVER-AREA CRAFT BREWERIES

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Three-Day and Two-Day Registration Options Available.
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BY DREW BEECHUM & DENNY CONN

HOW DO YOU BREW?

It speaks volumes about our advice

If you've been a homebrewer very long, you've either heard or said these words, "Ask 10 homebrewers their opinion and you'll get 12 answers." And it's true . . . homebrewers seem to almost always have plenty of answers to about any question. Nowhere is this more evident than when a new brewer asks what they need to get started brewing or what method they should use when they brew. You'll hear to start with extract; start with all-grain; do brew-in-a-bag; use a 3-tier, converted keg system; get an electric, all-in-one system; use a cooler; batch sparge; fly sparge; no sparge . . . you get the idea. But all of these answers are based on the personal preferences of the people answering the question. Their history impacts their choices. For us, starting out, batch sparging was an unorthodox potential heresy – brew-in-a-bag would have gotten you tossed from the fellowship of brewers!

What you don't often see, though, is anyone asking the questioner why they want to brew. What do they hope to get out of their brewing experience? What is it that they expect to enjoy most? Sure, we all do it because we love beer and want to make it ourselves, but there's a lot more to it than that.

In our book *Homebrew All-Stars,* we looked at the motivations behind homebrewing by grouping homebrewers by an archetype. In other words, how they think of their homebrewing. We talked to 25 people who represent some of the best homebrewers we know and asked them why they brew. We came up with five groupings. There are the gearheads, the scientists, the old-school masters, recipe innovators, and wild ones. So following we pulled together a guide to see where you land – it's just like in a magazine (oh wait this is a magazine) – or, these days, like those "which Hobbit are you" quizzes online. We guarantee as much accuracy as those quizzes too! Since the book was published, Denny has evolved into yet another archetype . . . the relaxed brewer.

Each motivation lends itself to a particular style of brewing and, contrary to some online discussions, none of them are wrong. It's a case of "different strokes for different folks." We want you to think about WHY you brew as a way to get to HOW you brew. That's the path to getting the most value out of your homebrew experience. So, let's check out some of the different reasons people homebrew and how that relates to the equipment and processes they use. This should then serve as your guide to make sure you're communicating properly to future brewers about your own goals in the hobby to help them find theirs.

Each motivation lends itself to a particular style of brewing and, contrary to some online discussions, none of them are wrong.

Photo courtesy of High Gravity

The rise of all-in-one brewing has changed the way brewers approach their brew days.

Point of Order Before Proceeding:

Just like in all things in life, you're bound to find you cross boundaries. "A little of gear head, a little of innovator, a whole lot of scientist." It's expected and fine — it's what makes humanity absolutely fascinating and frustrating. No matter how much science fiction writers want us to fall into easy categories, we don't.

THE GEARHEAD

Gearheads are all about the equipment. Whether they build it or buy it, they love their shiny, clean equipment and technological innovations. Most often they'll build their own equipment and that can often take precedence over the actual brewing part. If you're this type of brewer, you might save up for a fancy system, putting off brewing at all until you get it.

These are the brewers who might have the PID-controlled, tiered, converted-keg systems with multiple pumps, coupled with the pristine and immaculate gleaming piles of steel. Or maybe they're the ones with wires running everywhere

and soldering iron in the background. These are the brewers who know what a raspberry pi is (no, not the dessert) and how to program it. They also may be the kind of person who rebuilds something in their brewery each and every time they brew!

THE SCIENTIST

These are the people who have to know why things happen when they brew. Brewing beer is just a means to answer the questions. Does this mash temperature make a difference as compared to that one? What happens when I substitute one base malt for another? How does this new yeast compare to the one I used last time?

Scientists take extensive notes when they brew. They often will have two identical sets of equipment for doing split batches for comparison. They'll brew the same recipe multiple times, changing one thing each time, to investigate how that change affects the finished beer. Numbers and process are their best friends.

They're the people who often have "the answer" to whatever question you ask. But remember, answers in brewing are highly dependent on process, which we hope we've established through our years of preaching. Be wary of universal truths and do your own digging!

THE OLD SCHOOL MASTER

Old school masters have a reverence for traditional beer and the making of it in traditional ways. You won't see them making a sour hazy imperial raspberry milkshake Oktoberfest with habaneros and vanilla.

Denny: If anybody out there makes that, please don't tell me!

Drew: If you do make this, please let me know and send me a bottle that I can put in front of Denny when he doesn't expect it!

They want to make established, traditional styles in established, traditional ways.

It's not about being "boring" — it's about a belief and a preference for the expected quality and tastes refined over decades or centuries of brewing practices. It's about hitting a taste from refinement of those simple clean ideas. And to quote Denis Leary, sometimes it's about "beer-flavored beer."

The equipment of an old school master may well include an extra pot and burner so they can do decoction mashes easily.

THE RECIPE INNOVATOR

These homebrewers take as much delight in obsessing over a recipe and the ingredients in it as they do in actually brewing the recipe they've created. Every trip to the grocery store inspires a new recipe as they browse the shelves, seeing unusual ingredients and wondering how they could use them.

Drew has a reputation of being this type of brewer. He's toned it down a bit, but he'll always be known as the guy behind saison guacamole and clam chowder saison. And he still can't resist ordering a five-pound (2.3-kg) block of caramel and thinking about how he could use it in a beer.

Drew: No, seriously . . . 5 pounds (2.3 kg) of caramel. Thinking I'm going to take part of it, melt it, defat it, and use it as an addition to a tripel . . . maybe a wee heavy.

Also, yes, this is part of the current raging storm of cries and laments: "What's happened to craft beer?" in regards to pastry stouts and the aforementioned sour hazy imperial raspberry milkshake Oktoberfest with habaneros and vanilla. While, this is definitely my jam in terms of "brewing fun," even I think that the way people are "innovating" is a bit over-the-top.

THE WILD ONE

The wild one is all about the creepy crawly sour and funky stuff. Whether kettle-soured, barrel-aged, or made with bugs added to the fermenter, there's power in the pucker. Their deep and abiding passion is the broad swath of microbes out there. In fact where wild brewing used to have a reputation of being deeply idiosyncratic and "woo" filled — these days a lot of the most interesting science is happening here.

> **He came to the conclusion that if you stressed over homebrewing, you were doing it wrong.**

Their equipment might include an extra kettle and a way to keep it warm for kettle sours, or a collection of barrels to mine the possibilities of extracting flavors from microbial critters left in the wood. They also probably always have a browser tab opened to the *Milk the Funk* Wiki to read the latest offerings and the *Sour Hour* is dialed up on their podcast app!

THE BUSY BREWER

We all know that homebrewing can get to be an all-consuming passion. All homebrewers can often talk or think about is homebrewing. You know you've reached that point when you're explaining to your partner about how final gravity affects a beer and they just give you a wan smile as their eyes glaze over.

But believe it or not, there are homebrewers who have lives other than homebrewing! Family, jobs, or even other hobbies (yeah, it's hard to imagine) take up their time, energy, and budget. But there are ways they can fit homebrewing into their busy schedule.

One of the most interesting trends in the last 10 years has been the rise of small-batch brewing. One- to three-gallon (4- to 11-L) batches have become how many people are brewing. They take less time to brew, require less equipment, and can be done on your kitchen stove. While in the past the mantra was, "you might as well brew more all at a time," now it's "just brew!" Smaller batches are a great way to do that.

One of the most popular ways of brewing small batches is the brew-in-a-bag (BIAB) process. Other than the bag and a fermenter, you likely have most of the equipment you need right in your kitchen. And less volume means less time to heat water or wort, less time to chill after brewing, and less time bottling or kegging the result. Denny has even been doing a 20-minute mash and 20-minute boil on his 3-gallon (11-L) BIAB batches. That means that you can knock out a 3-gallon (11-L), all-grain batch in well under 2 hours. The key is to double the amount of bittering hops to compensate for lost IBUs.

THE EVOLUTION OF A HOMEBREWER – THE RELAXED BREWER

Denny started out as a gearhead when he began homebrewing. Even while he was still brewing in the kitchen with extract, he was exploring building a 3-tier system. That was pretty much the pinnacle of homebrewing 22 years ago. Sure, he didn't understand exactly how they worked or why you needed one, but they were SO cool looking and all the big guys in the hobby had them!

Fortunately, before he went down that rabbit hole, he discovered batch sparging. The "Cheap'n'Easy" brewing system was born, and along with an insatiable desire to know why things worked like they did. Because so many people at the time adamantly declared that batch sparging was a poor brewing method (one homebrew shop owner declared it would make "dirty beer"), Denny was compelled to figure out how to get the best out of it.

That led to a series of experiments, including decoction and first wort hopping. The beer was great, but it was secondary to the discovery and proof.

After 20 years or so, Denny decided that enough was enough. Something was missing and it was the joy he had felt when he first started brewing. There's a lot to be said for knowing nothing and just going with the flow! He had done enough exploration at this point to have a handle on how things worked. He came to the conclusion that if you stressed over homebrewing, you were doing it wrong. And so the relaxed homebrewer was born.

Denny knew from years of experience that you could make great beer with inexpensive equipment, like a cooler mash tun and bucket fermenters. But there was a level of effort there that didn't pay off in more enjoyable brewing for him. He wanted to groove on brew day, not toil. He started using an all-in-one electric brewing system, along with glycol chilled conical fermenters. He had his groovy brew day back.

And this is another important point — who you are as a brewer is not a fixed North Star. Over time, like Denny, you'll find your priorities and passions will change. Be adaptive. Keep enjoying your brewing!

WRAP UP

It's important to keep in mind that none of these goals, brewing techniques, or equipment choices are wrong, as long as they're not compromises. Keep in mind what you want to get out of your homebrewing (other than beer!), and tailor your equipment and process choices to achieve that, and know that not everyone is like you. Now go out there and brew! BYO

BY GEOFF PARKINS

PROPANE VS. ELECTRIC

What are the considerations?

Many homebrewers have cut their teeth on a kitchen stove, running 2.5-gallon (9.5-L) batches in a stockpot. It's a great way to learn the ins and outs of the craft. The advent of affordable brew-in-a-bag kits have made all-grain brewing accessible to the stovetop brewer. When the limitations on batch size and the easy cleanup starts to lose its luster, many brewers start looking to up the ante by moving to five-gallon (19-L) batches. Problematic for most home stoves, the move requires a substantial investment in bigger equipment. Along the upgrade path there are a lot of decisions, the first of which is your heat source: Gas or electric?

It's a question that polarizes brewing forums, with dedicated adherents from both camps happy to chirp at each other until the din is tiresome. We're going to take a look at the considerations without planting a flag for one heat source over the other.

EQUIPMENT

For discussion purposes, I'm going to stipulate that we're going to look at building a two-vessel (mash tun and kettle), 5-gallon (19-L) batch, semi-automated brewhouse using 10-gallon (38-L) kettle(s). Let's also assume that you are willing to spend a little more than the bare minimum in order to improve your overall product. With that in mind, we can now say that both rigs will have one electric pump, two temperature sensors, and a roughly comparable bill of hoses, connections, false bottoms, lids, etc. The kettles in an electric rig will require another hole for the heater elements, but each burner in a propane rig will require a solenoid valve and igniter. Let's call that a wash in terms of costs. Finally, let's also say that we are going to use a single-tier setup (kettles at the same height) to eliminate the risk of moving heavy kettles full of sugar water that's going to wind up at boiling temperatures.

That gets us pretty close to a comparison of apples. At least close enough that we have a baseline common to both. Let's take a look at where the equipment costs start to diverge.

Both rigs will need a control box of some kind. The propane rig will need to monitor two temperatures and have two thermostats of some kind with a settable temperature and adjustable hysteresis band. Hysteresis means that the thermostat will turn the burner off when it reaches the set point but will allow the temperature to fall by a certain number of degrees before reigniting the burner. The narrower the hysteresis band, the more often the burner will cycle, and the closer the temperature will stay at the set point. There is, however, a minimum cycle time. Don't expect to get much more than one cycle every ten seconds or so. The thermostat will also have to have a set of output contacts that can trigger the solenoid valve and igniter. Cheap luxuries would be an electronic timer and a switch to turn the pump on and off. There will be some 120VAC wiring, a DC power supply of some kind, and some overcurrent protection devices like a fuse or a breaker.

The electric rig will need a bit more and will be more expensive than what's needed for the propane setup. Two controllers are required. One, a PID controller, will control the hot liquor/mash tun element. The other, a duty-cycle controller, will control the boil kettle element. The controllers will also need solid-state relays (SSR), a big aluminum heat sink, several breakers and fuses, and a means to prevent both elements from coming on at the same time. There is a lot more wiring needed in the enclosure, and it introduces high voltage, high current power into the equation, so safety concerns are also a key component of the system design.

Assuming the basic, common elements of both automated rigs are going to be about the same price, the difference will be in the control panel.

Photo by Trent Neutgens

Photo by Christian Lavender

The battle of propane vs. electric drones on in some homebrew circles, but there is no clear winner, just what works best for you, your brewing settings, and your budget.

SAFETY NOTE: *Household 120/240VAC current can kill you. Do not attempt to build your own system without a thorough understanding of the safety precautions that will keep you from getting hurt or worse. Consult an electrician if this is beyond your skill set.*

More on the controllers: PID stands for Proportional, Integral, and Derivative. That describes the math used to compare the current temperature against the target temperature and the rate at which the two are converging. PID controllers, coupled with an SSR, can cycle power to the element many times per second, far faster than a propane controller can. Brewers just need to know that it's a device that ramps up temperature as quickly as possible without overshooting the target temperature. A duty-cycle controller turns on the element for an adjustable percentage of the time. In other words, it can be set to operate for 1.5 seconds out of every 2 (75%). Duty-cycle controllers are used in the boil kettle. Typically, they are set to 100% until the boil is reached, then cut back to somewhere between 50–60%, or to whatever percentage maintains a nice, gentle boil.

> **One challenge you will face as you become accustomed to your new setup is one of consistency and repeatability.**

Assuming the basic, common elements of both automated rigs are going to be about the same price, the difference will be in the control panel. For a DIY kit, expect to pay about $1,000–$2,000 (USD) for quality equipment and a proven design, and probably about 75% of that for an equivalent propane control panel. Naturally, the sky is the limit, depending on the features and automation you choose to build in, and you can always spend more by having someone else handle the assembly.

HEAT SOURCE

Propane

Pros:

- Can have faster ramp time with a good burner.
- Single-kettle plus cooler setup is the lowest price to build a 5-gallon (19-L) rig.

Cons:

- Must be used outdoors or in an open shed or garage due to the poisonous gases.
- More expensive per batch than electricity (about $7-$10 per 5-gallon/19-L batch if using a standard 20 lb. tank, vs. $1-$2 for electricity).
- Depending on your burner, only about 30-40% of the heat is actually applied to the liquid in the kettle.
- Heat deflectors or similar must be used to protect the hoses and temperature probe cables from the high heat from the burner under the kettles.

Electricity

Pros:

- Can be used indoors (with a vent or steam condenser).
- Cheaper per batch than propane.
- 100% of the energy goes to heating the liquid in the kettle.
- Easier to control temperature ramp-up without overshooting.

Cons:

- Increased risk of electric shock.
- Cleanup can be more difficult.
- Equipment costs and initial setup time is often higher.
- High-energy electric is required.

A note on induction burners: Some brewers are using induction burners as their heat source. For small batches, the 120VAC can work well, but stepping up in size to 240VAC is often recommended for 5-gal. (19-L)+ batches (kettles can be insulated to speed heating times). Also they operate by strictly manual control. An external thermostatic controller or PID controller would be impractical to use. Furthermore, once you go bigger than about a 2.5-gallon (9.5-L) batch, the price tag for a kettle that will work on an induction burner jumps significantly. Many large (10+-gallon/38+-L) kettles will not work on an induction burner.

BREW DAY

Once you've taken a look at the equipment and cost involved, there are still a few things to consider before you finalize your decision and start spending. Moving from the kitchen cooktop to the basement, driveway, or workshop is going to mean a very different brew day. Bigger batches mean more weight. More liquid to heat means more time to the start of the boil, and assuming you start brewing all-grain recipes, more cleanup at the end of the day.

One challenge you will face as you become accustomed to your new setup is one of consistency and repeatability. It's pretty easy to make sure you're consistent when assembling the grist and hops, and a boil is pretty much a boil. The two biggest factors for repeatability and consistency are found in mashing and fermentation. Fermentation is a discussion for another day, so spending some time figuring out the best way to a consistent mash is time well spent.

Many homebrewers with pumps will utilize some sort of recirculating mash system to gain better control over their mash. The most common are direct-fired (DFRMS), heat exchange (HERMS), and recirculating infusion (RIMS). This will add a level of complexity to your rig (or brew day) no matter which you choose, but generally HERMS and DFRMS are considered the easier to implement while RIMS requires more technical elements to put into place. Direct-fire recirculating mash system uses a burner to provide heat to the bottom of the mash tun while recirculating wort back to the top of the mash. The problem is that using a propane burner throws a massive amount of heat at the bottom of the kettle you don't want to scorch the wort. A HERMS set-up requires a heat exchanger placed within a hot liquor tank. The hot liquor tank's temperature will be controlled and wort recirculates through the heat exchanger

back to the top of the mash to raise the wort temperature. A PID-controlled electric element housed in a steel tube is the basis for a RIMS loop. Wort recirculates across the element heating the liquid to a set temperature. Each allows you to hit your target temperatures and keep them there every single time if properly implemented using calibrated temperature sensors. You can begin using multi-step mash recipes, and you can control mashout and sparging with precision. For pros and cons of recirculating mash systems, check out: www.theelectricbrewery.com/forum/viewtopic.php?t=28112

Electric brewstand proponents argue that the PID and duty-cycle control methods are instrumental in reducing boilovers. While any rig, from kitchen cooktop up to the largest non-calandria-heated professional systems, are subject to boilovers, there are some advanced systems that remove the need for absolute vigilance when approaching the boil and into the hot break. There are some automated systems that will monitor the temperature in a boil kettle and trigger an alarm when wort temperature gets just below boil to let the brewer know it's time to put down the crossword puzzle and pay closer attention. This can be implemented with both electric and gas rigs. But the electric rig can be set up to automatically scale back the duty-cycle controller so that the start of the boil is far less violent than what is typical with a propane rig. An alarm can be triggered here too when the system starts ramping back the duty-cycle percentage.

The biggest brew day advantage for propane brewers is when the fermenters are full and it's time to clean up. The relative simplicity of a propane rig as compared to an electric rig makes the chore slightly faster and easier. The brew kettle's electric element needs to be cleaned after each brew and there are fewer holes in the kettles, meaning there is less stuff to disassemble and clean. That advantage may be short-lived, however. More and more electric brewers are asking for bottom-drain kettles, which will bring true clean-in-place (CIP) capability to the homebrewery. Most kettles are manufactured with a thick 3-ply bottom with a heavy aluminum sandwich in the middle, so as to allow the propane flame to hit the kettle directly, without fear of scorching the wort. That isn't needed for an electric-only kettle and it's possible to build a slight slope to a drain in the bottom of the kettle (a specially designed stand would be needed though).

WRAPPING IT ALL UP

Hopefully, some of the points raised here will prompt a well-researched decision on your rig. Whichever method you choose, the goal is to make your next brewhouse a pleasant leap in the direction of better, more consistent beer. It should also be something you can be happy with for several years (or until your wallet starts to itch). Spend some time on YouTube and in the various homebrewing forums to get the deep-dive detail on some of the subjects that were just introduced. Above all, make sure that whatever you build or buy is safe, and appropriate for the intended use. Consulting a professional is always a smart move if you have questions.

BrewYour Own THE HOW-TO HOMEBREW BEER MAGAZINE 2020 STORY INDEX

Brew Your Own — THE HOW-TO HOMEBREW BEER MAGAZINE

2020 RECIPE INDEX

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BY ROBERT HAMM

BREWING IS IN MY BLOOD

Catching the homebrew bug again

As far as I know, I was the first homebrewer in my family's history — well at least recent history. But beer brewing runs deep in my blood. You may have heard of my great grandfather's brewery: Hamm's. No . . . not the Theodore Hamm's Brewing Co. located in Minnesota, that at one time was the 5th largest brewery in the U.S. My great grandfather's brewery was named Charles Hamm Brewery and was located in Wisconsin (imagine the lawsuit that would occur in this day and age). My great grandfather, Carl Hamm, was born in 1853 in Oberwinden, Germany. He apprenticed at a brewery in Oberwinden starting at the age of 15. In 1872 he sailed to New York City where he worked at George Ehret's Hell Gate Brewery, the largest in the state of New York at the time. He worked there for nine years before moving west to Silver Creek, Wisconsin (about 45 minutes north of Milwaukee in today's world) in 1881 where he purchased a brewery. He brewed at that location for 31 years but eventually built a more modern brewery in Random Lake, Wisconsin (next town over) in 1912. Also in 1910 Carl changed the name of the brewery to reflect his son's name, Charles. Carl operated the new brewery for two years until his death in 1914. But before his death he sold the brewery to its namesake, Charles Hamm. Tragically my great uncle Charles lost his life in 1918 fighting in Europe in World War I.

The Charles Hamm Brewery continued to operate after Charles' untimely death, having been purchased by the head brewer. My grandfather, Michael, worked there for an extended time as well. But as I stated, I was the first in the family lineage to start homebrewing. I received my first brewing kit and brewed my first beer in 1996. I got the initial homebrew bug but only brewed four batches before life put the hobby on hold. My first cousin Larry started homebrewing in 2008 and after trying his homebrew I realized he's a solid brewer. He gave me the itch to return to the hobby. I always kept my equipment with great intentions, but even then, life kept getting in the way.

My wife Debbie was not a self-described "beer drinker," but our lives include visiting breweries and attending beer fests. My wife always said, "Why brew 5 gallons (19 L) when it could turn out bad! Plus you have a choice of so many flavors." Sounded like logical reasoning not to homebrew, right? But recently we moved to Arkansas, Deb retired . . . and then COVID-19 hit. It was the impetus I needed. I decided to dust that old equipment off and get brewing again! Some local homebrewers recommended a supply store in Little Rock, Arkansas called Fermentables. That's when I met the owner, Mike. He steered us to a recipe for a Scotch ale. I went all-in and went right for a kegging system as well. I now have three 5-gallon (19-L) kegs and a 2.5-gallon (9.5-L) keg for carbonated water. My first batch we titled "Debsretired Scotch Ale," clearly a celebration of the event. I am about set to keg my third batch and have now brewed a total of six batches and they all have been fabulous. Mike helped me most recently modify an oatmeal stout recipe that I had picked out of an issue of *BYO*. He certainly played a huge hand in my return to brewing. My neighbors love all my beers and claim they have been better than anything they have purchased in a long time. Advancing my equipment has also been a center of joy, having just purchased a used fridge so I can start lagering.

The Hamm tradition of brewing lives on, but this time around it's taking place in our own homes. Prost!

I got the initial homebrew bug but only brewed four batches before life put the hobby on hold.

Photo by Robert Hamm

A relic from the Charles Hamm Brewery with a Random Lake, Wisconsin point of origin.

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

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

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